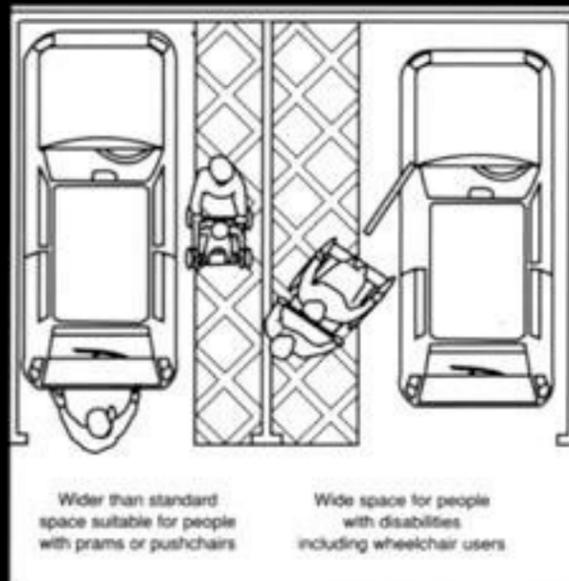
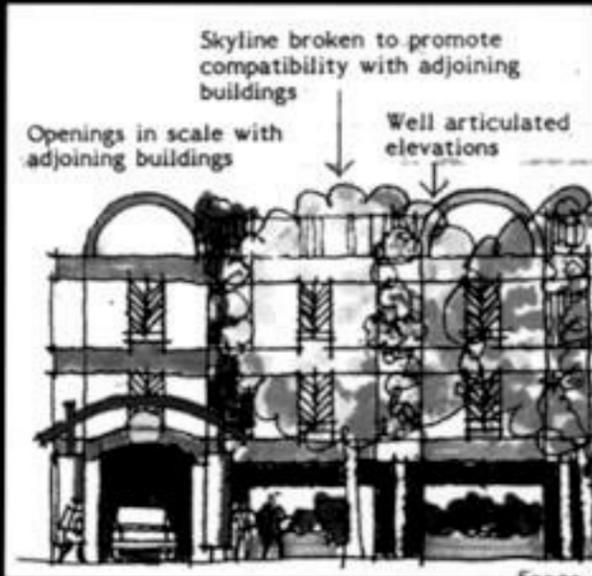


CARPARK

DESIGN·GUIDE



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1.1 INTRODUCTION

In recent years there has been growing public concern, both nationally and locally, about shortcomings in the design and maintenance of car parks. This concern has focussed on two main issues - firstly the relationship between the design of car parks and opportunities (actual or perceived) for crime against users of car parks and/or their vehicles, and secondly the visual impact which car parks (especially multi-storey car parks) can have upon the appearance of the environment.

It is now recognised that the general perception held by the public of many car parks, particularly multi-storey car parks, is one of unattractive and unsafe places. For many people, particularly women and people with disabilities, use of car parks can be difficult and intimidating.

The City Council attaches great importance to the issues of community safety, equality of opportunity and environmental quality. These are three of the strategic initiatives identified in the Council's City Strategy for 1991/92. Improving the design and maintenance of car parks in the City represents one way of putting these initiatives into practice. The Council believes that an approach to car park design which gives greater consideration to issues such as personal safety, crime prevention, accessibility and appearance will help to produce parking facilities which are more secure, convenient and attractive than many car parks built in the past.

The Design Guide is intended to encourage those responsible for the design and development of all types of car parks to adopt such an approach, by identifying key design considerations and providing practical advice on how these considerations may be dealt with.

The Guide is also intended to complement other City Council policies and guidelines relating to car parking, particularly the Council's city centre parking policy and development control guidelines on parking standards for new development (see List of Useful References).

PURPOSE OF THE DESIGN GUIDE

To provide guidance to designers and developers of public and private car parks, with the aim of ensuring that off-street car parking facilities in Birmingham meet the following objectives:

- Create facilities which are attractive, comfortable and convenient to all users, including people of restricted mobility such as persons with disabilities and parents with young children.
- Create an environment which maximises the personal safety of all users, minimises fear of crime and eradicates as far as possible opportunities for any form of crime against persons or property.
- Make a positive contribution to the appearance of the urban environment.
- Provide facilities which are able to be operated and maintained efficiently and effectively.

HOW TO USE THIS GUIDE

The format of this guide is intended to encourage designers and developers to consider all aspects of car park design, rather than to consider specific aspects in isolation.

The guide is divided into five sections. Section 2 identifies the key objectives which the City Council believes need to be addressed in the design of car park facilities. Section 3 identifies ten specific components of car park design and management, and gives practical guidance on how these components may be dealt with in a way that enables the design considerations set out in Section 2 to be properly taken into account. Section 4 is a series of technical appendices containing detailed information relevant to the design/management components referred to in Section 3. For ease of reference Section 3 contains cross references to the relevant appendices in Section 4. A checklist of the most important points in Sections 2 and 3 is provided for quick reference in Appendix 1.

All quantitative standards quoted in this guide are the optimum standards which the City Council will seek to secure wherever possible. It is recognised, however, that there is a need for flexibility to take account of particular circumstances which may apply in individual cases. Accordingly, higher standards may be required or lower standards accepted in some instances.



1.2 SUMMARY OF DESIGN OBJECTIVES

- Consider the safety of people and security of property in all aspects of car park design. Designers should think about these issues early in the design process, not as an after thought.
- Good design and good management and maintenance of car parks should go together, to create facilities in which people feel safe and secure.
- All car parks should provide for use by all, including women, parents accompanied by children, elderly people with restricted mobility, and those with disabilities.
- All car parks should contribute positively to the appearance of the urban environment, and be sympathetic to the scale and character of adjoining buildings and open spaces.
- All car parks must be structurally safe and function in a way which is convenient, efficient and economical.
- Hard and soft landscape design should aim to make a car park an attractive building or open space - "A park for cars".



2.1 SECURITY AND PERSONAL SAFETY ISSUES

Safety and security measures should be considered as early as possible in the design process. Key design decisions such as the type of parking layout can have a major influence over the perceived or actual degree of safety and security of car park users and their vehicles. Particular types of layout, and other design features which may eradicate opportunities for crime or reduce fear of crime, need not necessarily increase the cost of the development if considered early enough, and even if such costs are higher these may be offset by increased usage and decreased maintenance costs in the long-term.

Key Issues which need to be considered include:

- Methods to maximise casual and formal surveillance, ie. to see, to be seen and be heard.
- Ensuring that the chosen management system and controls (if applicable) are appropriate to the function of that particular car park and location.
- Ensuring that the design and number of access and exit points deter improper use of car parks and reduce opportunities for criminals to make easy and rapid escapes.
- Avoiding the creation of hiding places within car parks or on approach routes, by careful consideration of construction methods, illumination, enclosure, etc.
- Reducing the potential for conflict between pedestrians and vehicles, and between one vehicle and another, both within the car park and at the interface between a car park and the adjacent highways.

2.2 ACCESS FOR PEOPLE WITH DISABILITIES OR RESTRICTED MOBILITY

Any car park should make provision for and anticipate use by people with restricted mobility. This includes people with disabilities such as those restricted to a wheelchair and those with ambulant or sensory disabilities, but also other groups, for example parents with push-chairs or prams.

Achievement of this involves three main considerations:

- Facilitating a high standard of pedestrian movement between the car park and the surrounding environment.
- Facilitating a high standard of pedestrian movement within the car park.
- Providing car parking spaces which meet the particular needs of people with restricted mobility.



2.3 AESTHETIC CONSIDERATIONS

It should be recognised that car parks often have wider civic functions to perform than merely accommodating the maximum number of vehicles in the smallest possible space at the lowest cost.

In many cases car parks, particularly multi-storey car parks, are built on prominent sites at "gateways" to town and city centres. They therefore deserve to be designed with as much care and attention as other major public buildings, to ensure that they make a positive contribution to the appearance of the urban environment.

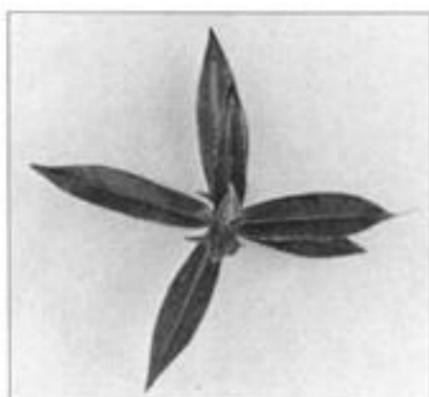
Multi-storey and surface car parks obviously present very different design challenges. In the case of multi-storey car parks, the principal consideration is likely to be how to ensure that the scale and form of a car park building integrates well with the surrounding urban fabric. In some cases it may be most appropriate for a multi-storey car park to blend with the surrounding buildings and be relatively anonymous. In other circumstances a more appropriate approach may be for the car park to be a bold, distinctive building which is a design statement in its own right.

In either case particular attention needs to be paid to the following:

- Where appropriate acknowledgement of the scale and character of adjoining buildings, and the need to articulate building forms to sympathise with this.
- Choice of elevational treatment and external materials.
- Roof form. The absence of a roof often leads to multi-storey car parks being out of sympathy with adjoining buildings. In certain circumstances (eg. sites in Conservation Areas) incorporation of a roof may be desirable.

In the case of open surface car parks, consideration needs to be given to the following:

- How best to relate the open space which a car park represents to the pattern and scale of buildings and other open spaces in the vicinity.
- Choice of surface materials and street furniture appropriate to local design vocabulary.
- Hard and soft landscaping, and in particular the treatment of car park boundaries.



2.4 LAYOUT AND CONSTRUCTION

Two essential requirements of any car park are that it is structurally safe and functions in a way which is efficient, economical and convenient to users. The design objective should be to meet these requirements in a way which takes account of the safety/security, access and aesthetic considerations already identified. Decisions made early in the design process about forms of construction and layout are likely to have a strong influence over other aspects of car park design. Accordingly, it is very important that all relevant issues are considered at an early stage.

Key considerations include:

- Relationship of layouts to the shapes and levels of car park sites, and the highway accesses available. Attempts to impose predetermined layouts onto individual sites should not be made. Rectangular forms of car parks (especially multi-storey) may not always lend themselves to the arbitrary shape of development sites. In some instances, it may be more important for building lines or plot boundaries to be followed, rather than the natural rectangular shape of the car park.
- Taking account of the envisaged hours and levels of use of the car park in the design of circulation spaces and access/exit facilities. For example, a car park servicing an office building or factory is likely to be subject to high demand on its access/exit points for short peak periods twice a day. Conversely a public car park serving a shopping centre will probably experience a more constant level of use throughout the day.
- Means of segregating pedestrians and vehicles (wherever practical) for safety reasons, particularly on access/exit routes.
- In the case of multi-storey car parks, taking account of the effects which different construction specifications can have on the overall massing and form of the building. For example, floor thicknesses and ramp gradients can directly affect the overall height of a car park.
- Means of achieving casual surveillance of car parks and of people and vehicles in them for security reasons.

2.5 LANDSCAPING

The overall aim of tree planting and hard and soft landscape design should be to help make a car park an attractive building or open space. In addition to making a car park visually more attractive, a well designed and maintained landscape can create a feeling of a cared for environment and thus a sense of security for car park users. Trees and other landscape features can help define pedestrian and vehicular routes, sub-divide large areas of car parking and provide appropriate means of enclosure.

The design of car park landscaping needs to take into consideration safety and security issues - for example planting schemes should not create potential hiding places.



2.6 MANAGEMENT AND MAINTENANCE CONSIDERATIONS

The management aim with any car park should be to emphasise customer satisfaction with the service provided. The motorist needs to find a space in which to park easily and know whether and how to pay a fee. Once out of the car the pedestrian should be able to exit the car park in safety in a well lit and clean environment, with the knowledge that the car will be reasonably secure and easy to retrieve on return.

The standard of maintenance and lighting of car parks can have a significant effect on the level of public confidence in the use of those facilities. The presence of litter, graffiti or other vandal damage, and badly maintained lighting, can seriously undermine confidence in the safety and security of car parks.

Good design can help to facilitate good standards of management and maintenance once a car park is operational. Particular attention should be paid at the design stage to the following:

- Any special requirements connected with supervision and management of the car park, eg. the siting of attendants kiosks.
- The use of surface materials which are vandal resistant and easy to clean.
- The quantity, positioning and design of lighting facilities to achieve specified levels of illumination at all times.
- The quantity, positioning and design of information and directional signs.
- The quantity, positioning and design of facilities such as ticket machines, litter bins, etc.
- Ensuring that the car park design and especially planting areas do not act as "litter traps".



3.1 CAR PARK FORM AND LAYOUT

Car park form and layout should not be pre-determined - the design must be tailored to suit the site shape and levels, highway accesses available, and intended function (eg. ancillary to a particular development, general purpose car park serving a district etc).

There are certain design issues which are specific to multi-storey car parks, and others specific to surface car parks. These are discussed on the following pages. However, there are some design considerations common to the layout of both types of car parks.

Security/Safety Considerations

Any car park design should seek to achieve the following:

- Pedestrian areas segregated from vehicle movements whilst maintaining visual linkages, perhaps by means of a raised walkway, small ramp or kerb, railings or floor markings.
- Avoidance of congestion, allowing ease of movement.
- Use of narrows and/or speed ramps to reduce vehicle speeds.
- Avoidance of dead ends, blind corners, solid walls, which obstruct visibility.
- Location of footways to avoid potentially dangerous areas such as densely landscaped areas or high walls which may conceal a would-be attacker or trap a possible victim.
- Pedestrian crossing points should be clearly identified and safely and conveniently positioned to relate to the facility the car park serves.

Access for People with Restricted Mobility

- Parking spaces for people with restricted mobility, especially those with disabilities, should be located in naturally well-lit positions and close to entrances, exits and lifts.
- All car parks should include a number of wider than standard spaces suitable for use by people with restricted mobility, including wheelchair users. Such spaces should be grouped so that the area between them can be shared for unloading between two spaces. Guidelines on the number of wider spaces to be provided and minimum dimensions, are given in Appendix 2.
- Ramps intended to be used by people with disabilities should conform to the maximum gradients specified in Appendix 2.



Layout and Construction Considerations

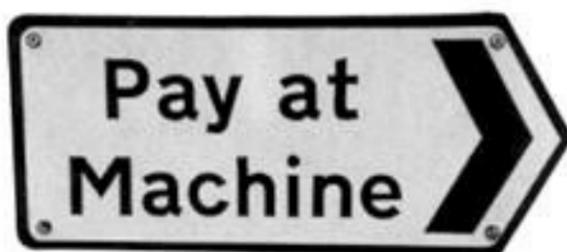
- In most circumstances parking bays at 90 degrees to aisles will provide the best layout, but in some situations angled parking may be more appropriate. A functional comparison of different generic layouts is given in Appendix 3. The temptation to increase the number of parking spaces by reducing the size of circulation areas and individual spaces should be resisted. Optimum dimensions for parking stalls (spaces) and aisles are also given in Appendix 3.
- The purpose which a car park serves will influence how quickly and how often its maximum capacity is reached. This factor needs to be taken into account in deciding upon the number and position of access and exit points. The traffic demand for each entrance and exit during peak periods, and the traffic flow in the adjacent highway should be considered in the design of entrances and exits, including decisions about the use of any control devices (eg. entrance barriers). For instance pay on entry or exit systems severely restrict the rate of flow of vehicles into and out of car parks. Detailed guidance on the various types of payment systems is given in Appendix 7. For a car park exit to operate without causing congestion, a space for vehicles waiting to join the highway is needed after any exit barrier. The size of this space (known as a reservoir) will depend on the traffic flow in the highway, but should always be big enough for at least one car. Similarly, to avoid blocking the highway, a reservoir should be provided at the entry to most car parks.
- Careful attention needs to be paid to drainage of car park surfaces - unless surface treatment and falls to drain water away are satisfactory, "ponding" will occur. This may result in under-utilisation of parking spaces, is uncomfortable for car park users and can cause long-term maintenance problems.

MULTI-STOREY CAR PARKS

The following design issues should be taken into account in determining the form and layout of multi-storey car parks:

Aesthetic Considerations

- The building mass and elevation treatment should be related to the scale and character of adjoining buildings and spaces. The uniformity of multi-storey car parks may be relieved by careful attention to patterns of treatment of external elevations and choice of facing materials. To help relate the design of the car park to adjoining buildings, an elevational treatment with vertically proportioned openings may in many cases be more appropriate than the usual horizontal openings generated by parking decks. (See Figure 1). In some cases, for example where car parks form part of a mixed development with other uses such as shops or offices, it may be possible to limit the extent to which car park elevations are visible from the street.
- Another means of counteracting the strongly horizontal emphasis of many multi-storey car parks, and adding visual interest to external elevations, is the use of imaginatively shaped and coloured grilles or sculptural features. This may be particularly appropriate in the design of



schemes to refurbish and improve the appearance of existing multi-storey car parks.

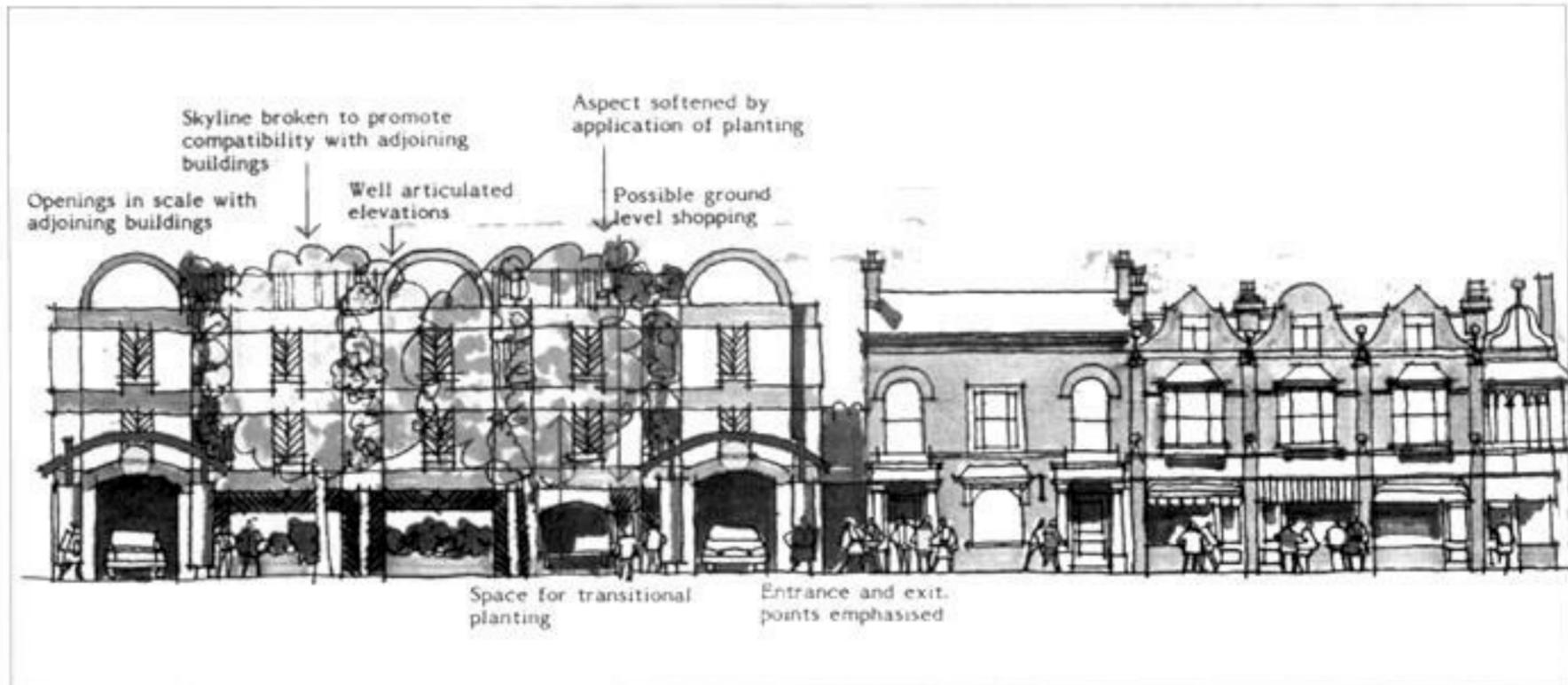


Figure 1:

Multi-storey parking in the street scene

Construction

The pros and cons of various structural alternatives for multi-storey car parks are discussed in detail in Appendix 2, however the following generalities may be stated:

1. Minimising the number of columns improves parking and safety.
 2. Locating columns at perimeters improves parking and safety.
 3. Thinner floor construction reduces the steepness of ramps, or alternatively enables greater headroom to be used.
 4. Downstand beams reduce lighting efficiency.
 5. Basement car parks may need more fire resistance.
 6. Basement car parks may need mechanical ventilation.
 7. Car parks over other buildings, eg. shops, require greater attention to water proofing and jointing.
- Columns intruding into parking spaces make parking less easy, and may result in one vehicle parking across two spaces. Where columns must be provided within the "bin width" (the aisle and the parking space on either side of the aisle) it is preferable that there should be not less than three parking spaces between columns. (See Figure 2)
 - Ceiling heights should in all cases comply with the minimum stated in Appendix 2. Wherever possible this height should be increased to help decrease opportunities for vandalism, eradicate feelings of oppressiveness and allow surveillance/radio communications.

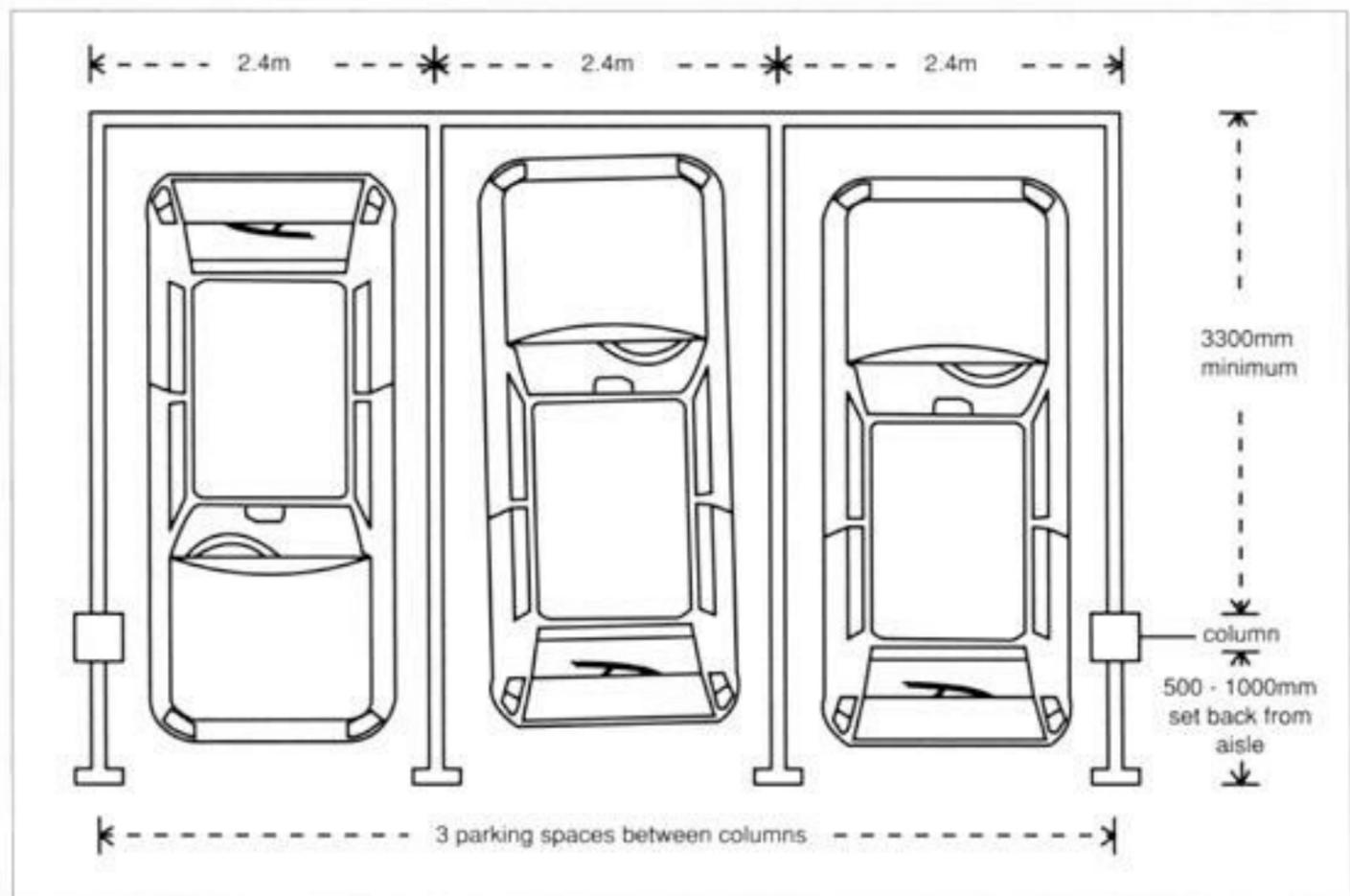


Figure 2:

Positioning of parking spaces and columns

- Vehicle ramps between floors should have low wing walls and/or railings if necessary. Ramps intended to be used by pedestrians should have a gradient suitable for use by people with disabilities, otherwise level access should be provided to the principal entrance floor. (See Appendix 1).
- Adequate drainage provision is especially important in multi-storey car parks. Falls to the drainage must be sufficient to overcome the roughness of the floor finish and the subsequent deflection of the floors. This latter point is particularly significant on long span car parks where the drainage points are fixed to the columns.

SURFACE CAR PARKS

Aesthetic Considerations

- The aesthetic design objectives with surface car parks should be to make them appear to be consciously designed open spaces, and not "gaps" in the urban fabric. (See Figure 3).
- In cases where it is desirable to preserve the continuity of building form along street frontages, careful attention should be paid to means of enclosure. In some instances it may be appropriate to retain frontage buildings and form entry points to car parks behind.
- Surface car parks should respect the scale of the buildings around them. In very large car parks, consideration should be given to means of breaking up large expanses of parking spaces into smaller identifiable areas of slightly different appearance or character, for example by changes in the colour and/or texture of surface materials, which will also assist orientation. The creation of 'landmark' landscape features can also help people to locate their vehicles more easily. (see Figure 4).

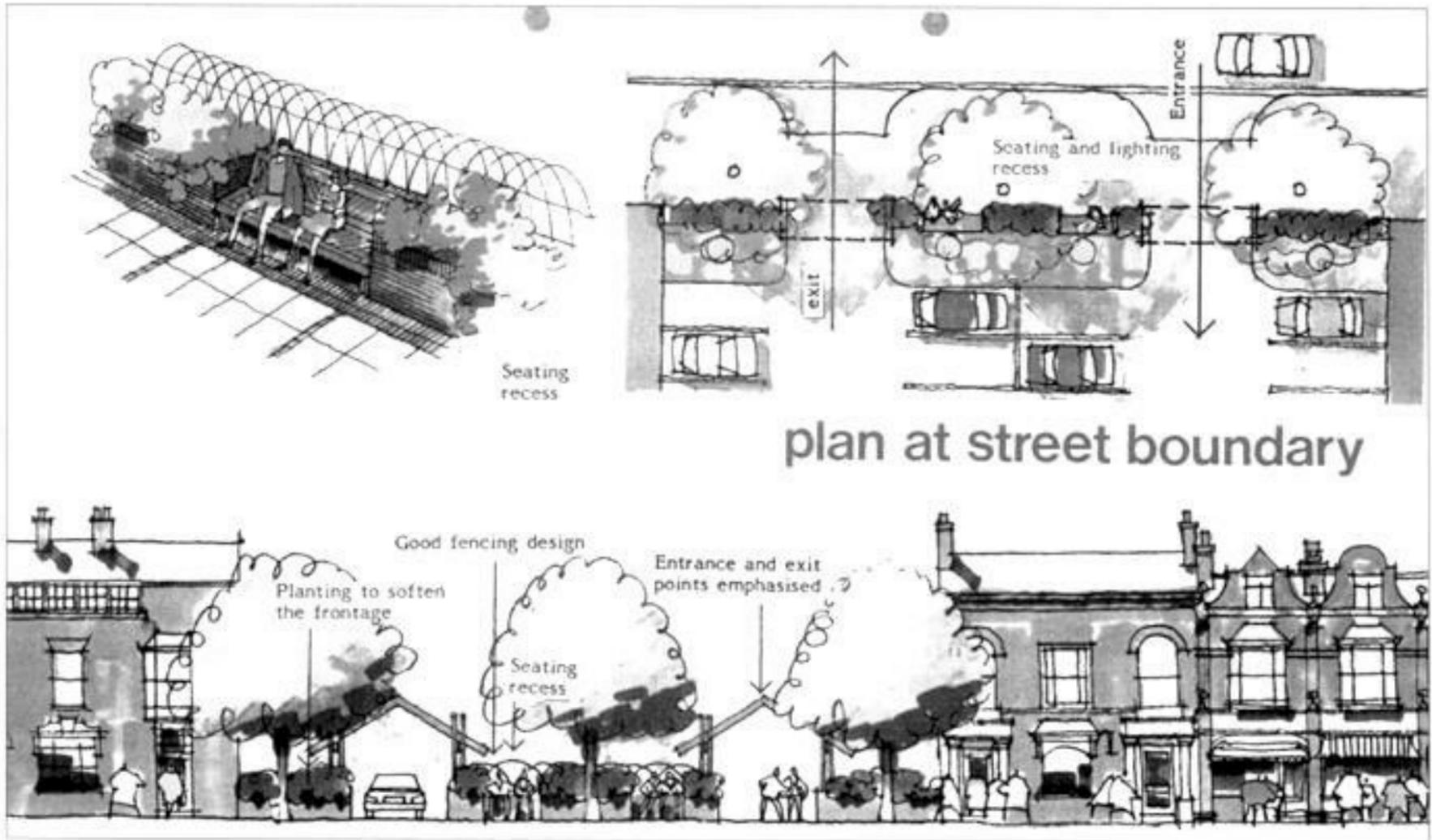


Figure 3:

Surface level parking
in the street scene



Figure 4:

Surface level
parking -
paving
variety



Safety/Security Issues

For safety and security reasons, car parks should have some degree of open aspect or be capable of being overlooked from nearby buildings to assist in surveillance. Good levels of lighting should be provided in all cases.

Landscaping

- Where car parks are developed on sites with existing mature planting, the layout should allow for the retention of good quality trees and shrubs.
- The size and location of trees and new planting areas should take account of vehicles and pedestrian movement patterns within the car park. Planting should not obstruct natural pedestrian "desire lines". Trees in open car parks can be accommodated at the intersection of parking bays.

3.2 APPROACH ENVIRONMENT

Safety/Security Issues

Approach footway routes should be limited in number, and achieve maximum visibility either by use of straight or long curved pathways and carefully selected low level landscaping. (See Figures 5a & b)

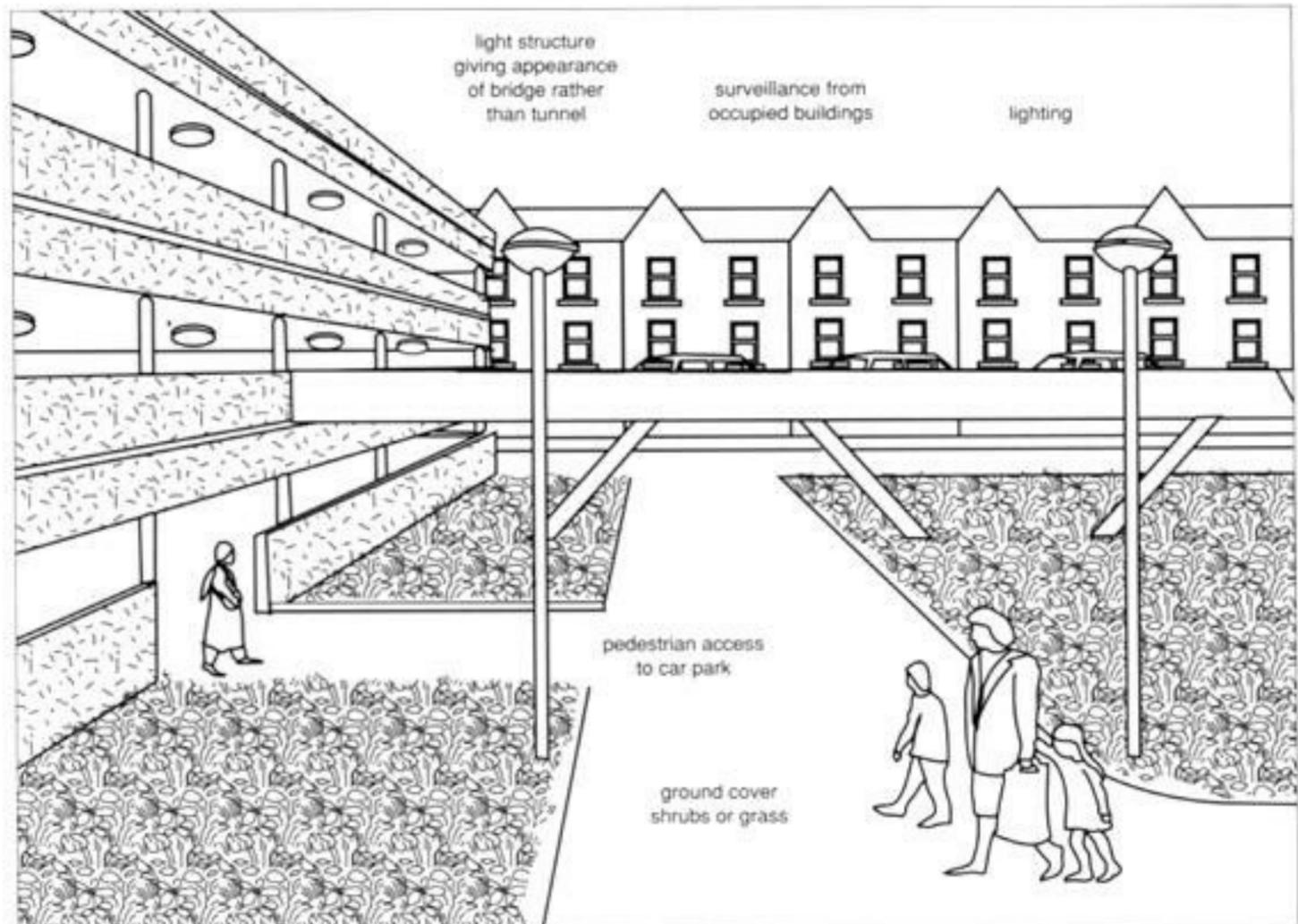


Figure 5a:

Good example of approach route design

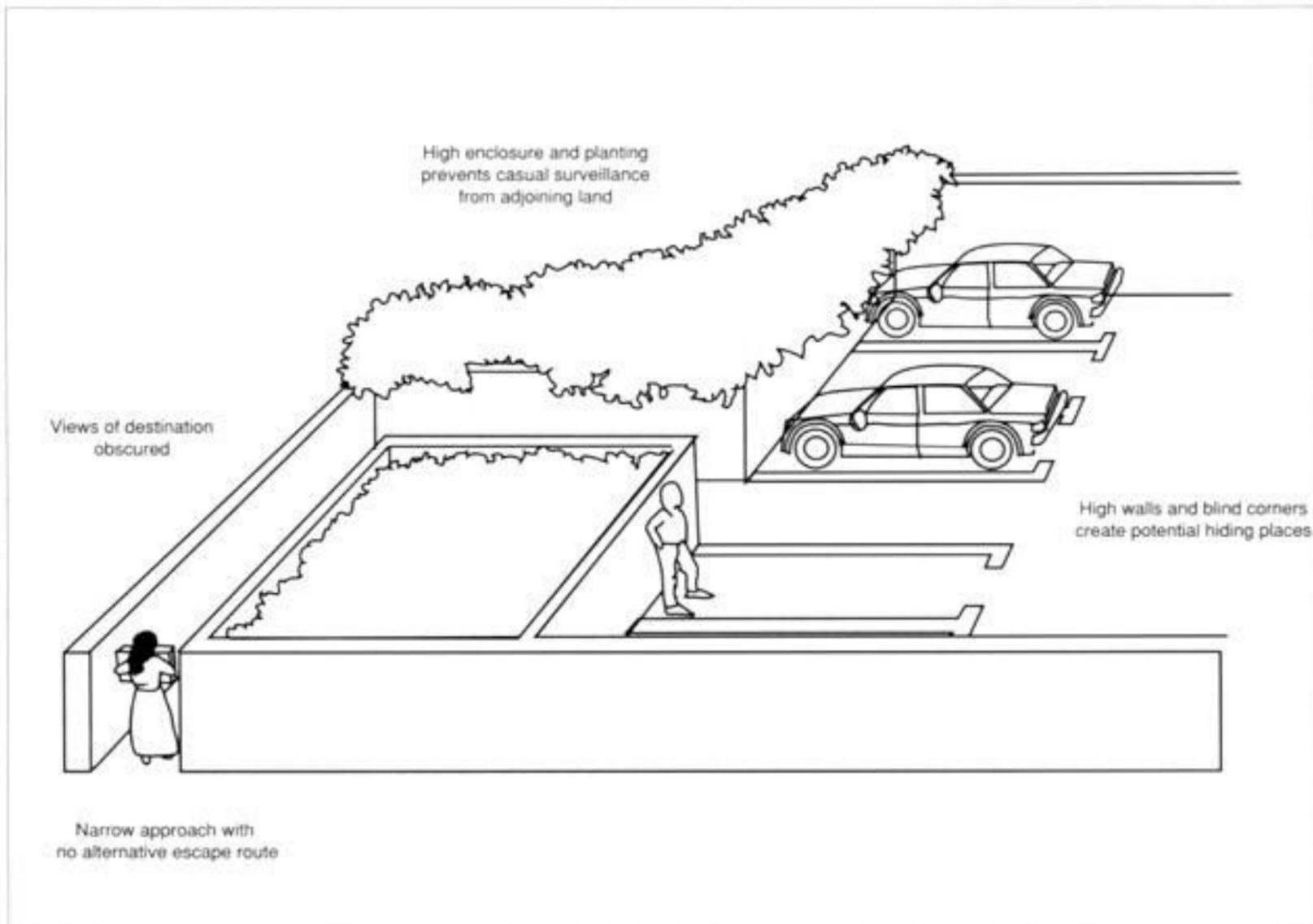


Figure 5b:

Bad example of approach route design

- Approach routes should lead to and from supervised areas to make them unattractive to criminals, but attractive to legitimate users.
- Approach routes should avoid isolated areas, subways and footbridges, and be well lit (as far as is the responsibility of the car park development).

Access Considerations

- If footbridges are unavoidable, they must have ramps of suitable gradient for people with restricted mobility (eg. parents with small children in pushchairs and people with disabilities).
- Pedestrian crossings over highways at the exit to car parks should incorporate dropped kerbs and have textured surfaces to denote the highway edge, to assist people with mobility and sensory disabilities.

Aesthetic Considerations

- Design should avoid the creation of litter traps which will detract from the overall appearance, thereby undermining confidence and deterring use of the facility.

3.3 ACCESS AND EGRESS

Safety/Security Issues



- Entry to car parks should be via a minimum number of recognised access points to maximise security, whilst complying with other safety requirements, eg. those of the Fire Service. Entrances/Exits should be clearly visible from the street or regularly used areas, wide and well lit.
- Car parks should have at least one rapid exit route for pedestrians which does not conflict with other traffic.
- In appropriate circumstances, consideration should be given to the siting of Closed Circuit Television (CCTV) cameras at entrance/exit points.
- In multi-storey car parks, the positioning and design of staircases should maximise visibility and enable surveillance up and down of adjoining stair flights. All potential hiding places should be eliminated by careful attention to detailed design. (See Figure 6).
- The number of staircases should be kept to a minimum, whilst complying with Fire Regulations, thereby encouraging greater numbers of people to use fewer staircases, increasing casual surveillance and decreasing fear of crime.
- All entrance and lift doors should have vision panels.

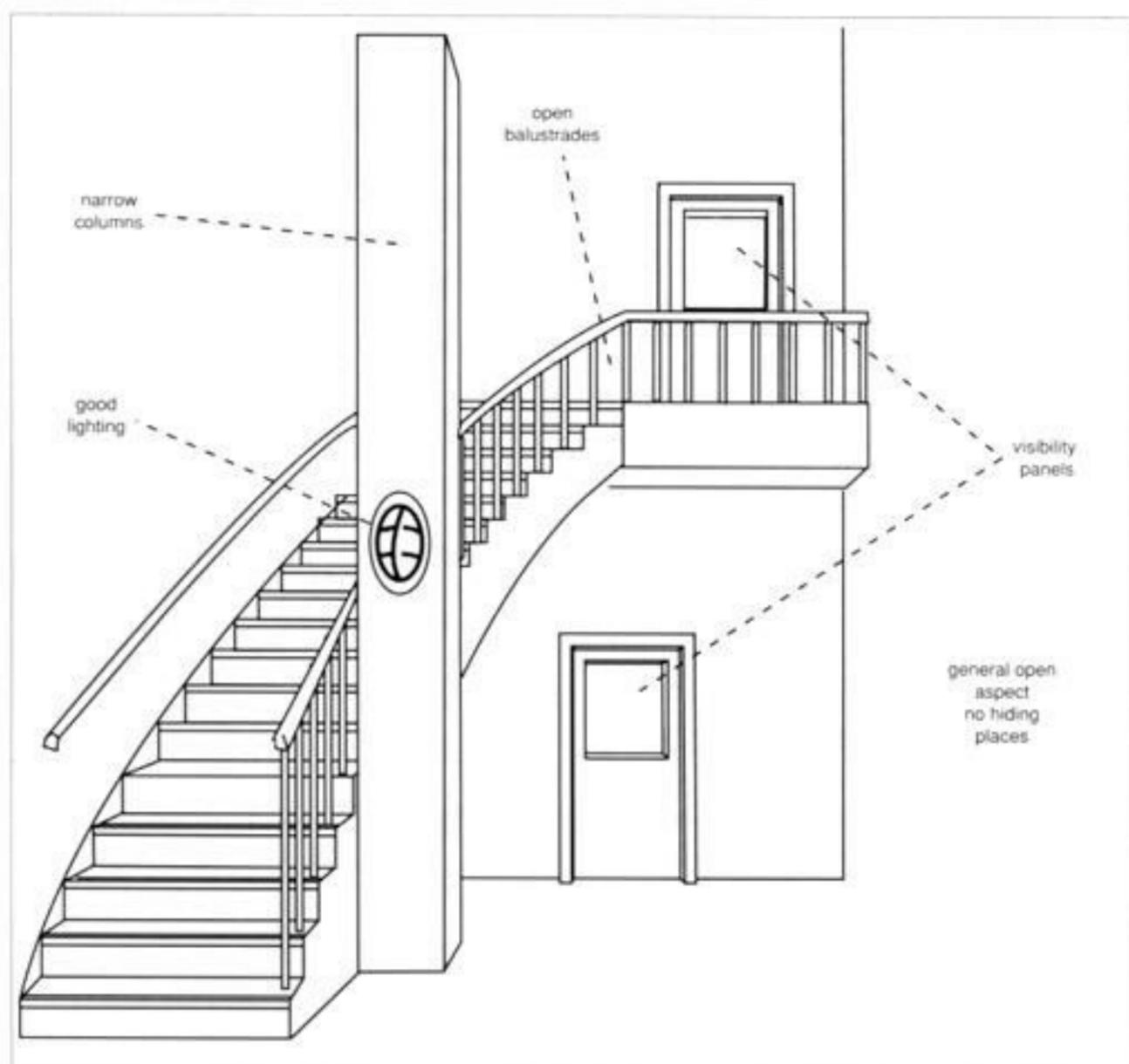


Figure 6:

Staircase design in multi-storey car park

Aesthetic Considerations

- If external staircases are provided in multi-storey car parks, for example as emergency fire exits, they should be designed so as to integrate and compliment the overall design rather than appearing as afterthoughts.

3.4 ILLUMINATION

- A high level of lighting is one of the most important features in increasing safety and reducing fear in the use of car parks.
- Light fittings and columns should be sympathetic to the overall design of the car park and the character of the surrounding area.

Multi Storey Car Parks

- Levels of illumination are required well in excess of generally prescribed existing standards. The required minimum levels are specified in Appendix 4.
- Illumination levels should be maintained at all times and in all parts of the car park regardless of external conditions.
- Natural lighting should also be maximised wherever possible, for example by use of large windows or openings in stairwells.
- Reflected light can be achieved by the use of light colour construction materials or surface finishes.
- Imaginative lighting schemes can also compliment the design of car parks, for example by the use of floodlighting of external elevations.



Figure 7:

Good standard of lighting in a multi-storey car park

3.5 MATERIALS AND FINISHES

- Surface materials should reflect the overall design concept of the car park which will vary depending on whether the car park is intended to be prominent or to blend in with its surroundings. In all cases an attractive, interesting appearance should be aimed for.
- Vandal proof, graffiti resistant surfaces, finishes, fittings and street furniture should be utilised throughout.



Figure 8:

High quality internal finish in a multi-storey car park

Multi-storey Car Parks

- Mono-chrome colour schemes should be avoided. Well designed colour and/or symbolic coding for different floors can help people to remember and identify where their vehicles are parked.
- Materials should be durable and largely maintenance free. Construction materials wherever possible should be of a bright colour which will not darken considerably with age.
- Rough textured surface strips should be included on ramps to discourage unauthorised use, eg. skateboarding.
- Internal surface materials in multi-storey car parks should wherever possible give a bright interior appearance. It is particularly important that areas used predominantly by pedestrians, eg. stairways, have a bright and clean appearance. Light reflective, easily maintained finishes should be considered rather than bare concrete, blockwork or brickwork.

3.6 LANDSCAPING

Safety/Security Issues

- Hard and/or soft landscaping on approach routes to car parks should be of a high quality and well maintained so as to create a good "first impression" for car park users. Trees should be of a high canopy variety so that vision is not impaired.
- The use of species with overhanging or projecting branches or thorns should be avoided adjacent to pedestrian walkways where they might be on the same level as a person's eyeline (including the eyeline of a person sitting in a wheelchair, pram or pushchair). See Appendix 5.

Management and Maintenance Considerations

- With soft landscaping, suitable species should be chosen, eg. shrubs should not trap litter, trees should not drip and both should be resistant to vehicle exhaust fumes.
- Planting between rows of vehicles should be easily maintained and shrub planting should be sufficiently low so as not to create hiding places.

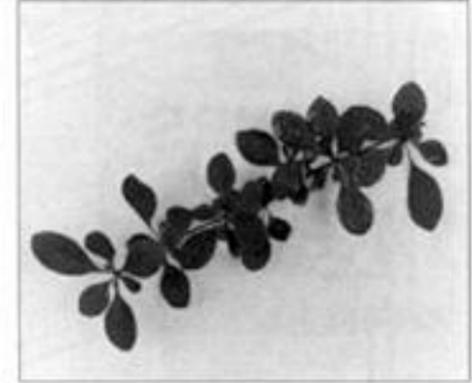


Figure 9:

Good quality landscaping in a surface car park

3.7 ENCLOSURE

- Means of enclosure should provide a secure, visually attractive perimeter whilst also maintaining clear sight lines. This can facilitate surveillance of car parks whilst also reducing potential exit routes for criminals.
- In surface car parks, hard and soft landscaping and fencing may be the only available means of defining spatial enclosure. The design of fenc-

ing should reflect the overall character of the car park design and the surrounding area.

- Over-long and boring fencing installations can be improved by the introduction of punctuating features, for example lighting, landscaping and seating (See Figure 3).

3.8 SIGNAGE



- Effective signage aids quick and safe circulation around car parks for both motorists and pedestrians. All signs should be clearly positioned and simple to read. The design of signs should take account of the need of people with sight and other disabilities.
- The detailed design of signs should conform to local design vocabulary where appropriate. Detailed guidance on sign design is given in Appendix 6.
- Regular inspection of signs is required to ensure displays are correct, and have not been defaced by graffiti or obscured by weather damage.

3.9 OTHER FACILITIES

- It is desirable that toilets and/or baby changing facilities should be provided wherever possible if a car park is attended and located near busy, accessible pedestrian routes. If other facilities, for example small kiosk-style shops, are to be incorporated this should be taken into account in the overall car park design at an early stage, so that facilities integrate well with the rest of the development. Such kiosks can increase opportunities for casual surveillance.

3.10 MANAGEMENT AND MAINTENANCE CONSIDERATIONS

- An official presence is important and can be achieved, for example, by the use of attendants or mobile security patrols. Alternative security measures, eg. the use of CCTV, has implications for staffing and management as constant monitoring is required to detect incidents and arrange appropriate action. If CCTV is utilised, a time-lapse record playback facility is recommended by police authorities. More information on management and maintenance considerations is given in Appendix 7.

4.1 APPENDIX 1 - DESIGN CHECKLIST

FORM AND LAYOUT (3.1)

1. Avoid predetermined layouts - car park designs should be tailored to suit individual sites.
2. Use natural surveillance as an aid to safety and crime prevention -avoid design features which obstruct visibility.
3. Segregate pedestrian areas from moving vehicles as much as possible.
4. Ensure easy movement of vehicles for safety and convenience. Don't be tempted to "squeeze in" a few extra spaces at the expense of the safety and comfort of car park users.
5. Provide parking spaces for people with restricted mobility in convenient locations.
6. Try to relate the appearance of car parks to the scale and character of any adjoining buildings.

APPROACH ENVIRONMENT (3.2)

1. Limit the number of approach routes - this can improve security.
2. Avoid sharp bends in approach footpaths which restrict views.
3. Approach routes should lead to and from supervised areas to make them unattractive to criminals.

ACCESS AND EGRESS (3.3)

1. Limit the number of car park entry points to improve security.
2. Entrances and exits should be clearly visible, wide and well lit.
3. In multi-storey car parks, the design and positioning of staircases should eliminate potential hiding places.

ILLUMINATION (3.4)

1. All car parks should have a high level of lighting at all times.
2. Natural lighting should be used to supplement artificial illumination wherever possible in multi-storey car parks.
3. Light fittings should be in keeping with the overall car park design and the character of the surrounding area.



MATERIALS AND FINISHES (3.5)

1. Surfaces, finishes and fittings need to be resistant to graffiti and other vandal damage.
2. Internal surface materials in multi-storey car parks should have a bright appearance and reflect light.
3. In multi-storey car parks different colour schemes on different floors can help people to find their way around.

LANDSCAPING (3.6)

1. Careful choice of plant species is required for safety, security and maintenance reasons.
2. Trees in car parks should be varieties with high canopies so that visibility is not obstructed.
3. Good quality ground surface materials and street furniture enhance the appearance of open car parks and can reduce maintenance work.

ENCLOSURE (3.7)

1. The design of multi-storey car parks should not allow unauthorised entry. Appropriate enclosure methods, particularly at ground floor will stop this.
2. Means of enclosing surface car parks should create secure, attractive perimeters, but at the same time preserve sight lines into and out of car parks.
3. Long lengths of fence or wall can be made more attractive by inclusion of features such as seating, lighting and landscaping.

SIGNS (3.8)

1. All car park direction and information signs should be clearly positioned and easy to understand.
2. The design of signs should take account of the needs of people with sight and other disabilities.
3. Signs should conform to local design vocabulary where appropriate.



OTHER FACILITIES (3.9)

1. Toilets and/or baby changing facilities should be provided where possible if a car park is attended and located near busy routes.

MANAGEMENT AND MAINTENANCE (3.10)

1. Good maintenance is essential in making a car park attractive to use. Good design can make good maintenance easier - poor design can create maintenance problems.
2. An official presence is important for security reasons and can be achieved by various means.

4.2 APPENDIX 2 - DESIGNING FOR PEOPLE WITH RESTRICTED MOBILITY

This appendix provides a check list of standards and requirements in relation to pedestrian access and egress, orientation, signage and parking space design.

Section 1 of the main report provides a statement on the objectives of designing for people with restricted mobility. The design should make the following provision:

- Pedestrian and vehicular access and egress - a car park should provide adequate access for people with restricted mobility.

The design should be sympathetic to people with ambulant and sensory disabilities and wherever possible for people restricted to a wheelchair.

ACCESS AND EGRESS FOR PEDESTRIANS INTO AND THROUGH CAR PARKS

Checklist

1. Pedestrian routes to and through the car park are to be clearly signposted.
2. Drop kerbs should be provided at all points along the pedestrian routes leading to and into the car park.
3. A ramp (maximum gradient 1 in 12) or level access is provided to the principal entrance floor of a multi-storey car park or part of the surface level car park (see diagram over page).
4. External ramps should have a textured surface to create a non-slip finish. Minimum width of 1.2m but 1.8m allows wheelchairs to pass. Pedestrian routes within the parking area should where possible be marked out in distinct colours to avoid pedestrian/



vehicle conflict.

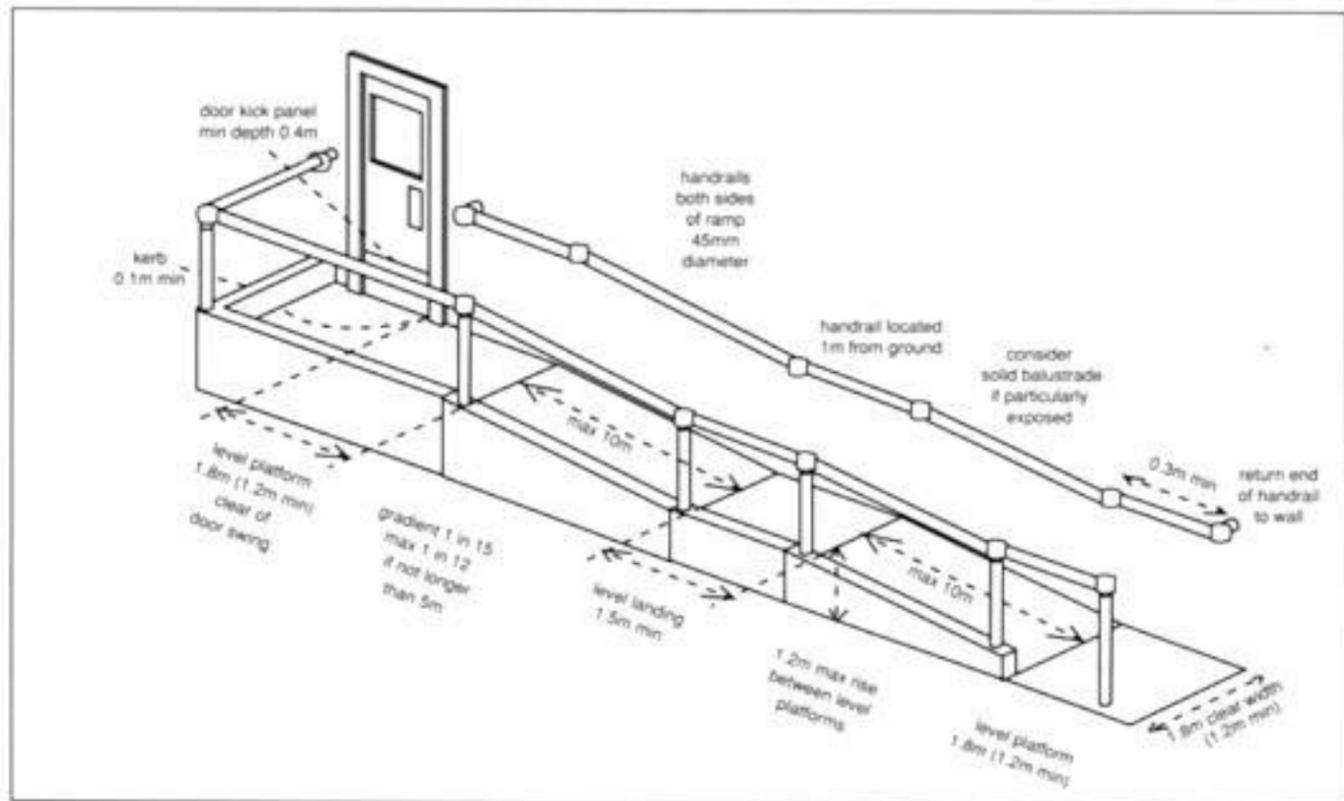


Figure 10:

Suitable ramp design for people with disabilities

5. Where paths are raised above adjacent parking or landscaped areas they should have edging to create an upstand to prevent wheelchairs slipping off edges and paths and to help the blind and poorly sighted by way of tactile cues.
6. Steps to have textured surface top and bottom of each flight and contrasting edging on the nosings of steps to assist poorly sighted people. Overhanging nosings and open risers should be avoided.
7. Steps to have maximum risers of 150mm if externally located and 170mm in cases of internal steps eg. those providing access within a multi-storey car park. The steps are also to have unobstructed width of at least 1000mm. The steps should also have handrails with a diameter of 45mm with non-slip finish and to be positioned 1000mm above the steps.

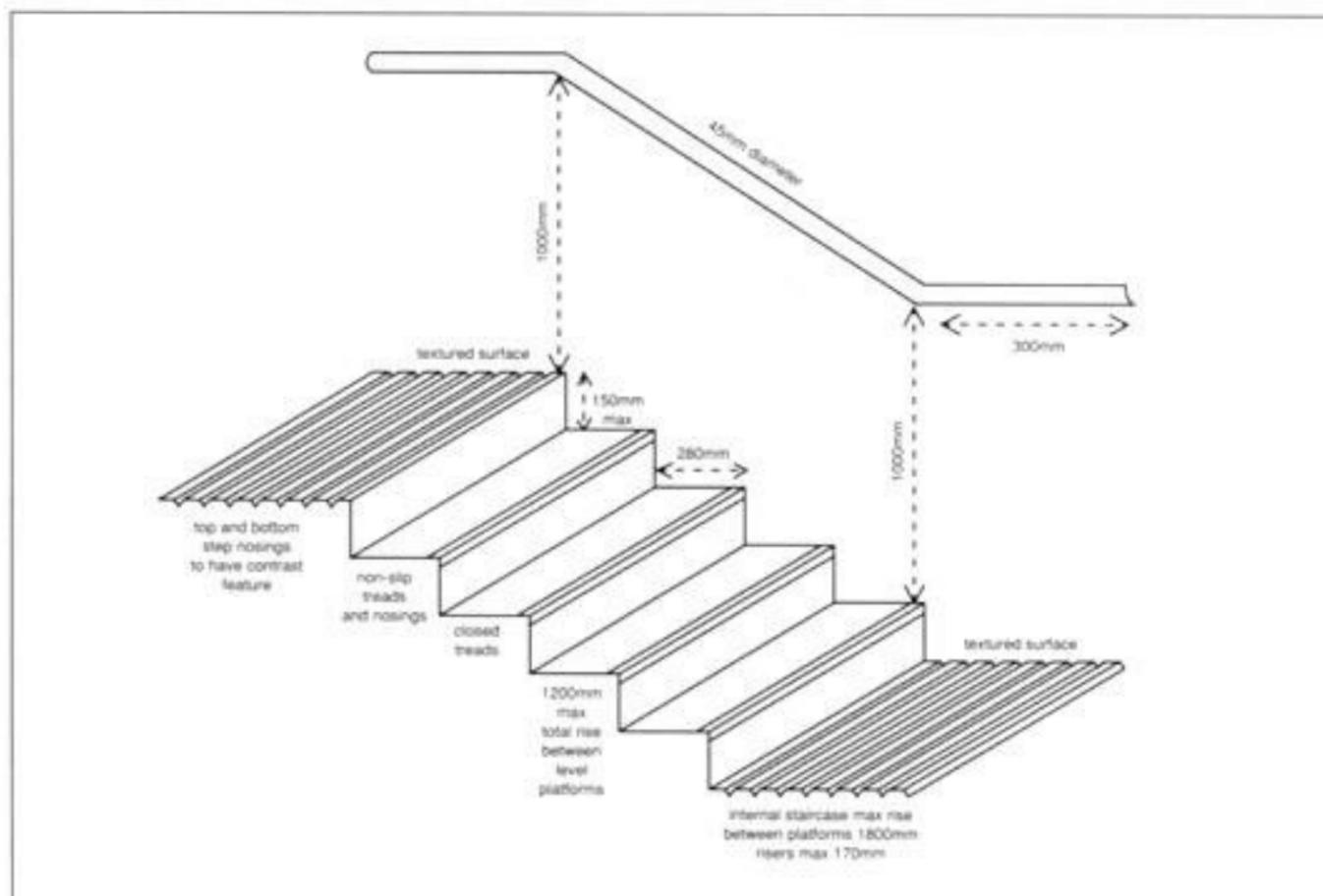


Figure 11:

Suitable steps design for people with disabilities

8. Entrance doors to have minimum clearance of 800mm. Vision panels in doors desirable; also ensure flush thresholds and avoid single steps in association with doors.
9. Ironmongery to be distinguishable from doors and easy to grasp, kick panels to be placed at the base of a door and to extend at least 400mm in height to protect doors from damage from wheelchairs and pushchairs.
10. Where lifts are proposed they must stop flush with floor level and doors should be at least 800mm clearance.
11. Lifts should have a minimum internal size of 1400mm x 1100mm and should preferably include handrails located no lower than 1000mm or no higher than 1350mm above floor level. Control buttons should have tactile features and doors should have vision panels.
12. Safeguards should be provided against low headroom to projecting features within the car park.
13. Car park barriers and pay/card machines should be located to assist people with disabilities.



ORIENTATION AND SIGNAGE

Checklist

1. Avoid monochrome colour schemes, use colour to indicate pedestrian routes, provide visual and tactile cues in large car parks and multi-storey car parks.
2. Signs should be mounted flush with wall along pedestrian routes and be directional and locational and to be of reasonable size to contrast with background. Use should be made of raised/embossed letters.

PARKING SPACES FOR PEOPLE WITH RESTRICTED MOBILITY

Checklist

1. Parking spaces should be located close to building entrances. In the case of multi-storey car parks designated spaces should be located on the ground floor or principal entrance floor which is serviced by a level or ramped entrance or lift and should be well-lit preferably by natural light.
2. Spaces to be clearly marked with vertical and surface disabled logo signs.
3. Parking spaces should be of two types for people with disabilities, wheel chair users 3.2m wide and those for people with ambulant disabilities or utilising a pushchair 2.8m wide (see figure 12).

4. Spaces should be grouped so that unloading spaces can be shared between two spaces.

For guidance on the number of spaces which should be provided for people with disabilities see the City Council's Development Control Guidelines for Car Parking.

APPENDIX 3 - LAYOUT AND CONSTRUCTION MATTERS (MULTI-STOREY CAR PARKS)

LAYOUT

Parking layouts may be:-

- Flat deck with external ramps (larger car parks)
- Split level or warped slabs
- Ramped floor

and the choice will depend on the site dimensions and levels, the feeder roads and the number of floors.

Incoming drivers should not have to search past more than 500 stalls or complete more than six circuits (ie. 6 No. floors).

One-way, clockwise circulation is preferred as more efficient and enabling the inflow to pass the maximum number of stalls whilst facilitating a quick outflow. However, two way and/or anti-clockwise circulation may prove necessary on some sites.

Cul-de-sacs should be avoided or be less than 6 No. stalls.

Angled parking permits narrower aisles but can only be used with one-way circulation and is less statically efficient.

Reservoirs are usually required prior to any entrance control, or after any exit control, to prevent queuing on the highway.

Dimensions

Stalls should be **4.8m** long by the following minimum widths:-

- Long stay **2.30m**
- General **2.40m**
- Disabled **3.20m**
- Other restricted mobility **2.80m** (parents with pushchairs)



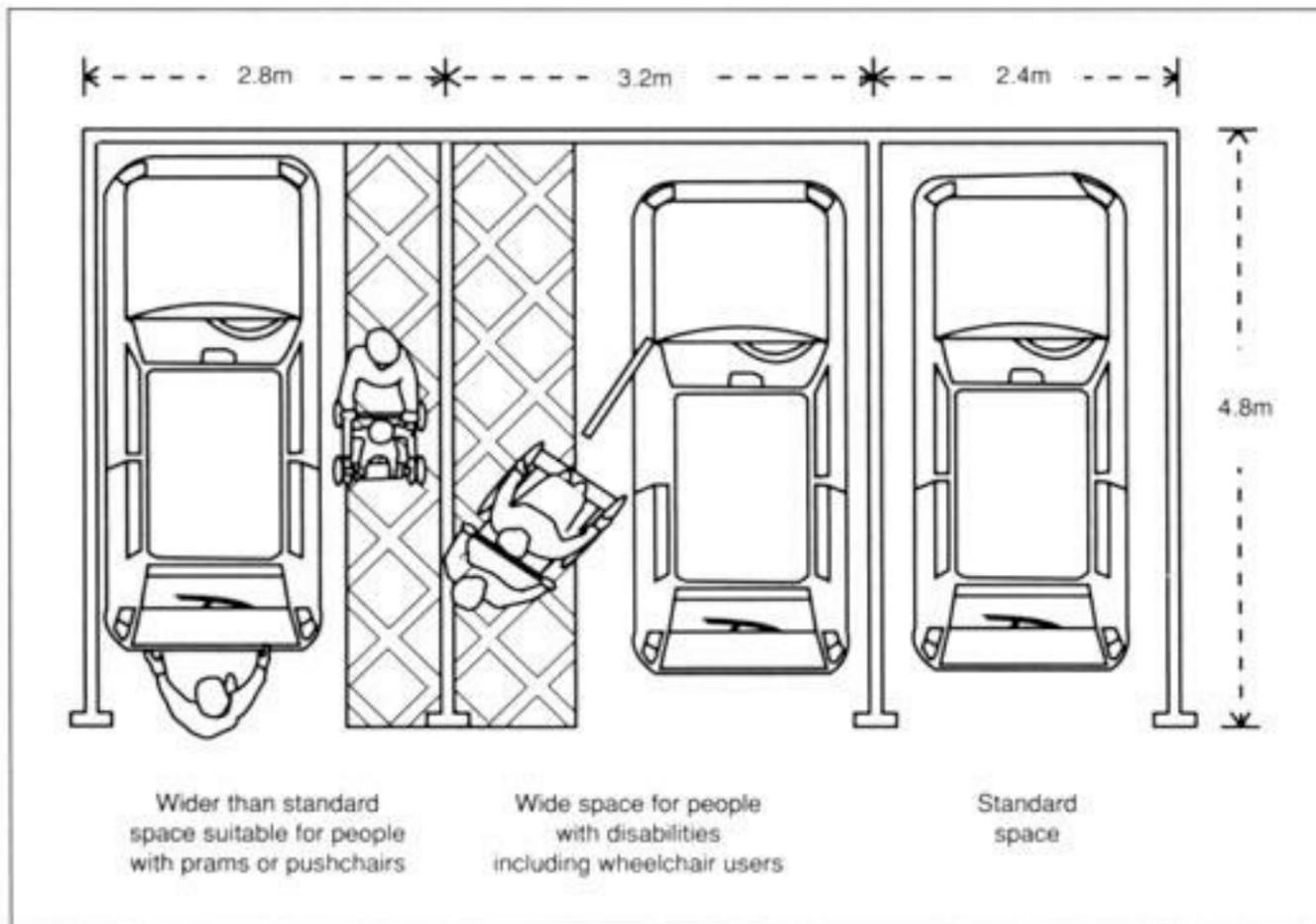


Figure 12:
Parking space widths

Aisles should have a minimum width of:

- 90° parking/two way aisles - 6.95m
- 90° parking/one way aisles - 6.00m
- 80° parking/one way aisles - 5.25m
- 70° parking/one way aisles - 4.70m

Straight ramps should be minimum 3.00m between kerbs with an additional clearance of 250mm to any structure and should have gradients not exceeding 1 in 7 up to 1.50m rise or 1 in 10 over 1.50m rise.

Curved ramps should be minimum 3.65m between kerbs with additional clearance of 250mm to any structure and should have gradients not exceeding 1 in 10 up to 3.00m rise or 1 in 12 over 3.00 rise and should have a super elevation of approximately 1 in 10.

Two way ramps should have a minimum central separation of 500mm.

Entry and exits should be reduced in width to 2.30m at barriers and have a straight length of 6.0m at not exceeding 1 in 12 before any barrier. Structural headroom should be a minimum of 2.20m throughout the building, with a minimum headroom of 2.10m below any fittings or signs. More headroom is aesthetically better and may also be required on floors where the parking of light vans is envisaged.

Ramps which have to be used by people with disabilities should not exceed 1 in 12.

DYNAMIC CAPACITY

Detailed calculations of capacities should be based on the "Design Recommendations for Multi-Storey and Underground Car Parks" report of the joint committee of the Institution of Structural Engineers and the Institution of

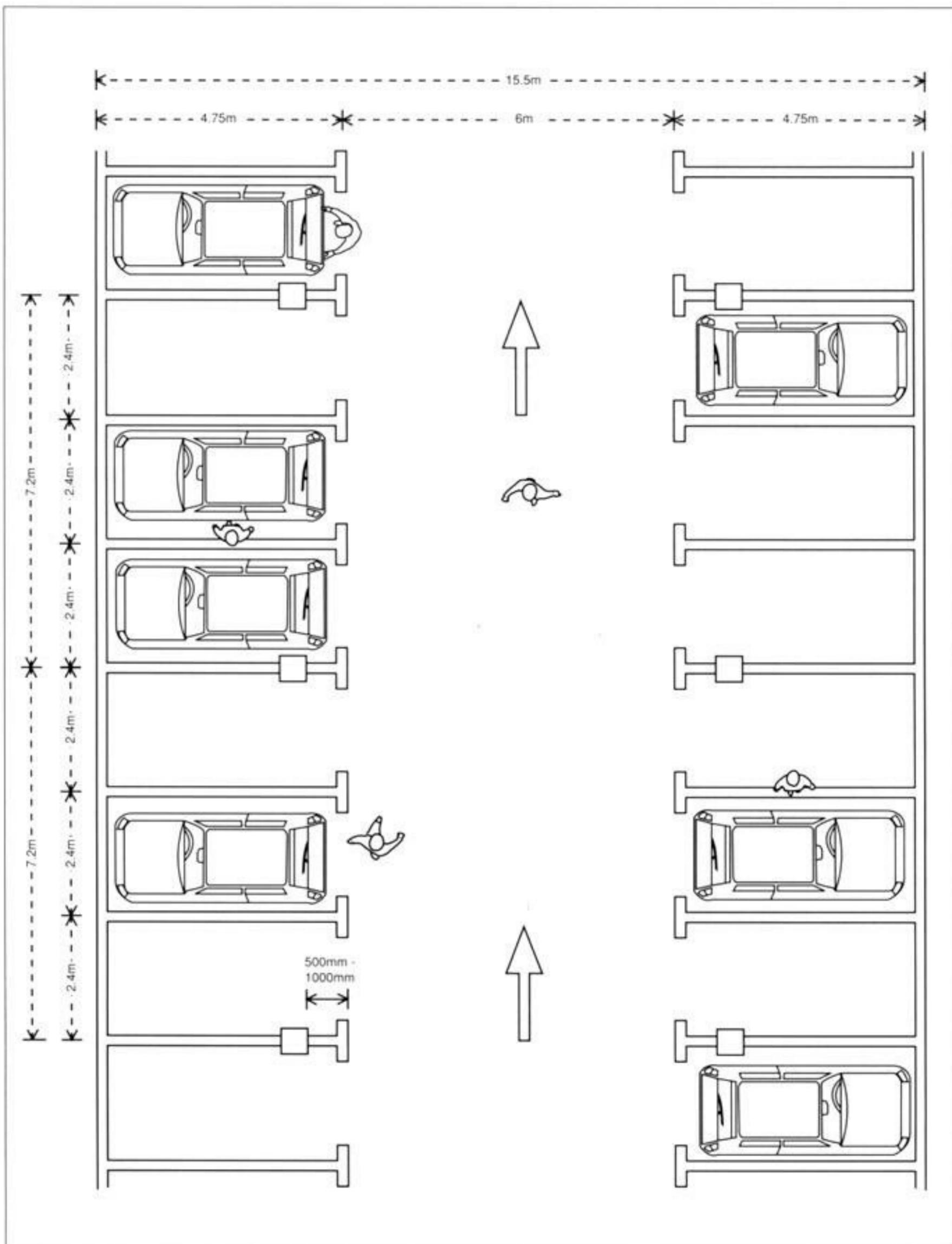


Figure 13: Illustrates the dimensions of spaces and aisles for 90 degree parking

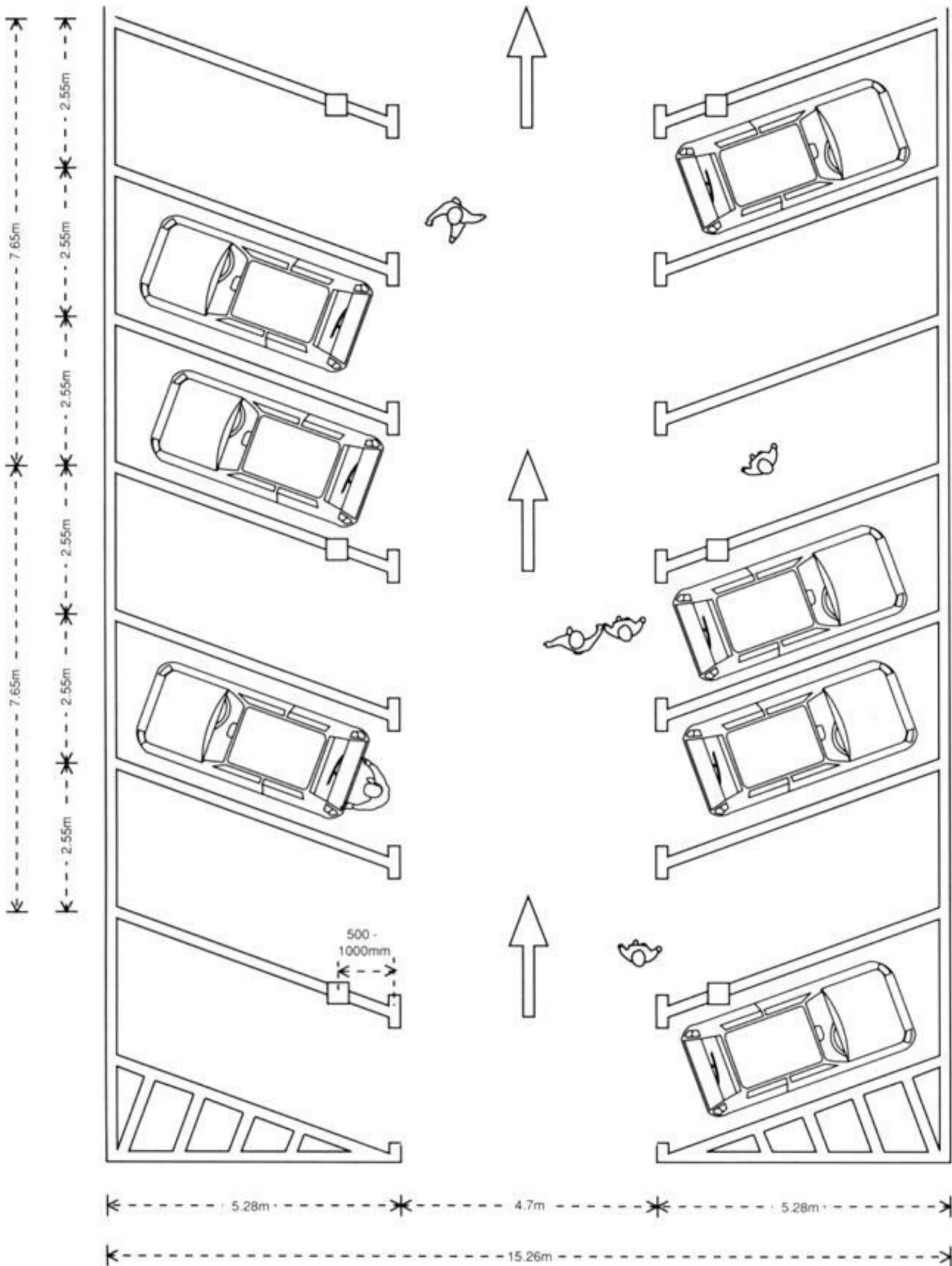


Figure 14: Illustrates the dimensions of spaces and aisles for 70 degree parking

of Highways and Transportation.

The dynamic capacity of the car park should permit one quarter of the capacity to enter, or leave, in a quarter of an hour unless information can be provided showing a lesser capacity to be adequate.

Barrier capacities in preliminary calculations may be taken as:-

- Machine Ticket on Entry 450 cars/hr
- Attendant Fixed fee on Exit 270 cars/hr
- Attendant Variable Fee on Exit 200 cars/hr
- Prepaid Token on Exit 400 cars/hr

CONTROLS

Controls should not be sited on ramps or so near to ramps as to cause queuing on them.

An electronic counter/guidance system should be considered for any car park of over 500 vehicles.

Vehicle barriers must be designed to the loadings specified in BS.6399 and provided to all perimeters, ends of aisles, bottom of long ramps and any other hazardous positions.

Segregation guardrails should be provided at all pedestrian entry points to the parking floors, and other areas of pedestrian congregation or conflict and on any ramps shared with vehicles.

Means of escape must be provided to the Fire Officers requirements but should not exceed 30m from the furthest point on a direct route or 45m around parked cars.

A minimum of 2 No. escape stairs are normally required with a minimum width of 1.1m. More/wider stairs may be required on larger car parks.

MATERIALS

Durability must be provided commensurate with the exposure and account must be taken of salt, snow and water brought in on vehicles, through the elevations and particularly at roof levels.

Concrete strengths and covers must be designed to meet the exposure conditions, particularly where no membranes are provided, in accordance with BS.8110.

Structural steelwork should have a high standard of protective treatment such as galvanising, to avoid repainting at less than 15 year intervals, in accordance with BS.5950.

Fire resistance must comply with the Building Regulations, or a Relaxation obtained, where it is proposed to use steel or composite construction without additional protection.

Materials should be as vandalproof and maintenance free as practical.



STRUCTURE

Imposed loading should be in accordance with BS.6399.

Wind loading should be in accordance with CP3 Chapter V and be taken on the total elevations.

Inset columns should be set back between 500mm and 1000mm from the aisles but be not less than 3300mm from the remote end of the stall. There should generally be at least 3. No stalls between adjacent columns.

Movement joints should be provided at not greater than 100m intervals, and between the floors and any rigid structure such as stair towers. A greater frequency of joint may be appropriate at roof level or where the cladding is rigid.

Movement joints must be carefully detailed for the full range of temperature possible in the car park and to prevent any water penetration.

Floors without waterproofing should be reasonably smooth with irregularities not exceeding 6mm in 3.0m. Rough tamped finishes which hold water should be avoided and a stiff brush finish to a previously trowelled surface is recommended.

Drainage falls must allow for deflection of the structure and, where the drainage points are located at the columns, precambering or other devices must be used to create a fall to the outlets.

FLOOR FINISHES

Waterproofing membranes are normally recommended with trough, waffle or precast floor systems, which are liable to exhibit fine cracking, particularly at roof level.

In insitu construction without a waterproofing membrane the construction joints must be detailed to be waterproof.

Where floors are to be used for other purposes (eg. shops) both the floor immediately over and the roof level, should have a waterproofing membrane.

Waterproof membranes must have the capacity to bridge cracks, be resistant to oil and salt from vehicles and the chemicals used in joints, and have a high wear resistance, particularly at ramps.

Thin waterproofing membranes must have good adhesion whereas debonded mastic asphalt membranes require special attention to detail at ramps.

Floors and ceilings should be as light as possible, and where not finished with membranes or paint, special attention should be paid to the mould oil used to avoid dark spots.

DRAINAGE

Drainage falls of at least 1 in 60 should be provided after allowance for deflection.

Outlets should be sufficient to eliminate ponding particularly at the bottoms



and sides of ramps.

Traps should be provided to prevent salt, grit and oil entering the surface water system and a petrol interceptor should normally be provided before the final connection.

4.4 APPENDIX 4 - SERVICES

VENTILATION

Wherever possible the car park should be designed so as to avoid the need to provide mechanical ventilation by providing openings with suitable enclosure means in outside walls with a minimum total area of 5% of the floor area at each level, at least half of this area being in opposite sides.

Where this requirement cannot be met then mechanical ventilation should be provided conforming with the requirements of Section B2-6 of the Guide as used by the Chartered Institute of Building Services.

DRY RISERS

These should be provided in accordance with the Fire Officer's requirements.

SPRINKLER SYSTEMS

Where sprinkler systems are required, normally in enclosed or underground car parks, these should comply fully with the latest addition of the Fire Offices Committee's Rules for Automatic Sprinkler Installations.

LIFTS

General

Full use should be made of natural topography in order to avoid the need for lifts where safe and satisfactory access can be achieved in other ways.

If installed, lifts should be located to be visible from as many viewpoints as possible, both inside and from outside the car park, and should not be of a fully enclosed design.

Regulation

The design of lifts, include mechanisms and installation should be in accordance with the following regulations:

1. BS.5655 - all applicable parts
2. The Factories Act.
3. The Electricity (Factories Act) Special Regulations, and the provision of



the Health and Safety At Work Act.

4. The Building Regulations.
5. The Institute of Electrical Engineers Regulations.
6. Any special site regulations.

DESIGN PARAMETERS

Lifts should serve all floors and be sized to meet the traffic analysis requirements of BS.5655 part 6.

- **Motor room** - all electrical installation switches and controls should be installed within the motor room.
- **Drive unit**- traction units should be used.
- **Lift cars** - these should be constructed of a rigid steel platform and frame to withstand uneven loadings in the car. The car should be provided with a robust internal finish with a maximum panel width of 300mm.
- **Landings** - the landings should have bolt on metal sill angles. Doors should be 900mm wide.
- **Controls** - an overload protection device should be fitted to each lift. All push buttons shall be of an anti-vandal type.

LIGHTING (MULTI-STOREY CAR PARKS)

Each car park must be treated on its merits with regard to lighting, but in general the average levels listed below should be considered as the minimum acceptable when measured at 0.5m from floor level:

- Entrances and exits - 200 lux
- Driveways and ramps - 200 lux
- Parking areas - daylight hours 70 lux
- Parking areas - darkness hours 140 lux
- Roof areas - all hours 40 lux
- Staircases and landings - all hours 200 lux

Extreme care should be taken to position all luminaires so that no dark corners or areas of shadow are present within the car park at any time, this is particularly important on pedestrian entrances and exit routes.

The location of luminaires is very dependent upon the structural design of the car park, but in general they should be positioned as high as possible (3m maximum) such that lamp replacement and maintenance can take place





during normal working hours, whilst the car park is occupied (ie. not over car parking bays or main car circulation routes).

Normally, luminaires should be positioned in rows along the length of the floor, each row should be split into two electrical circuits feeding alternative fittings. This method of control will provide at least 50% of the lighting level if one circuit should fail.

Dependent upon the daylight factor of the structure, rows of fittings can be time clock or solar cell controlled to reduce lighting levels during daylight hours if so required.

The selection of luminaires depends very much on the structural ceiling and height available, fluorescent or compact sodium lights are both acceptable. A waterproof luminaire should always be used but the extent of vandal resistance will have to be considered for each project, subject to location. Consideration should be given to the time required for lamp replacement and general maintenance which could provide expensive if a highly secure/vandal proof fitting is chosen.

Staircase lighting should consist of at least one luminaire per landing or half landing if these are present with natural lighting maximised. The luminaires should be extremely durable against vandalism and in many cases a wire guard should also be fitted, even though this will increase maintenance costs.

Roof lighting can normally be provided by the use of floodlights on conventional 3 or 4m columns, but care should be exercised to ensure that no glare nuisance is caused to adjoining properties or traffic in the highway.

Additional lighting may be required for pay and display ticket machines, illuminated signs and external areas depending on the detailed car park design.

An emergency battery operation lighting system should be incorporated for public exits and staircases, and at key points on the parking floors. Self-contained fittings or modified fittings with a battery pack are usually most suitable.

4.5 APPENDIX 5 - SUITABLE PLANTS FOR CAR PARKS

LATIN NAME	COMMON NAME	SPECIFICATION	HEIGHT/ SPREAD
TREES		OM girth	after 20 yrs
ACER CAMPESTRE	FIELD MAPLE	8-10 STANDARD	8M/6M
ACER SACCHARINUM	SILVER MAPLE		12M/8M
ALNUS GULTINOSA	COMMON ALDER	12-14 HEAVY STANDARD	10M/8M
AMELANCHIER LAMARCKII	SNOWY MESPILUS	10-12 SELECTED STANDARD	6M/6M
BETULA PENDULA	SILVER BIRCH	12-14 HEAVY STANDARD	10M/8M
CARPINUS BETULUS 'FASTIGIATA'	HORNBEAM	6 - 8 LIGHT STANDARD	8M/5M
FRAXINUS EXCELSIOR	ASH	12-14 HEAVY STANDARD	12M/8M
MALUS SYLVESTRIS	CRAB APPLE	12-14 HEAVY STANDARD	6M/8M

LATIN NAME	COMMON NAME	SPECIFICATION	HEIGHT/ SPREAD
TREES		OM girth	after 20 yrs
PINUS SYLVESTRIS	SCOTS PINE	12-14 HEAVY STANDARD	10M/5M
PRUNUS AVIUM	WILD CHERRY	10-12 SELECTED STANDARD	8M/6M
ROBINA PSEUDOACACIA	FALSE ACACIA	12-14 HEAVY STANDARD	12M/6M
SORBUS ARIA	COMMON WHITEBEAM	12-14 HEAVY STANDARD	8M/5M
SORBUS AUCUPARIA	MOUNTAIN ASH	10-12 SELECTED STANDARD	8M/5M
TILIA CORDATA	SMALL LEAVED LIME	10-12 SELECTED STANDARD	10M/6M
CONIFERS		Height mm	after 5 yrs
JUNIPERUS X MEDIA 'PFITZER-IANTA'	CHINESE JUNIPER	300-450/3	1M/2M
JUNIPERUS X MEDIA 'PFITZER-IANTA AUREA'	CHINESE JUNIPER	300-430/3	1M/3M
JUNIPERUS 'SABINA TAMARISCIFOLIA	DWARF SAVIN	300-450/3	450MM/1-2M
JUNIPERUS VIRGINIANA 'GREY-OWL'	EASTERN RED CEDAR	300-450/3	1M/2M
PINUS MUGO	MOUNTAIN PINE	300-450/3	1M/1M
TAXUS BACCATA	ENGLISH YEWE	450-600/7.5	2M/2M
CLIMBERS THAT REQUIRE SUPPORT		Height mm/Pot size litres	after 5 yrs
ACTINIDIA KOLOMIKTA	ACTINIDIA	600-900/3	4M/4M
CLEMATIS ARMANDII 'APPLE - BLOSSUM'	CLEMATIS	500-900/3	6M/6M
CLEMATIS 'MARIA BOISSELOT'	CLEMATIS	600-900/3	3M/3M
CLEMATIS 'NELLY MOSER'	CLEMATIS	600-900/3	3M/3M
CLEMATIS VILLE DE LYON	CLEMATIS	600-900/3	3M/3M
LONICERA PERICLYMENUM - 'BELGICA'	DUTCH HONEYSUCKLE	600-900/3	4M/4M
LONICERA PERICLYMENUM - 'SEROTINA'	DUTCH HONEYSUCKLE	600-900/3	4M/4M
POLYGONUM BALDSCHUANIOM	RUSSIAN VINE	900-1200/3	10M/10M
VITIS COIGNETIAE	ORNAMENTAL VINE	900-1200/3	9M/9M
WISTERIA FLORIBUNTA - 'MACROBOTRYS	WISTERIA	600-900/3	9M/9M
SELF CLINGING CLIMBERS		Height mm/Pot size litres	after 5 yrs
HEDERA COLCHICA 'DENTATA - AUREA'	PERSIAN IVY	450-600/3	4M/4M
HEDIA HELIX 'GLACIER'	IVY	300-450/2	2M/2M
HEDERA HELIX 'GOLDHEART'	IVY	300-450/2	3M/3M
HEDERA HELIX 'GREEN RIPPLE'	IVY	300-450/2	3M/3M
HYDRANGEA PETIOLARIS	CLIMBING HYDRANGEA	450-600/3	3M/3M
PARTHENOCISSUS HENRAYANA	CHINESE VIRGINIA - CREEPER	600-900/3	5M/3M
PARTHENOCISSUS TRICUSPIDATA 'VEITCHII'	BOSTON IVY	600-900/3	6M/5M

LATIN NAME	COMMON NAME	SPECIFICATION	HEIGHT/ SPREAD
SHRUBS			Height mm/Pot size litres after 5 yrs
ARUNDINARIA MULIELAE	BAMBOO	300-450/3	3M/1.5M
ARUNDMARIA VIRIDISTRIATA	BAMBOO	300-450/3	1M/1M
BERBERIS CANDIDULA*	BARBERRY	200-300/2	450MM/1.2M
BERBERIS 'JULIANAE**	BARBERRY	300-400/3	1.5M/1.2M
BERBERIS THUNBERGII - 'ATROPURPUREA**	RED BARBERRY	450-600/3	1.8M/1.2M
BERBERIS THUNBERGII- 'ATROPURPUREA NANA'	DWARF BARBERRY	200-300/2	600MM/ 600MM
BUDDLEIA DAVIDII 'WHITE CLOUD'	BUTTERFLY BUSH	450-600/3	3M/2M
BUDDLEIA DAVIDII 'ROYAL RED'	BUTTERFLY BUSH	450-600/3	3M/2M
BUDELEIA X LOCHINCH*	BUTTERFLY BUSH	450-600/3	3M/2M
CEANOTHUS THYRSIFLOURUS - 'REPENS'	MEXICAN ORANGE	300-450/3	2M/2M
CERATOSTIGMA WILLMOTTIAN- UM	HAIRY PLUMBAGO	300-450/3	0.5M/0.5M
CHOISYA TERNATA	MEXICAN ORANGE	200-450/3	2M/2M
CORNUS ALBA 'SIBIRICA**	RED STEMMED DOG- WOOD	450-600/3	1.5M/1.5M
CORNUS ALBA 'ELEGANTISSIMA'	VARIEGATED DOG- WOOD.	450-600/3	2M/2M
CORNUS STOLONIFERA- 'FLAVIRAMEA**	DOGWOOD	450-600/3	1.5M/1.5M
CORYLUS MAXIMA 'PURPUREA'	PURPLE HAZEL	300-450/3	1.8M/1.5M
COTINUS COGGYGRIA 'FLAME'	SMOKE BUSH	300-450/3	2M/1.5M
COTINUS COGGYGRIA 'ROYAL- PURPLE'	SMOKE BUSH	300-450/3	2M/1.5M
COTONEASTER CONSPICUUS- 'DECORUS**	COTONEASTER	300-450/2	800MM/1.8M
COTONEASTER 'CONUBIA**	COTONEASTER	450-600/3	2M/2M
COTONEASTER DAMMERI 'OAK- WOOD'	COTONEASTER	200-300/2	0.3M/1.5M
COTONEASTER HORIZONTALIS	HERRINGBONE - COTONEASTER	300-450/3	300-450/3
CYTISUS X PRAECOX 'ALLGOLD'	BROOM	300-450/2	0.9M/0.9M
DEUTZIA MAGICIAN -		450-600/3	1.5M/1.5M
ENONYMUS FORTUNEI 'EMERALD- GAIETY**		200-300/3	0.6M/0.8M
GENISTA LYDIA*	MEDITERRANEAN- GORSE	300-450/3	0.6M/0.9M
HEBE ALBICANS	SILVER LEAVED- VERONICA	300-450/2	450MM /600MM
HEBE RAKAIENSIS	VERONICA	200-300/3	0.5M/0.5M
HYPERICUM 'HIDCOTE**	HYPERICUM	450-600/3	1.5M/1.2M
LAVENDULA ANGUSTIFOLIA- 'HIDCOTE'	LAVENDER	200-300/3	5M/5.M
LONICERA PILEATA	HONEYSUCKLE	300-450/2	600MM/1.2M
MAHONIA AQUIFOLIUM*	OREGON GRAPE	300-450/3	800MM/1.2M
MAHONIA 'CHARITY'	CHINESE MAJONIA	300-450/3	1.8M/1.5M
OLEARIA X HASSTII	DAISY BUSH	300-400/3	1/2M/1.5M

LATIN NAME	COMMON NAME	SPECIFICATION	HEIGHT/ SPREAD
SHRUBS		Height mm/Pot size litres	after 5 yrs
PHILADELPHUS 'BELLE ETOILE'	MOCK ORANGE	300-450/3	1.5M/1.5M
PHORMIUM TENAX	NEW ZEALAND FLAX	600-900/3	1.2M/1.2M
PHORMIUM TENAX 'SUNDOWNER'	NEW ZEALAND FLAX	600-900/3	0.9M/0.8M
POTENTILLA DAHURICA 'MANCHU'	POTENTILLA	300-450/3	0.4M/0.8M
POTENTILLA 'ELIZABETH'	POTENTILLA	300-450/3	900MM/1.2M
PRUNUS X CISTENA 'CRIMSON - DWARF'	PURPLE LEAF- SAND CHERRY	450-600/3	1.2N/1.2M
PRUNUS LAUROCERASUS- 'ZABELIANA'	DWARF CHERRY- LAUREL	300-450	1.2M/1.8M
PRUNUS LUSITANICA	PORTUGAL LAUREL	450-600/3	1.8M/1.5M
PYRACANTHA 'ORANGE GLOW'	FIRETHORN	600-900/3	1.8M/1.8M
PYRACANTHA ROGERSIANA- 'FLAVA'	FIRETHORN	600-900/3	1.8M/1.8M
RIBES SANGUINEAUM 'BROCKLE- BANKII'	FLOWERING- CURRENTS	300-450/3	1.0M/1.0M
ROSA 'CANARY BIRD'	ROSE	450-600/3	1.8N/1.8M
ROSA FERDY'	ROSE	450-600/3	1.2M/1.5M
ROSA 'PENELOPE'	ROSE	300-450/3	1.1M
ROSE 'GROUSE'	ROSE (GROUND - COVER)	300-450/3	0.4M/2M
ROSA ERPENS 'MEIDILAND'	ROSE	450/600/3	0.4M/2.5M
ROSA RUGOSA 'ALBA'	ROSE	450-600/3	1.5M/1.8M
ROSA RUGOSA FRAU DAGMAR- HASTRUP'	ROSE	450-600/3	1.5M/1.8M
ROSA SWANY 'MEIDILAND'	ROSE	450-600/3	0.6M/1.5M
ROSA MOYESII 'GERANIUM'	ROSE	450-600/3	1.8M/1.8M
ROSA 'MAX GRAF'	ROSE (GROUND - COVER)	450-600/3	PROSTRATE / 1.8M
ROSA RUBRIFOLIA	ROSE	450-600/3	1.8M/1.8M
RUBUS 'BETTY ASHBURNER'	ORNAMENTAL- BRAMBLE	200-300/2	0.4/1.5M
RUBUS COCKBURNIANUS- 'GOLDEN VALE'	ORNAMENTAL BRAMBLE	300-450/3	1/1.5M
RUTA GRAVEOLENS- 'JACKMAN'S BLUE'	BLUE RUE	300-450/2	0.5/0.5M
SASA VEITCHII	DWARF BAMBOO	300-450/2	1/1.5M
SENECIO 'SUNSHINE'	SENECIO	300-450/3	1M/1.5M
SORBARIA ARBOREA		600-900/3	3/3M
SPIRAEA X BUMALDA 'GOLDFLAME'		300-450/2	0.5/0.5M
SYMPHORICARPUS X CHENAULTII- 'PANCOCK'	SNOBERRY	450-600/3	800MM/2.5M
VIBURNUM DAVIDII		200-300/3	1.5M
VIBURNUM TINUS 'EVE PRICE'	LAURUSTINUS	300-450/3	1.8M/1.5M
VIBURNUM RHYTIDOPHYLLUM*	VIBURNUM	300-450/3	2M/1.8M
VIBURNUM OPULUS*	GUELDER ROSE	450-600/2	2M/2M
VINCA MAJOR 'VARIEGATA'	GREATER PEPIWINKE	200-300/2	0.2/1M
VINCA MINOR*	LESSER PERIWINKLE	300/450/2	200MM/600MM

* Plants suitable for Industrial Sites

PLANTING NOTES

All planting beds should be thoroughly cultivated to a depth of 300mm incorporating a 150mm layer of farm yard manure into the soil. To ease planting, provide an open soil texture for root growth, and add humus to aid storage of water and plant nutrients.

After planting 25gms of Fisons, Ficote '70' (fertilizer) should be applied around the base of each plant and 100 gms per tree.

After planting all plants should be well watered.

Maintenance should include keeping the planting beds free of weeds using a combination of chemical treatment and hand removal. During dry spells the plants should be well watered on a regular basis. Control of weed growth eliminates competition for soil moisture and nutrients, and watering provides much needed moisture to plants that have not yet developed a full root system.



4.6 APPENDIX 6 - SIGNS

This appendix provides guidance on the use of signs in both public and private surface level and multi-storey car parks. Obviously sign requirements for car parks associated with an adjacent land use will be different from those required for a public pay car park. Section two of the main report provides guidance on the components and principles in relation to signage.

GENERAL DESIGN HINTS

Well designed and informative signage helps maintain a recognised circulation of traffic and safe operational conditions.

Signs should be consistent through and continuous along pedestrian and vehicle routes.

Ensure legibility by attention to lettering size and style, use of strong colours and non distracting background, good lighting without glare. Good contrast should be provided.

EXTERNAL SIGNS

Car Park Entry Signs

Gantry or multi-storey signs should be located at the entrance to a car park. They should be fixed to a height restricting gantry or to the entranceway to the multi-storey car park, and shall include a suspended gauge to indicate maximum height. Figure 15 shows a model layout. All main text should be in Futura bold or Sans Serif Font upper and lower case letters. Signs may be on a white background. Lower case letters shall not be less than 30mm height and upper case letters shall not be less than 45mm height.

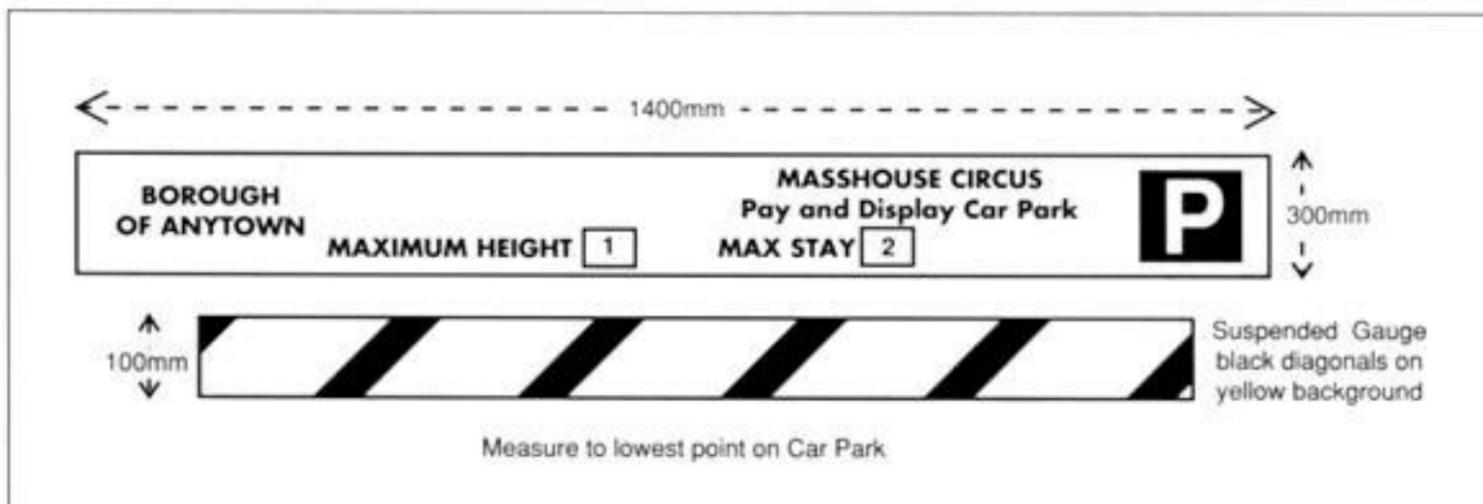


Figure 15:
Gantry or multi-storey entry sign

PRIVATE USE CAR PARKS

The ownership and purpose of the car park should be clearly indicated by a sign placed near to the entrance.

VEHICULAR MOVEMENT SIGNS

The following are standards for specific types of signs:

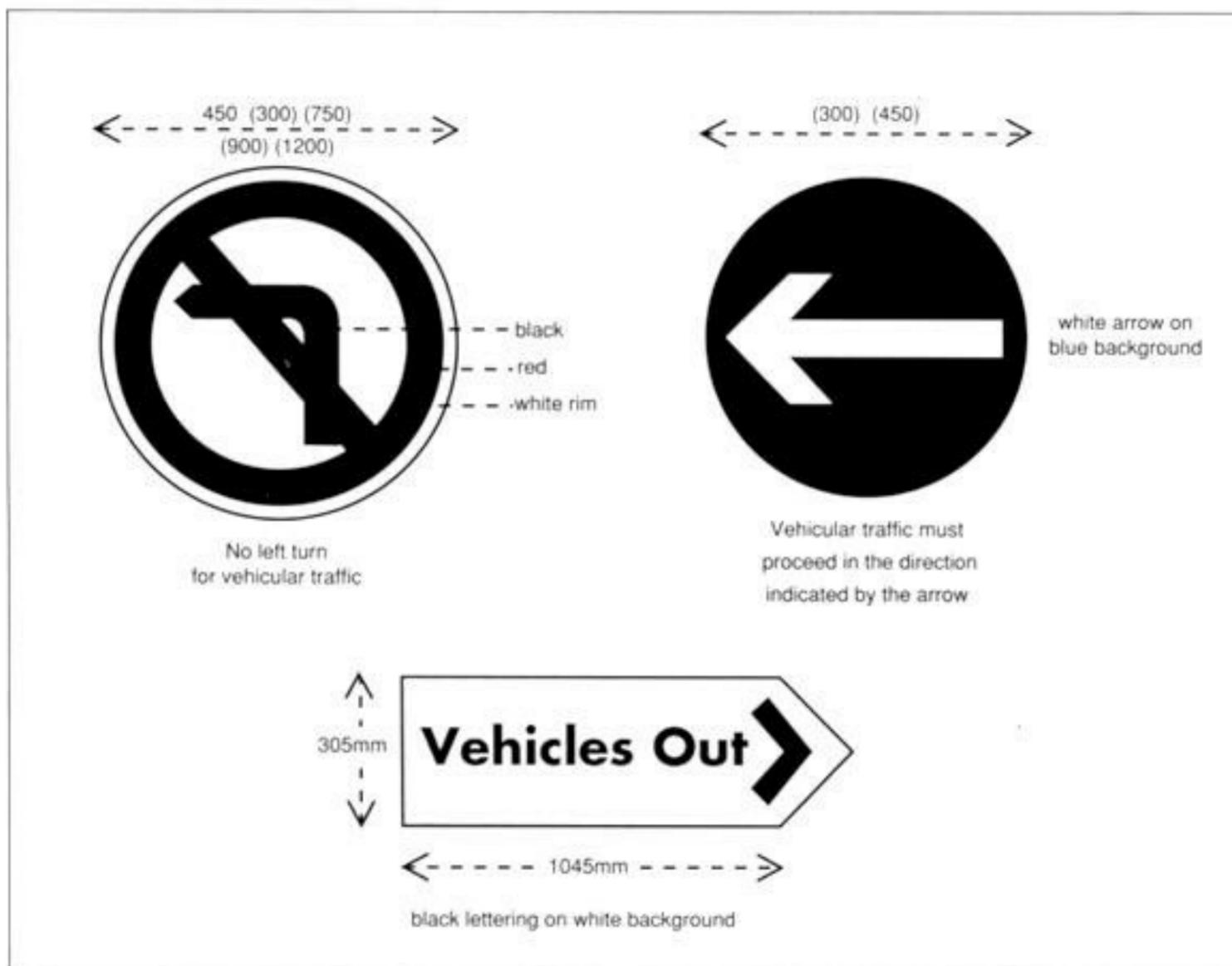
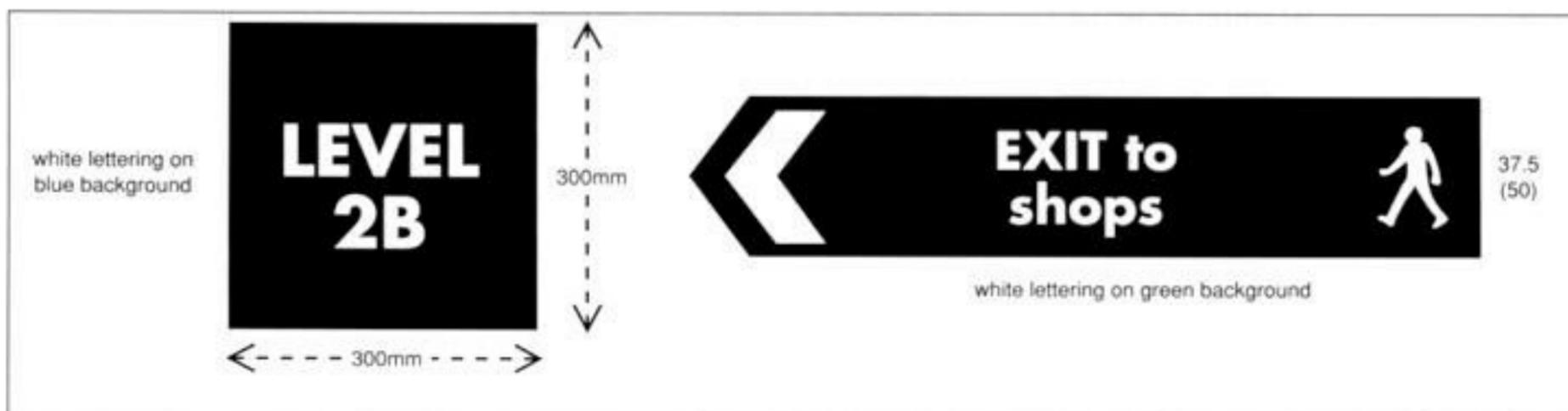


Figure 16:
Vehicle movement signs

PEDESTRIAN ROUTE SIGNS

Figure 17:
Floor level signs

Figure 17 indicates standard designs for pedestrian route signs and floor level signs.



PAY AT MACHINE SIGNS

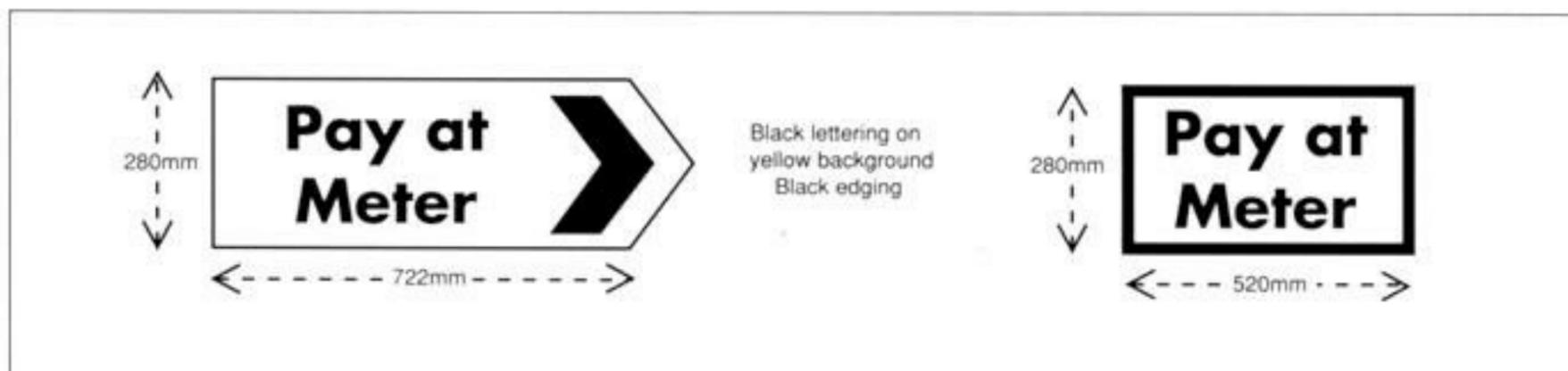


Figure 18:
Pay at Machine

MARKINGS

The following are the main markings recommended for use on both surface level and multi-storey car parks. Operators may consider that if their sites and premises are correctly marked in conformity with the code of practice it may represent a reasonable defence in the event of claims.

Materials

Generally thermo - plastic is recommended for surface level sites and paint (yellow) for multi-storey sites. The material shall contain 20% glass beads in accordance with Table 1 of BS.3262. If additional surface application of glass beads is required this shall be applied evenly to the materials at the rate of 400-500 g/m2 in accordance with Clause 15 of BS.3262.

Marking of parking spaces for people with disabilities

Parking for people with disabilities see Appendix 2.

Directional Markings

Figure 19 provides standard directional marking. Arrows should be marked in

either white or yellow thermo plastic or similar material or paint.

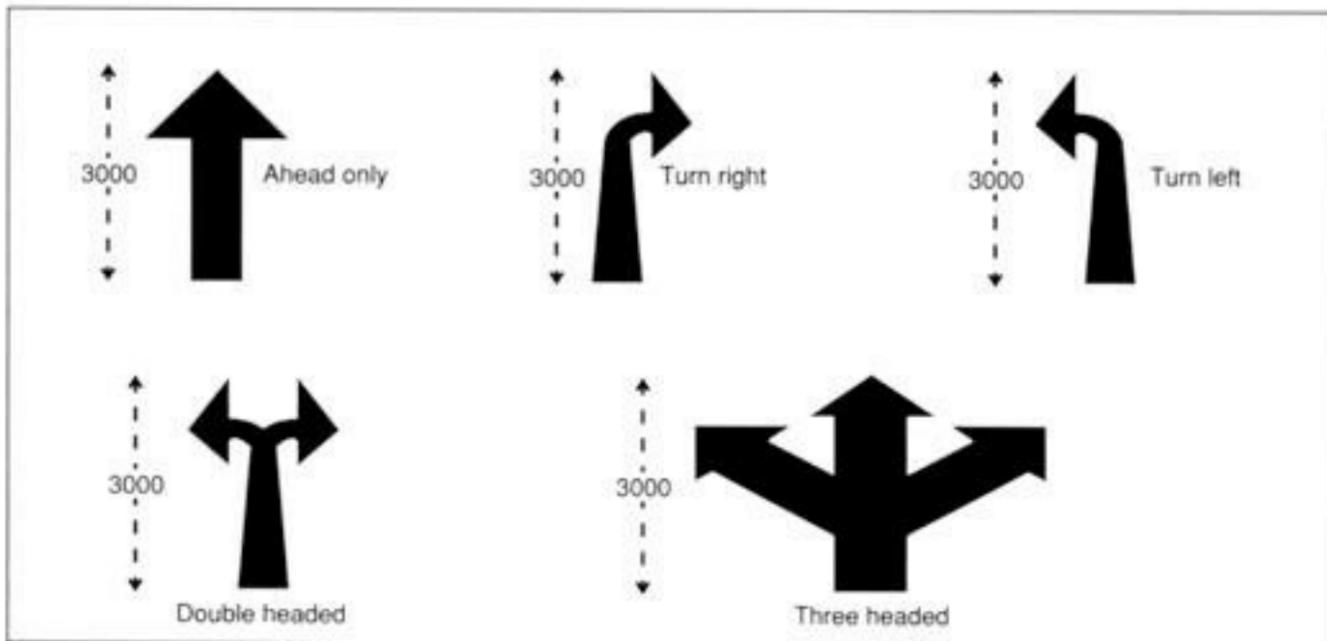


Figure 19:
Directional markings

Give Way Marking

Give way marking should be 600mm long 200mm wide, 300mm apart.

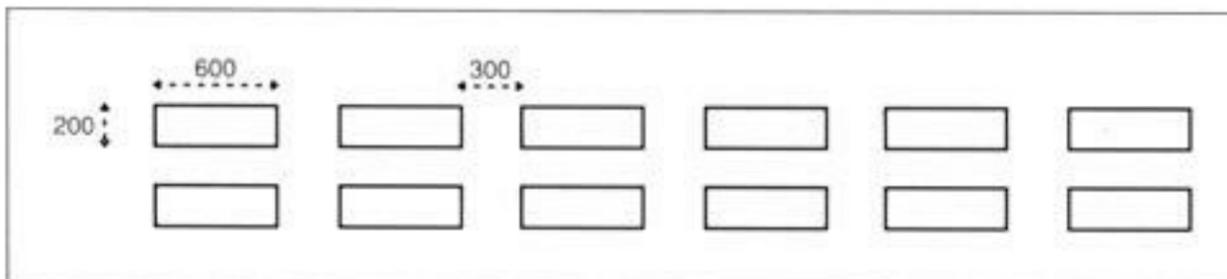


Figure 20:
Give-Way marking

No Parking Markings

These markings may be used in areas where parking is prohibited. This type of mark is particularly useful in gangways and accessways where vehicles continue to cause obstruction.

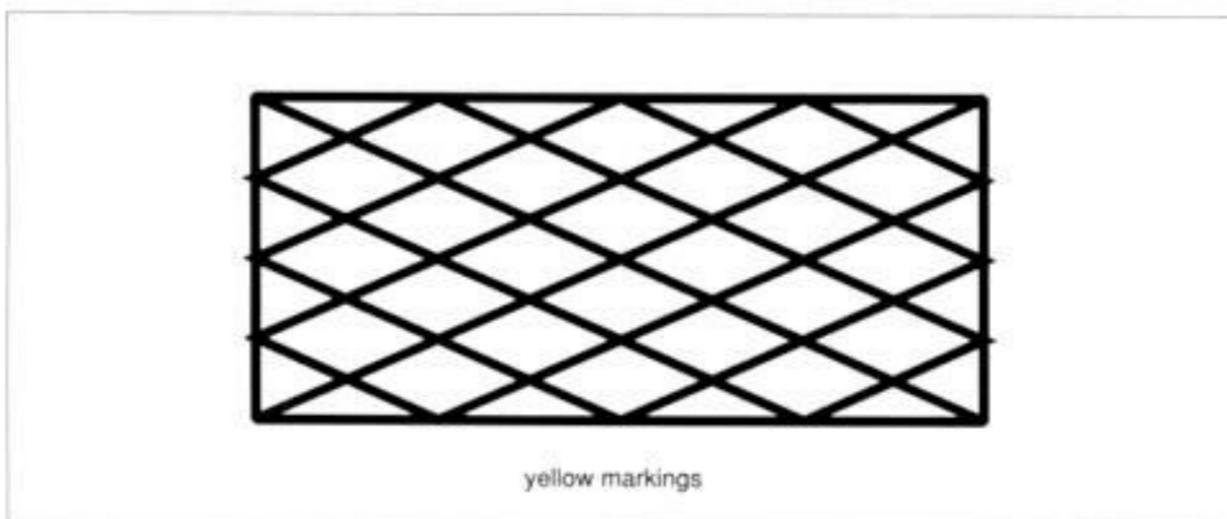


Figure 21:
No Parking markings

4.7 APPENDIX 7 - MANAGEMENT AND MAINTENANCE OF CAR PARKS

CAR PARK CONTROL EQUIPMENT

There are a number of systems available controlling both entry/exit to the car park and methods of payments, as follows:

- Pay on Exit
- Pay on Entry
- Pay and Display
- Pay on Foot

In this connection, the approved standards need to be achieved for an efficient operation.

Pay on Exit

A ticket is obtained at entry and payment is made at an exit kiosk or exit machine.

- Advantages - ensures payment for time parked.
- Disadvantages - congestion possible within car park at peak times, possible loss of ticket

Pay on Entry

Payment is made at entry kiosk or machine

- Advantages - ensures payment is made for usage.
- Disadvantages - careful consideration should be given to impact of possible queuing on adjoining highway. These systems can severely restrict a car parks dynamic capacity.

Pay and Display

Ticket bought for the time required at machine within car park and displayed in vehicle.

The machines should be in accordance with BS.6571: Part 3 1989. Specification for pay and display equipment.

- Advantages - Easy to manage
- Disadvantages - User needs the correct change, also may give an idea of how long the vehicle is likely to be unattended.



Pay on foot

Motorists pay at internal kiosks or machines for time parked and is given a master ticket to allow passage through exit barrier (often used at airports).

The equipment should be in accordance with BS.6571: Part 6 Specification for Pay on Foot Parking Control Equipment.

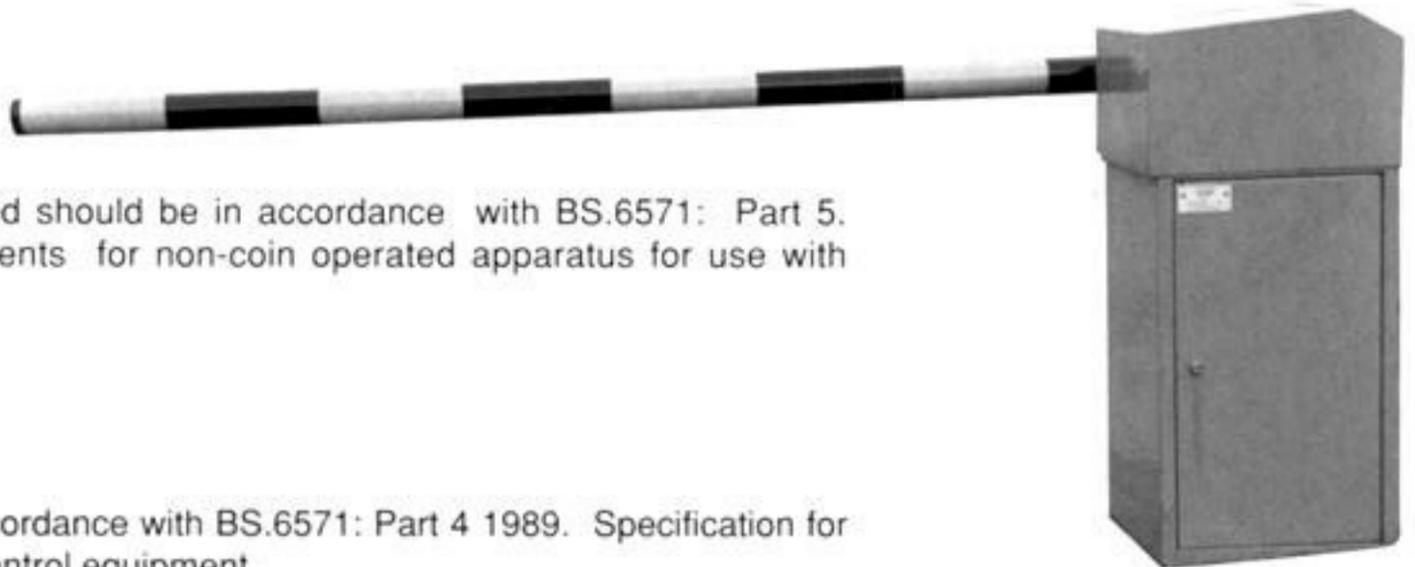
- Advantages - allows free flow of vehicles, ensures payment.
- Disadvantages - no attendant on the site. Causes problems if motorist loses ticket.

Payment Cards

The cards/devices used should be in accordance with BS.6571: Part 5. Guide to the requirements for non-coin operated apparatus for use with parking equipment.

Barriers

These should be in accordance with BS.6571: Part 4 1989. Specification for barrier type parking control equipment.



MAINTENANCE

A fast response is required in respect of general maintenance, especially for lighting faults/repairs. General maintenance is essential in making a car park attractive to use, and such matters as removal of graffiti and other vandal damage should receive prompt attention. The incorporation of vandal resistant and low maintenance materials in the initial construction should be considered. Although initial costs may be more expensive subsequent savings should accrue in lower maintenance costs.

CLEANSING

Regular cleansing of all areas is an important consideration if public confidence is to be retained in using the car parks. Daily inspection is recommended so that problems can be dealt with immediately.

SECURITY

Security is of prime importance, and besides the physical characteristics of the buildings, it requires a positive approach in management terms to combat crime.

It is in the long-term interest for operators to address this problem as a car park which is run down and unattended will lose patronage and income.

Managers should consider regular security patrols as a means of combating crime and of instilling confidence of patrons in using the facility. This is especially important insofar as fear of personal attack is concerned.

Ideally, multi-storey car parks should be constantly patrolled, with a regular security presence on the decks, stairs and levels.

4.8 APPENDIX 8 - CYCLISTS PROVISION

INTRODUCTION



It is the City Council's policy to promote cycling as a means of transport in Birmingham. The provision of cycle parking facilities at appropriate locations, either directly by the Local Authority or by encouraging developers to provide facilities is an important component of the policy. In all new car parks, provision should be made for the safe parking of cycles. The installation of such facilities are low cost, require little space, and will encourage more people to visit the locations in question. Further, inherent in the design of car parks should be the provision of safe approach routes for cyclists.

NUMBER OF SPACES

The number of spaces or ratio of cycle spaces to car parks which will be required will be dependent upon the type of facility the car park serves. Demand will also vary depending upon local circumstances and therefore each development should be considered on its merits. The City Council is currently developing a set of standards to guide the developers in calculating the appropriate number of cycle spaces.

TYPE OF PROVISION

Locations where significant numbers of cyclists are expected to park for all or a substantial part of the day will be expected to make long term as well as short term cycle parking provision.

A type of stand similar to that shown in the attached sketch is widely accepted as a standard form of cycle parking provision, giving support to the whole cycle frame and allowing both wheels to be securely locked. Displays should accord functionally with these requirements and visually with their requirements.

Cycle lockers would be appropriate at locations where long term users may be expected.

In both cases facilities should also offer some protection from the weather.

SIGNAGE AND POSITIONING

Adequate signage is essential to publicise the provision of cycle spaces, directions to the space and within the spaces themselves, to indicate that they are for the sole use of cyclists.

For people with disabilities and especially people with sight loss, the relationship of stands with other street furniture is important to facilitate orientation. If there is likely to be a problem, guard rails detectable at ground level may be

required.

Careful note should be taken of likely pedestrian flows and desire lines to ensure that cycle stands do not cause an obstruction or inconvenience.

SECURITY

Lack of suitable parking facilities leads to much damage and theft of cycles and is a significant deterrent to cycling. Careful choice of stands/lockers such as those previously described are essential.

The location of cycle parking should be prominent in order to maximise casual surveillance throughout the day and well illuminated at night.

MOTOR CYCLE PARKING PROVISION

Consideration should be given in new car park developments to including provision for motor cycle parking.

As with cycle parking facilities, such provision can be made at low cost and require little space. Parking areas for motorcycles should be hard surfaced and level, to ensure that motorcycles can be parked on their side or centre stands securely.

Due to the high incidence of thefts of motorcycles, parking areas should as far as possible be located in positions which allow opportunities for formal or casual surveillance from occupiers of nearby buildings or passers by.

Comments above regarding signage and positioning in relation to cycle provision are equally applicable to motorcycle parking facilities.

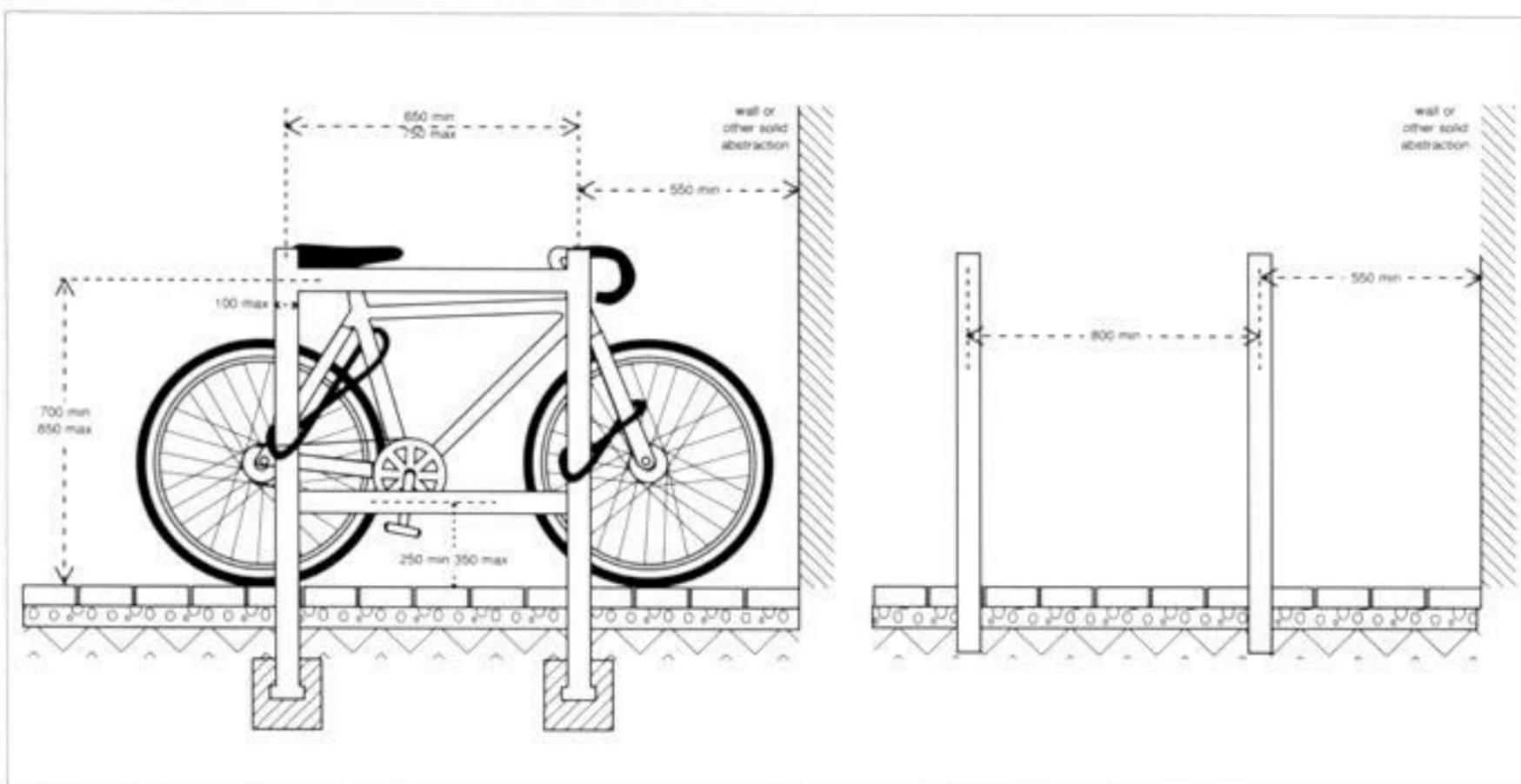
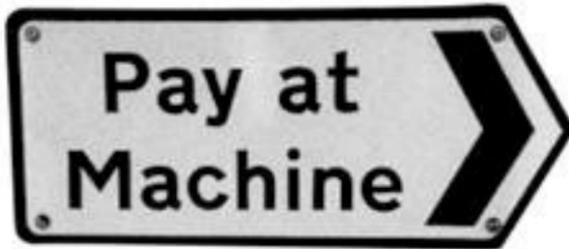


Figure 22:

5.1 USEFUL REFERENCES

DESIGN REFERENCE BOOKS



- **CHREST, SMITH & BHUYAN** - Parking Structures: Planning, Design, Construction, Maintenance and Repair. 1989.
- **HILL & SHENTON** - Multi-storey Car Parks. c.1984
- **BISON CONCRETE** - Multi-storey Car Parks. c1981.
- **INSTITUTION OF STRUCTURAL ENGINEERS & INSTITUTION OF HIGHWAYS AND TRANSPORTATION** - Design Recommendations for Multi-Storey and Underground Car Parks. 2nd Edition 1984

PLANNING PERMISSION AND BUILDING REGULATIONS

Planning Permission : The Birmingham Unitary Development Plan (UDP) contains both strategic policies and more detailed local planning and development policies and proposals to guide and control development in the City up to the year 2001. Annex 1 to the UDP sets out a list of Supplementary Planning Guidance which may be used by the City Council in considering planning applications for particular types of development. This includes guidance on appropriate levels and forms of car parking provision for different types of proposed development.

Building Regulations: A revised Approved Document M, Access facilities for disabled persons, took effect on 1 June 1992. Its provision will apply to applications for multi-storey car parks submitted for approval under the Building Regulations 1985 on and after that date.

The Guidance offered includes (1) Means of access to and into the building and (2) Means of access within the building.

Designer's attention is also drawn to the revised Approved Document B, Fire Safety, and particularly Section 11, which gives advice on fire safety in car parks. Separate advice is given on (1) Provisions common to all car parks (2) Open sided car parks and (3) Car parks which are not open sided

5.2 CONTACTS

Building Consultancy Division

Building Consultancy Division, Department of Planning and Architecture, Birmingham City Council, 1 Duchess Place, Hagley Road, Birmingham, Tel No: 021-235 2911.

Advice on application of the Building Regulations to a particular development proposal.

Planning Control Division

Planning Control Division, Department of Planning and Architecture, Birmingham City Council, Baskerville House, Broad Street, Birmingham. B1 2NA. Telephone number: 021-235 3208/2933

Advice on planning legislation and policies in respect of car parking.

City Engineers Department

City Engineers Department, Birmingham City Council, Lancaster Circus, Queensway, Birmingham. Telephone number: 021 235 6242

West Midlands Police

West Midlands Police, Architectural Liaison Officer, Community Services Department, PO Box 52, Lloyd House, Colmore Circus, Birmingham B4 6NQ. Telephone number: 021-626 5107, Fax number: 021 626 5285



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- School of Planning, University of Central England
- The Automobile Association
- Transport 2000 West Midlands
- West Midlands Fire Service
- West Midlands Police

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