Car parking
What works where

English Partnerships
The National Regeneration Agency

Foreword

Parking suffers from being treated as a footnote to housing. But research regularly shows that parking is the aspect of layout design that provokes most comment from residents. Where cars are parked is also key to whether a development has active streets, crucial to making a place feel alive and safe for those living there. English Partnerships' remit includes the delivery of high quality housing and part of our support for creating sustainable places is this toolkit for parking, produced with Design for Homes.

There is a gap between policy aspiration to reduce car use and the levels of car ownership generated by increased prosperity. Accommodating enough cars to meet reasonable expectations is an important objective, but the parking debate cannot be exclusively about how much. Whatever the level of parking, making it safe and attractive has to be the focus. This toolkit analyses how appropriate and well designed parking can reconcile policy and consumer aspirations.

So the main aims of this publication are to:

1. Identify the widest range of parking options available.
2. Review the options in relation to density of housing in a range of locations - central, urban, and suburban.
3. Present 24 British case studies to illustrate design and layout principles.
4. Evaluate the parking options against the following values:
   - The quality of the neighbourhood, or creating a 'good address'
   - Convenience of access and use between parking space and home, for residents and visitors alike
   - Safe routes for people going to and from the parking space
   - Security of parked cars
   - Efficiency of land and construction costs.

Key elements of the guide:

- Developing the range of options into a matrix of parking types
- Critical commentaries of 24 case studies
- Cross referencing to match density and parking type to case studies
- Golden rules for getting it right
- Display pages on special topics, including imported technology.

DESIGN FOR HOMES

English Partnerships
The National Regeneration Agency

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Millfield Lane in Tarporley, Cheshire. Built in 1997

It's not how much, it's how - a toolkit for parking

This manual takes stock of common car parking treatments and reviews how successful they are in providing adequate levels of safe parking within a high quality environment. Here the introduction briefly reviews recent studies into demand, allocation and parking efficiency as a starting point for designers. It also touches on innovation, including mechanical systems, homezones and the use of travel plans such as car clubs.

Treatment toolkit

This is not a set of templates but a toolkit for looking at which treatments work well in different locations. It looks at parking from the urban design perspective: does the treatment create an attractive and safe environment? It compares with the expectations of consumers: how happy will they be to park there? It takes note of the treatment's impact on the developer: can they sell it and would it be viable to build?

The manual critiques each treatment for its strength and weakness and urges a 'proceed with caution' approach to some treatments and how they can be improved. As national standards change for the amount of parking, designers are set to enjoy greater flexibility: this manual is about the fitness of purpose of many parking options in relation to the fundamental elements of housing layout – the street, the plot, and the building.

Creating better places

Car parking rarely satisfies. Like holidays, many respondents to any survey asked about parking provision want more. At the same time, campaigns are mushrooming to improve the quality of residential development through reducing traffic speeds.

There is a real dilemma here between the individual's desire to own and park a car and the collective desire to enjoy a safe and an attractive street. The neighbourhood in which we live affects fundamentally our quality of life and parking has a real impact, both positive and negative, on the way the neighbourhood looks and works. A balance between the two perspectives needs to be struck and this is only likely to happen when parking is integrated as a key component of urban design and not simply as a numerical or functional component of housing layout.

One message from our survey of developments at all densities is that it is not only the amount of parking that really matters but how and where it is accommodated in relation to the home and the street. The other side to this message is that good parking is inseparable from good urban design practice. It is only through combining good external public environments with good private home environments that successful and sustainable neighbourhoods can be built.

There is now a great deal published on good urban design practice, from Government guidance - PPS1, By Design, Better Places by Design: A companion guide to PPG3 and Safer Places: The Planning System and Crime Prevention - to English Partnerships' own Urban Design Compendium. Most of the principles underpinning urban design practice are now familiar and widely accepted: Interconnected streets help reduce car reliance and make a neighbourhood walkable. If the area is also sufficiently dense and compact it can support local facilities, and together these two principles of connectedness and compactness add vitality to public spaces and encourage safe, surveilled streets. Government policy is aimed at reducing the oversupply of parking spaces in new residential areas as well as managing demand by promoting layouts designed according to these principles.

How the street lost its way

From the 1960s onwards a model of new housing layout began to dominate: joined up streets were replaced by hierarchical cul-de-sac layouts; integral garages with hard standings replaced the street as the place to park. Owing to a legal aversion to allocated on-street bays, and with residents' cars usually parked in front of garages, visitors must park on pavements. The result is that cars dominate the 5.5m strip to the front of houses on both sides and the cul-de-sac itself. The setting for the home becomes dominated by cars parked at many visually conflicting angles. The utilities' aversion to street trees means that the car is the dominant element in the public highway and the view is unsoftened by foliage.

The vehicle-dominated streetscapes that resulted from 'prairie planning' and standardised highways regulations was challenged early on by The Essex Design Guide[1] and Cheshire County Council's Housing:Roads[2] and later formalised in Design Bulletin 32[3]. The next big challenge to housing layout and parking followed the publication of PPG3 in March 2000. “Car parking standards that result, on average, in development with more than 1.5 off-street car parking spaces per dwelling are unlikely to reflect the Government's emphasis on securing sustainable residential environments. Policies which would result in higher levels of off-street parking, especially in urban areas, should not be adopted.”

This guidance involved a real change of direction for the volume house builders. After initial resistance, alternatives were rapidly developed. The old garage court previously associated with council housing estates re-emerged as the rear parking court. Car parking spaces began to be placed inside the block and to the rear of the house, either in parking courts of various sizes or within the garden.

Rear parking courts could be described as the new default setting of housing layout practice. This has come about because of a convergence of interests: planners wanting to reduce the visual intrusion of cars on the street and the overall numbers of spaces provided; highway engineers wanting to restrict frontage access to houses from many streets and to keep the public highway open for the free movement of vehicles; and developers wanting narrow streets to minimise the cost of constructing highways to adoption standards.

A specific rear court design used at Poundbury (almost a lane behind homes) has led to imitation. But there are disadvantages with rear parking courts caused by the duplication of streets and rear access routes. It is inefficient as a large proportion of the land is used for roads and parking areas; the internal routes result in reduced garden sizes; there is a loss of security and privacy to the rear of the home; and, with parking to the rear of the house, residents may be less likely to use their front doors with a consequent loss of activity in the street.

Most current highways guidance has little to say about the benefits of on-street parking. With rising densities there is a physical limit to the number of spaces that can be laid out on plot. The arguments about on plot parking options have obscured the potential of the street as a location for parking.

Beautiful streets: the building blocks

Go for clear, direct and continuous routes

Make building fronts face each other across the street for enclosure and surveillance

Put buildings close to the front of the plot and vary dimensions according to street type, density and parking types

Make sure residents have to come and go through front doors to access parking spaces

Reference
1. Essex County Council, (1973), A Design Guide for Residential Areas.
2. Cheshire County Council, (1976), Housing: Roads
3. The Department of the Environment and Department of Transport, (1977), Residential Roads and Footpaths: layout considerations Design Bulletin 32, HMSO, London (& second edition) The Department of the Environment and Department of Transport, (1992), Residential Roads and Footpaths: layout considerations Design Bulletin 32 Second Edition, HMSO, London

Why 'how' is more practical than 'how many'

Allocating spaces makes car parking less efficient. DB32 first spelled out this principle in 1990 and a 1996 study by Noble and Jenks[1] illustrated the impact on parking need when spaces are allocated. The definition of an allocated parking space is one found within the curtilage of a property, such as in the garage or on the driveway, and includes any space found off plot clearly dedicated to a particular property, such as in rear courts. Spaces on the adopted public highway cannot legally be allocated, unless for disabled users and even then rarely to any single home.

Generally parking standards project a level of provision for visitors of about one space for every five homes, or 20%. But the Noble and Jenks study of Lower Earley in Reading found that most visits by non-residents in cars clustered during evenings and weekends, coinciding with periods when some residents were using their cars elsewhere. Noble and Jenks calculated that, if a majority of residents' parking is unallocated, this inflow balances with the outflow as spaces are available to both visitors and residents. So, they recommended that no special provision be made for visitors when at least half of the parking provision associated with a development is unallocated. But if less than half the parking was to be unallocated, then an extra 0.2 spaces per dwelling (or 20% over all) are needed to cope with additional demand generated by visitors.

Alan Young of WSP Group and Phil Jones of Phil Jones Associates have built further on the Lower Earley study to show the impact of allocating spaces. Taking the 1991 Census data which shows that average levels of ownership for a house with 5 habitable rooms is 1.1 cars, they create an imaginary development dependent on such dwellings to show that each group of 10 5-habitable-room houses needs 11 parking spaces. However, if each of these dwellings is allocated one space, which cannot be used by any other property, then 19% of these allocated spaces will be unused because the households will have no car. But there is also the further inefficiency of demand for additional parking by those properties with two or more cars. They use a formula to calculate overall demand for further unallocated parking per property, when one allocated space per property is provided.

Additional demand = 1 x (no. of two car households) +
2 x (no. of three car households)

which in this case would be:

Additional demand = (1 x 0.23) + (2 x 0.04)
= 0.31 cars per dwelling

so the overall parking requirement per dwelling would therefore be:

1 allocated space + 0.31 unallocated space = 1.31

So the number of spaces needed by a group of 10 houses would be 13 (10 allocated + 3 unallocated), compare with 11 if unallocated.

Allocating spaces means the developer needs to provide 2 more spaces for every 10 homes - or 18% more. Where local authorities demand 20% visitor parking, this could result in an extra 2 spaces for visitors as well - in other words 15 spaces for every 10 homes, compared with 11 if unallocated.

Reference
1. Noble and Jenks (1996) Parking; Demand and Provision in Private Sector Housing Development published by Oxford, School of Architecture, Oxford Brookes University.

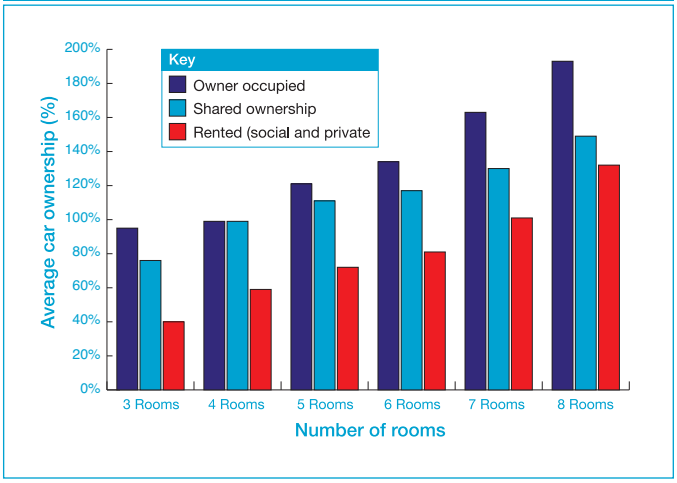
How many cars should we design for?

Census data from 1991 and 2001 records car ownership. This can be broken down into ownership levels according to size, type, tenure and location. In October 2003 ODPM commissioned a group led by Alan Young of WSP Group and Phil Jones of Phil Jones Associates to research a toolkit based on Census data for local authorities to calculate the number of spaces needed in any planning application.

The Office of National Statistics was unable initially to provide cross tabulated data so the consortium turned in the first instance to the Cathie Marsh Centre for Census and Survey Research (CCSR) at the University of Manchester from the Standard Anonymised Records set for data from the 1991 Census. They used this to generate their key conclusions on how ownership levels are affected by size, tenure and location. At time of publication of this manual, the consortium was updating their work with the 2001 Census data to come to accurate figures for the most recent ownership levels. With their co-operation, graphs of some 2001 data for ownership have been produced here for the first time (below and opposite).

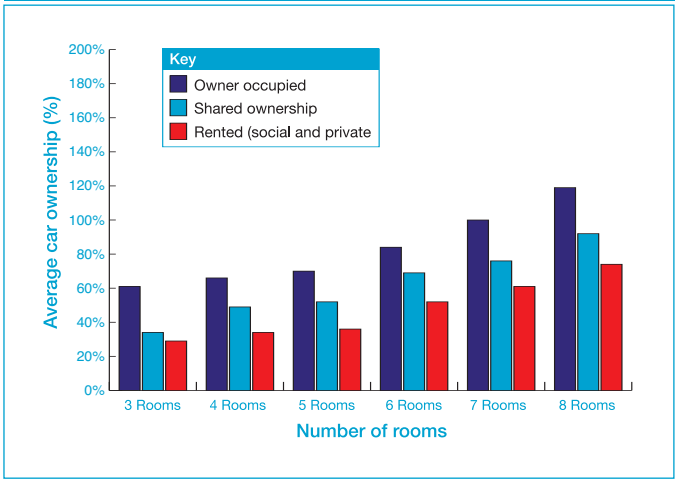
There are patterns to car ownership that show that averages rise or fall according to size of home, tenure and, to a smaller degree, whether the property is a house or flat. But Jones and Young also found that there were real differences in ownership levels in any type on which the averages were based. So those living in houses with 5 habitable rooms owned on average 1.1 cars (1991 Census data) but some 19% of dwellings had no car, 54% had one car, 23% had two cars and 4% had three or more cars. This range may be less pronounced in the most expensive streets where home ownership indicates a degree of prosperity - the study shows car ownership is also a function of prosperity. But it remains clear that to design on a plot-by-plot basis for average car ownership ignores significant variations within and wastes space by allocating bays to people who won't need it.

Car ownership levels in houses



More habitable rooms generally means residents have more cars. This was evident in both the owner-occupied sector where a house with 8 habitable rooms typically hosts twice as many cars as one with 3 habitable rooms, and in the rented market where the same comparison shows car ownership is about three times the level.

Car ownership levels in flats



One consistent pattern is that flats have about 0.1 to 0.2 of a car less than houses because of fewer occupants. The other difference between flats and houses is that owner-occupied and rented flats add cars at similar rates as the home increases in size. This may reflect that multiple occupancies are mostly found in rented houses.

How much? The golden rules

1. Car ownership varies greatly by size of property. An 8 habitable room house typically has twice as many cars as a 4 habitable room house.
2. Car ownership is affected by tenure. On average, across the whole of England, owner-occupied households owned about 0.5 more cars in houses and flats of all sizes.
3. Car ownership varies less according to type of property, with the number of cars per flat being slightly less (about 0.1 to 0.2 cars per home) than the number of cars per house (right), of equivalent size and tenure. This may reflect the reduced numbers of families with children in such housing.
4. It is inefficient to design on a plot-by-plot basis for average levels of ownership. Give each plot two spaces and about one-quarter of residents will have either too few or too many spaces.

Houses by Tenure	Number of cars or vans					
	Total	None	One	Two	Three	Four+
Owner occupied	12743372	1680294	5885010	4115485	814097	248486
1 Room	10526	2678	5117	2103	454	174
2 Rooms	48838	13588	27106	6999	892	253
3 Rooms	217234	56592	120334	34999	4301	1008
4 Rooms	1710922	402101	964162	304202	32705	7752
5 Rooms	3776671	602943	1997450	987355	153435	35488
6 Rooms	3352073	441547	1611008	1061951	189438	48129
7 Rooms	1651516	102099	643287	711826	149780	44524
8 + Rooms	1975592	58746	516546	1006050	283092	111158
Shared Ownership	96609	20775	5275	20267	2676	816
1 Room	198	86	92	14	3	3
2 Rooms	1482	585	717	159	21	0
3 Rooms	5154	1991	2512	559	72	20
4 Rooms	32910	7500	19056	5746	471	137
5 Rooms	33806	6463	18428	7756	923	236
6 Rooms	15601	2940	8006	3834	638	183
7 Rooms	4416	742	2104	1195	275	100
8 + Rooms	3042	468	1160	1004	273	137
Rented	3345622	1528857	1352248	376920	66648	20949
1 Room	11462	7591	3209	490	115	57
2 Rooms	54647	33329	18301	2548	338	131
3 Rooms	264548	171582	81133	10097	1288	448
4 Rooms	826916	420982	332470	64941	6538	1985
5 Rooms	1228616	540475	522838	138353	21741	5209
6 Rooms	660420	266616	278913	91824	18117	4950
7 Rooms	175219	57674	72044	34149	8319	3033
8 + Rooms	123794	30608	43340	34518	10192	5136

Flats by Tenure	Number of cars or vans					
	Total	None	One	Two	Three	Four+
Owner occupied	1117262	358996	611677	127330	15007	4252
1 Room	14082	6504	6781	678	78	41
2 Rooms	69604	29126	35806	4100	401	171
3 Rooms	304680	118588	161578	21774	2088	652
4 Rooms	520683	159366	293847	60253	5685	1532
5 Rooms	143217	34270	80404	24249	3490	804
6 Rooms	38519	6913	20677	8977	1508	444
7 Rooms	13659	2093	6804	3690	828	244
8 + Rooms	12818	2136	5780	3609	929	364
Shared Ownership	36424	17891	15450	2604	384	95
1 Room	1287	905	338	33	6	5
2 Rooms	3833	2188	1445	168	28	4
3 Rooms	12487	6754	5110	526	64	33
4 Rooms	14698	6367	6807	1326	172	26
5 Rooms	2901	1218	1249	361	64	9
6 Rooms	677	254	273	108	34	8
7 Rooms	235	93	95	36	8	3
8 + Rooms	306	121	133	46	8	7
Rented	2615192	1630563	837303	124891	16160	6275
1 Room	134139	99389	32033	1972	410	335
2 Rooms	314494	218177	87057	7782	865	613
3 Rooms	982665	664287	284408	29191	3387	1392
4 Rooms	837561	472451	305471	53064	4835	1740
5 Rooms	251431	130748	94256	21810	3689	928
6 Rooms	56684	26438	21424	6650	1634	538
7 Rooms	19201	9092	6703	2399	708	299
8 + Rooms	19017	9981	5951	2023	632	430

Source: 2001 Census collated by Alan Young (WSP Group) and Phil Jones

The street: the original shared car park

Ask any real estate agent for the best addresses in a town or city and they will be, almost without fail, the residential districts built in the late 18th, 19th, and early 20th centuries. It is easy to visualise these areas – relatively wide and tree-lined streets; building frontages with grand or more modest entrances and doorways lining the street. Cars are parked formally on the street in either parallel, angled, or right-angled alignments. The trees prevent the cars being dominant in the street scene, the formality of the parking arrangements are visually 'smooth' rather than 'jagged'. The lines of cars themselves form a buffer between the pedestrian on the footpath and the moving vehicles on the carriageway. There are squares which give additional communal garden space to the houses which surround it as well as a real visual amenity for passers-by. Sometimes here are also the former service alleys, now converted into quiet and highly desirable mews.

The active street is just one strength of the original Georgian housing square, which divides parking between cars on the housing square and those in the mews street behind (see Cornwall Gardens right). The layout form is also highly flexible. According to location and the density required, it can be scaled up with building heights rising from three storey to four, five, or even six, as in the example of Cornwall Gardens. The habitable rooms per hectare here are equivalent to that of multi-storey apartments. The dimensions of the square can be easily adjusted to relate to the height of the buildings and the width of its carriageway varied in accordance with the type (parallel, angled or right angled) and number of parking spaces required for the number of houses being provided.

A large housing square allows wide pavements, increased planting and generous semi-private garden in the middle of the square. The garden square to the front of homes is also the most popular method of incorporating shared amenity space, as Design for Homes found in its study[1] into how residents relate to public and private space as densities rise.

Dimensions are an integral aspect of quality. The size and shape of the urban block are as critical to the delivery of successful parking as the more detailed aspects of design. When compared with the land-efficient rectangular blocks of early 20th and 19th-Century residential areas, many recent housing schemes adopt a very different grain of layout with relatively small square blocks. But small square blocks (50 x 50m) are generally inefficient as the corner-to-street-edge ratio is high compared with larger rectangular blocks which have more perimeter as parking edge. If parking is to be transferred from the back of the block to the front, street length (or the distance between junctions) and street width become important layout factors (see table page 10 which gives pointers to the most efficient block sizes and parking types.).

The recent fashion for placing parking spaces behind buildings has led to many schemes around the country being blighted by cars parked to the front of the house where there is no space designed to accommodate them. Housebuyers are showing their preference to park in front, but where there are neither the spaces designed into the street nor the carriageway widths to allow parallel parking on the road itself, cars are parked with two wheels on the road and two on the pavement.

The urban block form underpinning Britain's most expensive streets

Parking to both sides of street on housing square.

On plot parking in mews street behind.

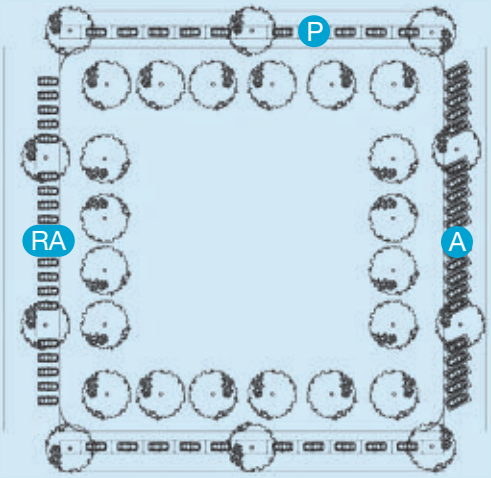
High-density block in Cornwall Gardens, London without gardens to separate homes in the mews streets from houses on the square.

Reference

1. Perceptions of Privacy and Density in Housing. 2003. Published by Design for Homes.

If the house buyer regularly shows a preference to park on the street in front of their home, strong enough to park in a hazardous or even illegal way, the layout designer ought to accommodate that desire. Noble and Jenks and Young and Jones have both shown in their studies the efficiency of unallocated spaces on street. Parking on street remains the simplest and most successful way to supplement on plot parking and to achieve the level of parking that car ownership levels demand. This is not restrictive for designers – parking can be provided in many permutations on street by widening the street (see left and below) which can significantly add to the numbers of spaces provided on plot.

On street parking: how much street do you need to lay out these treatments?



Assumptions

1. Parking bays dimensions:
   - Parallel (P) 5.5 x 1.8/2.0m unmarked bays
     6.0 x 1.8/2.0m marked bays
   - Right angled (RA) 5.5 x 2.5m
2. Need to add 10m free of parking spaces at approach to all junctions, so add according to how parking edge is arranged into urban blocks.
3. Planting provided within footways. Alternatively, need to add additional space if parking bays are to be broken with tree planting.

Left shows parallel (P), right angled (RA) or angled bays (A) round a housing square. Using Young and Jones' calculation of 11 unallocated parking spaces for a notional layout of 10 houses with 5 habitable rooms each, the table below calculates the amount of street edge needed for each parking type and the implications for street width.

Parking type	Street width in metres	Street edge in metres
Parallel (P) one side only	5.0 – 6.2	Marked bays - 66 Unmarked bays - 60.5
Parallel both sides	6.4 +	Marked bays - 33 Unmarked bays - 30.25
Right angled (RA) one side only	10	27.5
Right angled both sides	15	13.25
Angled (A) one side only	Varies according to angle (45/60°)	Falls between ranges above, ie <66 but >27.5
Angled both sides	Varies according to angle (45/60°)	Falls between ranges above, ie <33 but >13.25

Source: Sue McGlynn, Graham Smith, Mike Stanley

A balance between on street and on plot

Off-the-shelf highway designs do not create attractive environments. Neither does slavishly copying a single urban design solution - this is not a call for parking on street to become the new default setting. But rear parking should be the second resort, not the first. The first option for the selection should always be frontage access types.

The fold-out pages which follow at the end of this section present a matrix of parking options. Each treatment is derived by varying the relationship between the elements – the block, the street, and the plot. Its aim is to help designers and developers restore the balance of parking provision between the street and the plot and to provide safe, active and attractive neighbourhoods for resident and passer-by alike.

Innovation 1 - Mechanised parking

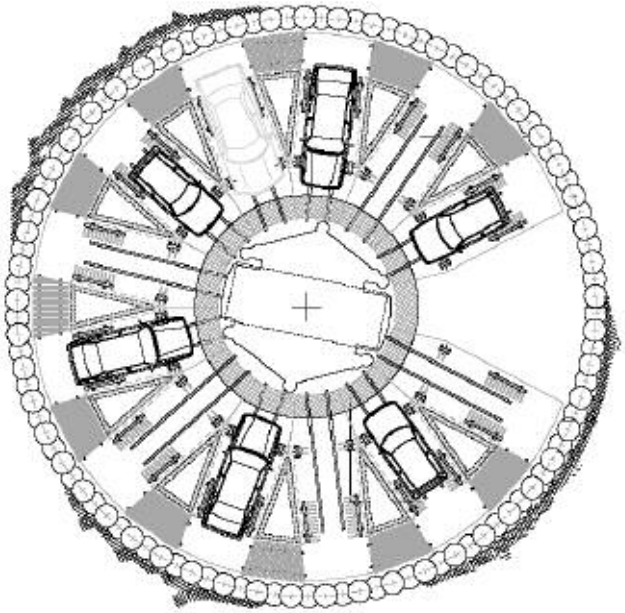
A snapshot of the future fast becoming reality

Mechanical car parking systems have begun to cross the Channel from continental Europe. Nearly all systems allow cars to be parked automatically by computer-driven hydraulics in spaces only a few centimetres wider than cars. These systems offer much higher capacity, but at a capital cost which is restricting take up mostly to city centres and where land values are high. With a trend to increased housing densities mechanised parking can be an important tool in delivering more usable public and private space.

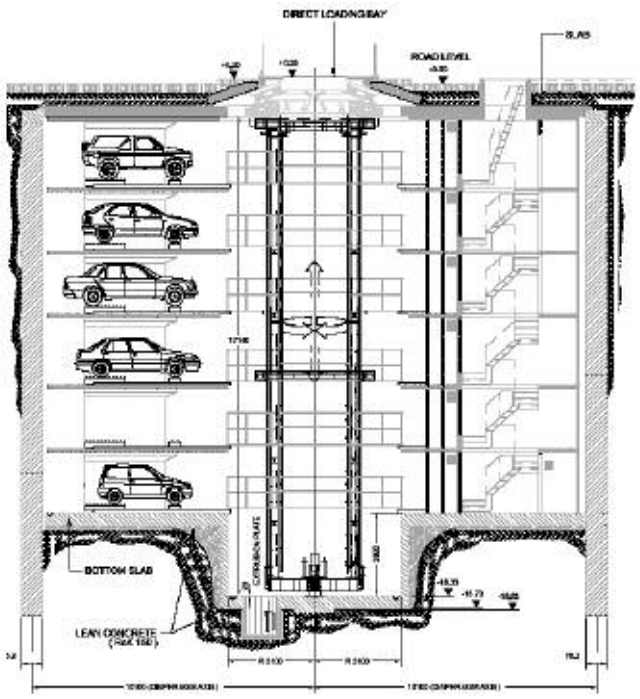
Design options are proliferating from systems that stack two cars vertically on a single plot to those that shift cars horizontally between dozens of spaces without carriageway widths between (see Merchant's House pages 42-44).

The system illustrated here in Cesena, Italy, can store up to 108 cars within a 21m by 21m ground surface area. (A rule of thumb allowance of 25m^2 for each conventional parking space would require six times as much land.) The driver and passengers alight, leaving the car in the entry bay with the engine off. A computer then parks the car in the nearest available space inside a drum-like silo using a turntable which rotates and rises and falls within it. When the owner returns and requests the car, it is brought back to the surface facing the right direction ready to be driven away. Parking and retrieval times are on average 50 seconds. For more information see **www.trevipark.co.uk**

A turntable means cars access and leave in the direction of travel. It takes about 50 seconds from the request call for the car to appear.



The transport lift revolves to find an empty chamber...

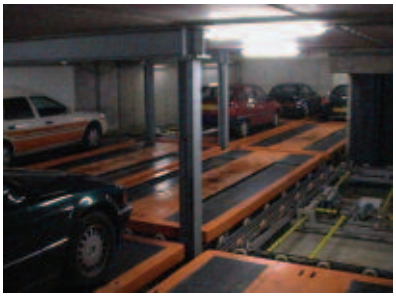


... or rises or falls to find empty levels.

In Amsterdam, the 'Silodam' by architects MVRDV is a mixed-use development standing in the waters of the River Ij behind the Central Station. A 10-storey building contains 42 owner-occupied and 15 rented homes, and 600m^2 of business units are accessed along a projecting quayside roadway under which are parked the majority of residents' and tenants' cars. The parking uses a system by Ecosafe which arranges cars like the toy which challenges children to slide tiles around a tray to achieve a pattern. Here there are 105 spaces below the roadway, and more on the road level for visitors. See **www.ecosafeparking.nl** for more information.

Silodam mixed-use development, Amsterdam. The entry garage to the underground car park can be seen to the left of the roadway.

Drivers park up and key in a parking code...



... then car is slid into a vacant slot below.

Innovation 2 - Homezones

Homezones: turning roads into amenity space

The 1963 Buchanan Report 'Traffic in Towns' recognised that there should be environmental areas where traffic does not dominate and also that some roads should be made free for movement. The standard response in the UK was the cul-de-sac, relatively safe because 'through-movement' is removed but the hierarchical road layout leads to maximum journey lengths. Despite an excellent traffic safety record, the UK has a large 'pedestrian accident' problem among the youngest and the elderly in residential areas.

The Netherlands and Germany took on board ideas from Buchanan differently. Wider areas of the city are conceived of as environmental areas. Traffic is not banned from these areas but physical measures were applied to ensure that moving cars do not dominate the public space. The highway is designed to integrate play, socialising, slower movement of vehicles and also car parking (see Utrecht, right). This approach is now known in the UK as the homezone.

At its best, the homezone removes the limitations on the use of the street that highway engineering policy had previously exclusively defined. “Introducing a homezone allows greater scope for a wider range of activities in street space that was formerly considered to be for exclusive use by vehicles.” Traffic speeds are limited to a maximum 20mph. Outdoor seating, trees and planters are positioned next to vehicle routes, while surfaces are finished with materials to indicate use by all. Table heights of road and pavement are usually the same but pedestrians have a car-free space. Signage has to announce the start and finish of the homezone and indicate pedestrians will be sharing the highway. Car parking is only in marked spaces. The rational is to colonise the highway for all, while also making these areas safer for children to do what they used to do in streets, such as learning to ride bicycles and to play games.

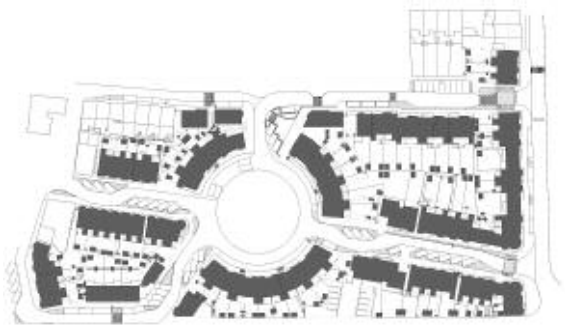
The 2000 Transport Act made provision for homezones, becoming law in April 2001. The Methley's homezone in Leeds was among the first completed and was greeted as a triumph by the resident community after a four-year campaign (**www.methleys.org.uk**). It was anticipated that such 'retrofit' schemes would outnumber the number of homezones designed for new-build developments as more local residents groups came forward to seek homezone status. However, the high cost of public consultation exercises has reduced the number of schemes coming forward. In the interim, the first new-build schemes big enough to incorporate homezones have started to appear, including in 2005 Gun Wharf (illustrated) in the Devonport area of Plymouth. Here the city council has also sponsored one of the largest retro-fit homezones at Morice Town.

Homezones are also now being promoted by English Partnerships on its larger sites, such as Allerton Bywater near Leeds. Many developments which have not sought or obtained official homezone status now borrow from the homezone toolkit, seeking to calm traffic with raised road tables topped with bonded gravel to create a more appealing public realm than would be possible with the speed hump.

More details can be found at **www.homezones.org.uk**, managed by the Institute of Highway Incorporated Engineers.

Graanstraat in Utrecht, a Dutch homezone from the 1970s which includes children's play space.

Gun Wharf in Devonport, Plymouth.



Site plan of Gun Wharf.

Innovation 3 - Car free and car clubs

The Design House in Manchester's Smithfield was developed without parking and adjacent roads are yellow lined. Anecdotal evidence suggests owners simply keep cars elsewhere.

Smart growth: is it wiser to target car use?

Car-free development arrived in 2000 in Edinburgh. A venture between Canmore Housing Association and Malcolm Homes offered 120 homes in various tenures to residents willing to sign away rights to own a car while living there. Edinburgh and Glasgow city councils subsequently adopted guidance to promote car-free development.

However, Edinburgh has since had to advise housing associations that they cannot enforce a car-free tenancy agreement against a tenant. Assumptions about the control of residents flaunting the rules have proved ungrounded. Scotland's Planning Advisory Note 57 appears to acknowledge this with its emphasis that car-free parking should be considered only for controlled zones where the issue of permits could be restricted and so car ownership made very inconvenient. But car-free was being promoted as a consumer choice, while PAN 57 appears to accept that reducing car ownership is possible only through denying rights. The hope that residents will voluntarily abandon cars has encountered similar issues in Malmo's exhibition development Bo01.

Traffic forecasters have been predicting the number of journeys to rise by 17% by the end of the decade. The commute to work, currently just over a quarter of all miles driven by car or van, is also expected to rise as a percentage of journeys and also in terms of length of journey – currently 8 miles. Some local authorities are instead trying to manage the growth in journeys with travel plans.

Travel plans include encouraging local employers to develop methods of getting employees to share lifts or use alternative transport. Pfizer in the Kent town of Sandwich has plumped for incentives, offering employees £2 a day subsidy not to drive to work, equivalent to the cost to Pfizer of maintaining a car parking space. The pharmaceutical group also provides a bus and has invested in boosting local transport provision.

London Borough of Sutton is promoting a travel plan approach for new development which overlaps with car ownership. The plan asks developers to consider car clubs for applications. Residents can still expect a car space but they are asked to use a car supplied by a recognised hire firm whenever they need a second or occasional vehicle. The facility is shared across the development and time is booked online at a discounted rate with the hire firm. This is promoted as a way of sharing the cost of car ownership and there is some potential for shared journeys. The local authority has also been campaigning to get all those already living within the borough to sign up to a sustainable transport code and make more journeys by means other than car.

Using the Planning System to Secure Travel Plans, published by Department of Transport, is available either as “research” or in the form of “best guidance for local authorities, developers and others” from **PO Box 236, Wetherby, West Yorkshire S23 7NB** and **dft@twoten.press.net**

Further information about initiatives can be found at: **www.transport2000org.uk**

Treatments - Solutions to parking issues

Issue

Limited parking to the front of houses in a street with a narrow road encourages residents to park two wheels on the pavement, rather than take vehicles round the back of properties to courts. This is especially common where there are dropped kerbs for access to garages or rear courts.

Issue

Fussy treatments which are not close enough to the front door will be shunned by residents in favour of the space by the front door. Highways will end up controlling the expensively detailed streetscape with double yellows.

Issue

Don't put cars in open ground floor structures where residents can't see cars or what is happening in the parking area. Blank ground floors without surveillance of either pedestrians or vehicles encourage car and street crime. Uses will feel vulnerable accessing their cars if no-one can see them.

Solution

A. Plan for access to vehicles at the front of properties

B. Increase building scale to compensate for wider roads and more cars

C. When raising footways, use materials to distinguish between footway and carriageway

D. Add planting to soften the impact of cars

Solution

A. Go for obvious parking bays as part of the carriageway

B. Put the cars in view of the home

C. Make the treatment sufficiently formal so that the majority of residents abide by its formality

D. Make the streets wide enough to include parking bays

Solution

A. Use garages, not ground floor structures

B. Where you use integral garages, use them in houses wide enough to accommodate at ground floor level both a front door and a habitable room with window to street

C. Put visitor parking to front of properties to encourage active streets


DO NOT EVEN THINK
OF PARKING HERE

Golden rules for all locations

1. Go for the quality of the street above all else. So where you put the parking is more significant than how much.
2. There isn't a single best solution. A combination of on plot, off plot, and on street is the solution, according to location, topography and the market.
3. Rediscover the street as a beautiful car park – people understand how it works, it's efficient and it increases the activity and safety of the street.
4. Maximise the activity between the street and the house for safer, friendlier streets. New residential areas usually have too few people moving around.
5. Do not park in the back of the block until on street and frontage parking permutations have been exhausted. Use of the mews or rear court should support on street provision, not replace it.
6. Avoid allocating more than half of parking spaces. Research by Noble and Jenks shows that the more spaces you allocate, the more you have to provide.
7. There are now three types of on street parking: uncontrolled; controlled parking zones (CPZ) where spaces can be defined by user and/or by times; and restricted parking zones (RPZ) where positive parking control does not rely on yellow lines.
8. Provide cycle parking to all parking solutions that is safe and secure.
9. Don't forget Secured by Design principles.

How apt is a treatment to location?

Sketches and brief descriptions of common parking treatments follow. Some treatments work well in most locations, but be alert to the limits of others. The traffic lights indicate how well a treatment will fit within the urban design of a central, urban or suburban location.

Defining location

Development density is a reasonable indicator of how you should approach your parking treatment. Draft planning guidance for housing proposes indicative density ranges for three locations considered in this parking guide:

Central	more than 70 homes to the hectare
Urban	40 to 75 homes to the hectare
Suburban	35 to 55 homes to the hectare

Proceed with caution

Car parking standards rarely follow density downward because urban and suburban locations include a higher proportion of houses which in turn bring higher levels of car ownership (see Phil Jones and Alan Young, pages 7-8). Many of the treatments featured here work in urban and suburban locations with density of 35 to 75 homes to the hectare, where houses make up more of the dwelling mix than flats. Such locations call for a mix of car parking treatments to meet appropriate levels of provision, including or supplemented with unallocated on street spaces, ideally controlled with permits or similar.

Traffic light symbols indicate the aptness of each treatment in a given location. For example, the podium car park (4) gets a red light in suburban locations, not least on cost considerations. By contrast, the housing square (12) gets a green light for each location because it can be scaled up according to whether it is in a village, town or city to accommodate more spaces. An amber light indicates that a design will work, provided you “proceed with caution”. Traffic lights are not definitive. For example, the use of right angled on street parking (9) with two-storey houses will exaggerate the wider street needed to accommodate it: right angled parking will usually work, but only if building heights are scaled up to compensate. As always, there are other considerations which are explored in the case studies.

Why traffic lights?

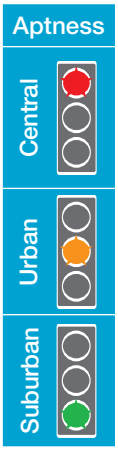
A number of car parking treatments suit only one location - central or urban or suburban. We can be unequivocal about whether they are apt or not, so they get a red or green light.

But there are an equal number of treatments that can be made to work in locations where they are not usually the first choice, provided care is taken. The manual urges care with these treatments in these locations. An amber signal means, of course, proceed with caution.

Red: rarely suitable in that location

Amber: can be made to work in that location provided care is taken to design out risks

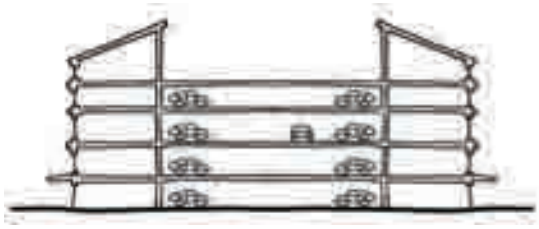
Green: is appropriate in that location at all times



What works where How apt is a treatment to location?

1. Off plot: multi-storey

Single or multiple entry point. Covered parking in marked bays, arranged over levels connected with ramps. Access generally controlled from residents' cars. No direct access to homes. Should be wrapped in buildings to maintain active streets.



Aptness

Central

Urban

Suburban

2. Off plot: underground

Single or multiple entry point. Covered parking in marked bays, full storey height or more below street. Access generally controlled from residents' cars. No direct access to homes.

Aptness

Central

Urban

Suburban

3. Off plot: undercroft

Open sided parking bays at street level or half level down for natural ventilation, best secured with grill or other bar to access from street. Accommodation over. No direct access to homes.

Aptness

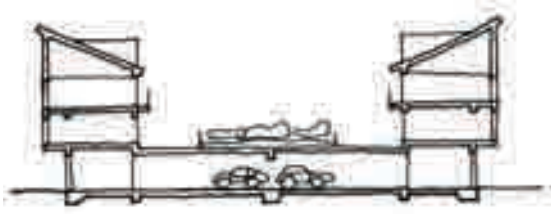
Central

Urban

Suburban

4. Off plot: podium

Distinction from underground/undercroft by the addition of private or shared outdoor space above parking. Naturally ventilated. Should be closed to street or it echoes open ground floor structures (bottom, page 15). No direct access to homes.



Aptness

Central

Urban

Suburban

5. Off plot: mechanical

Sliding, stacking or rotating system on one or more levels. Best when controlled by residents. No direct access to homes.

Aptness

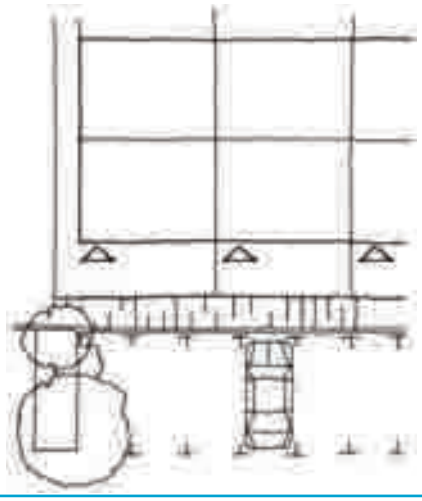
Central

Urban

Suburban

6. Off plot: front court

Marked or unmarked bays overlooked by fronts of homes partly enclosed by building/walls and within depth of pavement.



Aptness

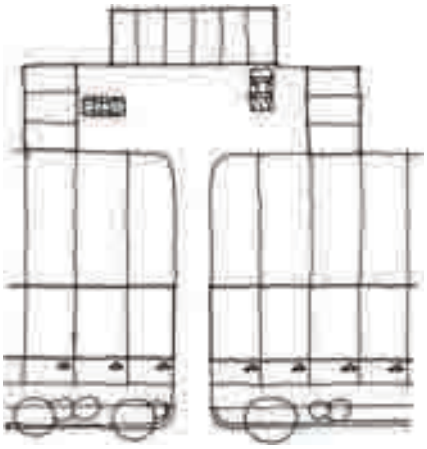
Central

Urban

Suburban

7. Off plot: rear court

Grouped (often terraced) garages or hardstandings (marked or unmarked) around shared court, accessed between and located to rear. Court should serve no more than six homes.



Aptness

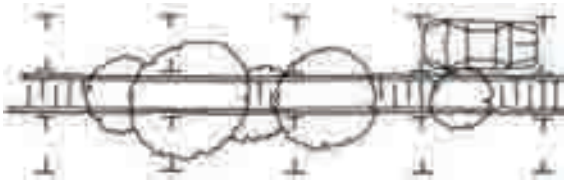
Central

Urban

Suburban

8. On street: central reservation

Kerbside parking arranged both sides of strip dividing traffic flows with marked bays for parking in same direction as the traffic flow. Landscaping a benefit.



Aptness

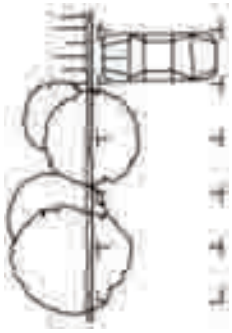
Central

Urban

Suburban

9. On street: right angled

Kerbside parking at right angles to axis of pavement, generally in marked bays. Increase in building heights needed to compensate for wider street. Needs landscaping.



Aptness

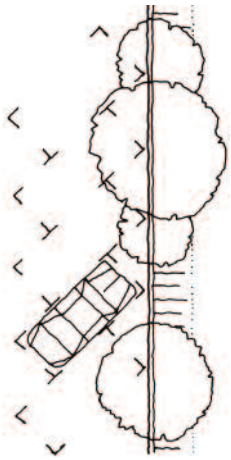
Central

Urban

Suburban

10. On street: angled to pavement

Kerbside parking at less than right angle to axis of pavement, generally in marked bays. Needs landscaping.



Aptness

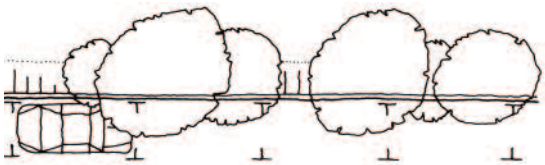
Central

Urban

Suburban

11. On street: in line with pavement

Kerbside parking parallel to the axis of the pavement, bays may be either marked or unmarked. Landscaping a benefit.



Aptness

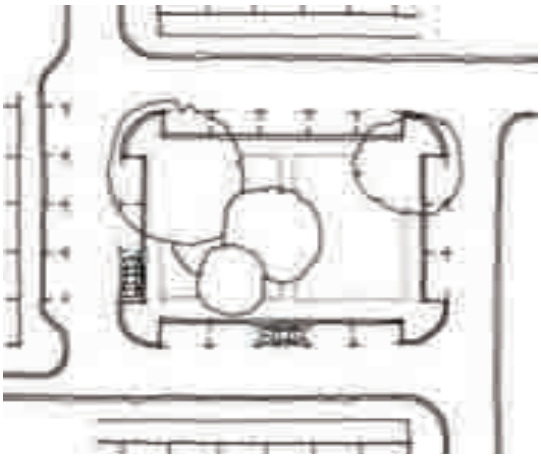
Central

Urban

Suburban

12. On street: housing square

In line kerbside parking arranged around sides of landscaped central space, further parallel parking to other side of surrounding streets.



Aptness

Central

Urban

Suburban

Open here to fold out **What works where**

13. On plot: mews court

Terraced or grouped on plot garages in yard serving homes above. Found within perimeter blocks. Differs from the off plot flats-over-garages of a mews street (page 9) where frontages usually face each across a lane equal in width to building height.

Aptness
Central
Urban
Suburban

14. On plot: chauffeur unit

House with detached garage with accommodation above to encourage flexible living, such as workshops. Urban design use is as a gateway or focal point, or as sentry to a rear court.

Aptness
Central
Urban
Suburban

15. On plot: integral garage

Garage within footprint of house gives direct access to home, accommodation continues above or around. Risk of inactive street so best used with double-fronted bay windows for surveillance. Garage doors best placed close up to highway.

Aptness
Central
Urban
Suburban

16. On plot: attached garage

Garage is located to side of house giving direct access to home, often with “bonus” rooms over. May be paired with neighbour. Garage best placed close up to highway

Aptness
Central
Urban
Suburban

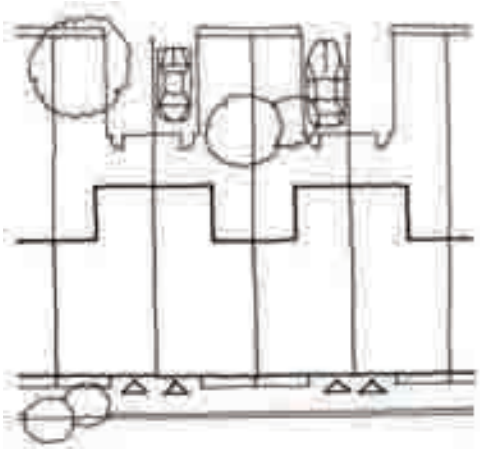
17. On plot: cut out or drive through

Arch formed at street level allowing driveable access under first floor accommodation to hardstanding or garage at rear of plot. Cut out may be shared with neighbour if hardstandings or garages paired.

Aptness
Central
Urban
Suburban

18. On plot: rear court

Single or larger area of hardstanding accessed from and located at rear of property. Differs from 7 in having direct access to home.

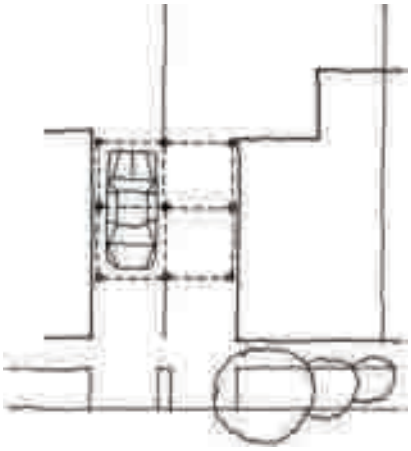


Aptness
Central
Urban
Suburban

Open here to fold out **What works where**

19. On plot: car port

Open sided frame structure, generally located to side of house, may be paired with neighbour. Ports sometimes incorporate outdoor private amenity above, such as a sun terrace.



Aptness

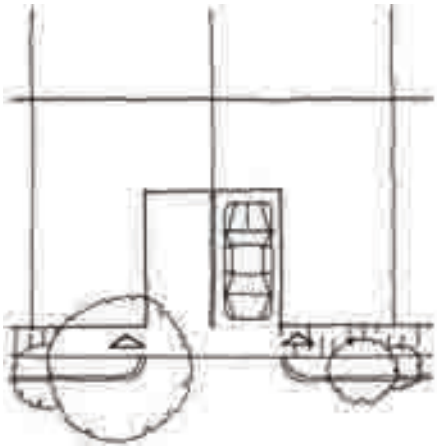
Central

Urban

Suburban

20. On plot: hardstanding

Uncovered parking area adjacent to side or front of house, may be paved or finished in material allowing grass to penetrate.



Aptness

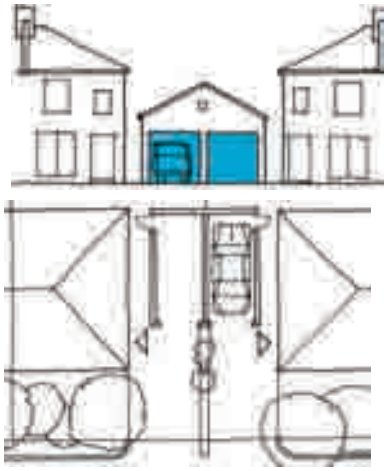
Central

Urban

Suburban

21. On plot: detached garage

Garage is located to side of house giving indirect access to home. May be paired with neighbour.



Aptness

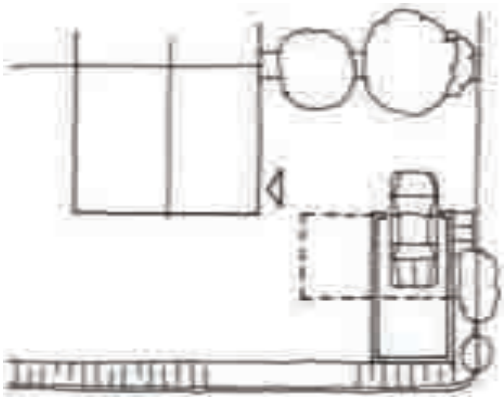
Central

Urban

Suburban

22. On plot: detached garage to front

Separate garage or pair of garages at front of plot, may be parallel or at right angles to house.



Aptness

Central

Urban

Suburban

What works where

	Central Mostly flats	Urban Terraced houses & flats	Suburban Detached & linked houses
OFF PLOT			
Multi-storey			
Underground			
Undercroft			
Podium			
Mechanical			
Front court			
Rear court			
Mews street			
ON STREET			
Central reservation			
Right angled			
Angled to pavement			
In line with pavement			
Housing square			
ON PLOT			
Mews court			
Chauffeur unit			
Integral garage			
Attached garage			
Cut out or drive through			
Rear court			
Car port			
Hardstanding			
Detached garage			
Detached garage to front			

How to pick a case study

The guide illustrates parking treatments for 24 housing schemes in England and Scotland. To find a scheme relevant to your criteria, look at the horizontal axis to choose a location and a parking treatment, then follow down the vertical column to find page numbers for examples. Scheme names can also be found in the far left and far right vertical columns. Case studies have between one and four treatments and so some are referenced more than once.

Case study analysis

The purpose of this guide is not to promote any single parking treatment, but to highlight reasons why some succeed where they are an appropriate balance between the needs of consumer, developer and urban designer.

Each scheme is illustrated with a location map, a site layout and a photograph to introduce its feel and look. The parking ratio includes visitor parking, so 1.5 spaces per home plus 0.2 spaces for visitors would be expressed as 170%. The case study then looks at the parking, highlighting only those treatments that the guide's authors believe have something of interest. In a few cases this is wholly positive but in most examples the guide attempts to define the best of what is shown with notes on how it could be improved.

Analysis comments appear in the same red, amber and green colours familiar to traffic lights. So comments in red or amber signal the guide is highlighting where designers need to proceed with most caution.

What you will find in each example

1. Scheme title and highlights
2. Location map / site layout
3. Scheme information
4. Descriptive text
5. Scheme photo
6. Parking images
7. Parking plan
8. Analysis comments

Case studies identified by type and scheme name

	OFF PLOT	Multi-storey	Underground	Undercroft	Podium	Mechanical	Front court	Rear court	Mews street*	ON STREET	Central reservation	Right angled	Angled to pavement	In line with pavement	Housing square
CENTRAL															
Brewery Square			p27												
Chapel			p31											p31	
GMV		p35			p35										
Iroko Housing Co-op												p39			
Merchant's House			p43			p43									
Queen Elizabeth Sq											p47	p47			
Sutherland Avenue											p51			p51	
URBAN															
Bennet's Courtyard					p57										
Dockwray Square															
Elmington Village							p65								
The Fox													p69		
Ingress Park				p75				p73						p73	
The Staiths					p79							p79			
Tarporley								p83 p85							
Waterside							p89								
SUBURBAN															
Allcourt Meadow								p95							
Bryanston Hills															
Butts Green								p105					p103		
Cala Domus															
The Dairy															p113
Little Shilling												p117			
Micklethewaite							p121								
Poundbury														p125	p125
The Village								p131					p131		p131

Open here to fold out **Case study matrix**

* The example listed is illustrated in the introduction as part of the analysis of the housing square's efficiency on pages 9-10.

ON PLOT	Chauffeur unit	Integral garage	Attached garage	Cut out or drive through	Rear court	Car port	Hardstanding	Detached garage	Detached garage to front	Mews court	
											CENTRAL
											Brewery Square
											Chapel
											GMV
											Iroko Housing Co-op
											Merchant's House
											Queen Elizabeth Sq
											Sutherland Avenue
											URBAN
											Bennet's Courtyard
			p61							p61	Dockwray Square
						p65					Elmington Village
											The Fox
	p75									p73	Ingress Park
											The Staiths
	p85	p83			p83		p83				Tarporley
											Waterside
											SUBURBAN
											Allcourt Meadow
		p99				p99		p99			Bryanston Hills
	p105									p103	Butts Green
	p109	p109									Cala Domus
				p113							The Dairy
								p117			Little Shilling
		p121									Micklethewaite
					p127						Poundbury
											The Village