Responsive environments

A manual for designers
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He is currently a design tutor in the Department of Architecture at Oxford Polytechnic, with a particular concern for the relationship between architecture and urban design. He has a specialist knowledge of two and three-dimensional geometries; whilst his interest in the architecture of the 1920s and 30s has been expressed through writing, photography and exhibition work.
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Introduction

This is a practical book about architecture and urban design. It is meant to be useful on the drawing board, so it does not tell you how to do things most designers know already: how to plan buildings efficiently for a given set of activities, how to keep the weather out, how to lay out services and so forth. Designers sometimes do these things rather badly, but at least ways of doing them well are known, and information about them is readily available elsewhere.

We are concerned with those areas of design which most frequently seem to go wrong. As a starting point, we are interested in why modern architecture and urban design are so often criticised as inhuman and repressive, despite the high social and political ideals shared by so many influential designers over the last hundred years.

The tragedy of modern design, it seems to us, is that designers never made a concerted effort to work out the form implications of their social and political ideals. Indeed, the very strength of their commitment to these ideals seems to have led designers to feel that a concentration on form itself was somehow superficial. Form, they felt, ought to be the by-product of progressive social and political attitudes. But in adopting this stance, paradoxically enough, designers failed to realise that the manmade environment is a political system in its own right: try walking through a wall, and you'll notice that it is the physical fabric, as well as the way it is managed, that sets constraints on what you can and can't do. Multiplied to the scale of a building or - crucially - a city, this is indeed a political matter.

How does design affect choice?
The design of a place affects the choices people can make, at many levels:
- it affects where people can go, and where they cannot: the quality we shall call permeability.
- it affects the range of uses available to people: the quality we shall call variety.
- it affects how easily people can understand what opportunities it offers: the quality we shall call legibility.
- it affects the degree to which people can use a given place for different purposes: the quality we shall call robustness.
- it affects whether the detailed appearance of the place makes people aware of the choices available: the quality we shall call visual appropriateness.
- it affects people's choice of sensory experiences: the quality we shall call richness.
- it affects the extent to which people can put their own stamp on a place: we shall call this personalisation.

This list is not exhaustive, but it covers the key issues in making places responsive. Our purpose is to show how these qualities can be achieved in the design of buildings and outdoor places.
Permeability

Only places which are accessible to people can offer them choice. The quality of permeability - the number of alternative ways through an environment - is therefore central to making responsive places. Permeability has fundamental layout implications. In the diagram below, the upper layout offers a greater choice of routes than the lower one: it is therefore more permeable.

Variety

Permeability is of little use by itself. Easily accessible places are irrelevant unless they offer a choice of experiences. Variety - particularly variety of uses - is therefore a second key quality. The object of this second stage in design, which is covered in Chapter 2, is to maximise the variety of uses in the project. First we assess the levels of demand for different types of uses on the site, and establish how wide a mix of uses it is economically and functionally feasible to have. Then the tentative building volumes already established as spatially desirable are tested to see whether they can feasibly house the desired mix of uses, and the design is further developed as necessary.

Robustness

Places which can be used for many different purposes offer their users more choice than places whose design limits them to a single fixed use. Environments which offer this choice have a quality we call robustness. This is the subject of Chapter 4.

By this fourth stage in design, we have begun to focus on individual buildings and outdoor places. Our objective is to make their spatial and constructional organisation suitable for the widest possible range of likely activities and future uses, both in the short and the long term.

Legibility

In practice, the degree of choice offered by a place depends partly on how legible it is: how easily people can understand its layout. This is considered in the third stage of design. The tentative network of links and uses already established now takes on three-dimensional form, as the elements which give perceptual structure to the place are brought into the process of design. As part of this process, routes and their junctions are differentiated from one another by designing them with differing qualities of spatial enclosure. By this stage, therefore, the designer is involved in making tentative decisions about the volumes of the buildings which enclose the public spaces. This process is discussed in Chapter 3.

Visual appropriateness

The decisions we have already made determine the general appearance of the scheme. Next we must focus on what it should look like in more detail. This is important because it strongly affects the interpretations people put on places: whether designers want them to or not, people do interpret places as having meanings. A place has visual appropriateness when these meanings help to make people aware of the choices offered by the qualities we have already discussed. Designing for visual appropriateness forms the subject of Chapter 5. First a vocabulary of visual cues must be found, to communicate the levels of choice already designed into the place. The appearance of the project is then developed in detail, using these cues as the basis for design.
Richness
The decisions about appearance already discussed still leave room for manoeuvre at the most detailed level of design. We must make the remaining decisions in ways which increase the choice of sense-experiences which users can enjoy. This further level of choice is called richness: it is the concern of Chapter 6.

By this stage, we are dealing with the smallest details of the project. We must decide whereabouts in the scheme to provide richness, both visual and non-visual, and select appropriate materials and constructional techniques for achieving it.

Personalisation
The stages of design already covered have been directed at achieving the qualities which support the responsiveness of the environment itself, as distinct from the political and economic processes by which it is produced. This is not because we do not value the ‘public participation’ approach: it is highly desirable. But even with the highest level of public participation, most people will still have to live and work in places designed by others. It is therefore especially important that we make it possible for users to personalise places: this is the only way most people can put their own stamp on their environment.

Putting it all together
Taken together, Chapters 1 - 7 outline a step-by-step approach to achieving the qualities we have described:
1. Permeability: designing the overall layout of routes and development blocks.
2. Variety: locating uses on the site.
3. Legibility: designing the massing of the buildings, and the enclosure of public space.
4. Robustness: designing the spatial and constructional arrangement of individual buildings and outdoor places.
5. Visual appropriateness: designing the external image.
6. Richness: developing the design for sensory choice.
7. Personalisation: making the design encourage people to put their own mark on the places where they live and work.

In practice, things are more complex than this simple step-by-step structure implies: it is constantly necessary to modify the emerging design as you think through the implications of each new step. This process is explored, by means of a case-study, in Chapter 8: Putting it all together. Here we show the implications of designing to support all the qualities together, in the context of a large inner-city redevelopment.

How to use the book
Each chapter has three parts:
- an introductory section
- a set of design sheets
- a series of footnotes

Each part contains a different level of information.

The introductory sections
Each introduction discusses how to design for the particular quality concerned. Together, these sections give a comprehensive coverage of responsiveness as a whole. If you are not already familiar with the subject, the best way to start using the book is by reading through all the introductions in sequence.

In our experience, it is necessary to consider all the qualities, even when designing quite small schemes. But the proportion of design effort expended on each quality tends to vary; depending on the particular site, and on the scale of project concerned. Large, complex schemes demand a greater proportion of time on the qualities covered in the earlier chapters, whilst smaller projects are usually more concerned with the later ones.

The design sheets
Once designing begins, we need the second level of information: a series of design sheets, covering the practical implications of achieving the qualities concerned. The sheets are arranged in the order we have found most useful in our own projects.

The notes
It is impossible for a book like this to cover all the eventualities which might arise when designing. So footnotes and suggestions for further reading open up a wider information network, for investigating particular topics in greater depth.

And finally.....
The book as a whole explores an approach to designing responsive places. It does not dictate a recipe. So it should be used creatively. All its ideas are intended as springboards for design, not as straight-jackets on the designer’s imagination.
Chapter 1: Permeability

Introduction
Only places which are accessible to people can offer them choice. The extent to which an environment allows people a choice of access through it, from place to place, is therefore a key measure of its responsiveness. We have called this quality permeability.

Permeability: public and private
If everywhere were accessible to everybody, physically or visually, there would be no privacy. But one of our basic sources of choice stems from our ability to live both public and private roles. For this capacity to flourish, both public places and private ones are necessary.

Permeability and public space.
The permeability of any system of public space depends on the number of alternative routes it offers from one point to another. But these alternatives must be visible, otherwise only people who already know the area can take advantage of them. So visual permeability is also important.

The advantages of small blocks
A place with small blocks gives more choice of routes than one with large blocks. In the example below, the large-block layout offers only three alternative routes, without backtracking, between A and B. The version with small blocks has nine alternatives, with a slightly shorter length of public route.

Smaller blocks, therefore, give more physical permeability for a given investment in public space. They also increase visual permeability, improving people's awareness of the choice available: the smaller the block, the easier it is to see from one junction to the next in all directions.

The decline of public permeability
Three current design trends work against permeable public space:
- increasing scale of development.
- use of hierarchical layouts.
- pedestrian/vehicle segregation.

Scale of development
Unnecessarily monolithic developments, which could function equally well if divided into smaller elements, produce excessively large blocks.

Oxford’s Westgate Shopping Centre

As it is...
- 6 blocks
- 3 entrances
- 3 internal changes

As it could be...
- 8 blocks
- 9 entrances
- 5 internal changes
Hierarchical layouts
Hierarchical layouts reduce permeability: in the example below there is only one way from A to D, and you have to go along B and C: never A-D directly, or ADCABCD, but always ABCD. Hierarchical layouts generate a world of culs-de-sac, dead ends and little choice of routes.

This is not to say that culs-de-sac are always negative: they support responsiveness if they offer a choice which would otherwise be missing. But they must be added to a permeable layout, not substituted for it.

Segregation
Permeability is effectively reduced by segregating the users of public space into different categories, such as vehicle users and pedestrians, and confining each to a separate system of routes. When this happens, the only way to give both categories a level of permeability equivalent to a de-segregated system is through an expensive duplication of routes.

Avoid built-in segregation.
Chapter 4 will show other ways of helping motorists and pedestrians to live together. And in any case, it is never necessary to build segregation irrevocably into a layout early in design. If we initially make a high level of permeability for everyone, then segregation can be achieved later, if necessary, by detailed design or management. This gives future users control over how they want to use the place, because they can de-segregate if circumstances change.

Permeability and the public/private interface
Since physical access to private space is necessarily limited, permeability across the public/private interface is largely a visual concern. This has different implications for public and private space.

The interface: visual permeability
Visual permeability between public and private space can also enrich the public domain. If wrongly used, however, it can confuse the vital distinction between public and private altogether.

This is because not all the activities in private space are equally private: there is a gradation, for example, from entrance hall to lavatory. To maintain the public/private distinction, the most private activities must be kept from visual contact with public space.

The interface: physical permeability
Physical permeability between public and private space occurs at entrances to buildings or gardens. This enriches public space by increasing the level of activity around its edges. We shall show how important this is in Chapter 4: for now, it implies that as many entrances as possible should be located round the edges of public spaces, as opposed to what often happens nowadays.
The need for fronts and backs
This means that all buildings need two faces: a front onto public space, for entrances and the most public activities, and a back where the most private activities can go. This gives users the chance to do whatever they like in their private space, including the right to make rubbish and clutter, without compromising the publicness of public space.

The interface: effects on private spaces
For the public/private interface to make private life richer, instead of destroying privacy altogether, it is vital that its degree of permeability is under the control of the private users. Do not worry about this: it is not difficult to achieve at a later stage of design, by using normal building elements like level changes, windows, porches, curtains, sound-reducing glazing and venetian blinds. This will be covered in Chapter 4.

Summary: physical form and permeability
The implications of visual and physical permeability make powerful demands on design. The easiest way of meeting these demands is by designing perimeter blocks:
- fronts facing outwards onto public space - street, square or park - close enough to enjoy its liveliness.
- backs facing inwards to the centre of the block.
- private outdoor space at the back.

Starting the design
We have explained the key factors governing permeability, and the reasons why it is a problem nowadays. The next step is to use these ideas in design.

Links to surrounding areas.
In any project large enough to have more than one block, people can potentially move through the site from its surroundings, from one side to another. This choice will only be useful if people are aware of it, so it is important to locate new routes as continuations from as many access points as possible outside the site itself, and make sure they can be seen to lead somewhere.

The first step in design, therefore, is to analyse the layout of routes in the surrounding area; defining the access points onto the site, and noting their relative importance in terms of where they lead to. This is covered in Design Sheet 1.1.
Locating new routes.
This analysis can now be used to position the most important new routes through the site, as discussed in Design Sheet 1.2.

Intensity of use
Now we have located all the routes through the site, it is useful to estimate how intensely each is likely to be used by people from outside the site. We shall need this information when we come to consider the uses in the various blocks, in Chapter 2. For example, high levels of traffic flow might inhibit housing unless handled carefully in detail.

It is easiest to make these estimates while we still have the question of routes in the forefront of our minds: ways of doing so are covered in Design Sheet 1.3.

Junction design
Next check that the junctions between the proposed streets are acceptable to the traffic engineers. This will depend on the traffic roles of the streets themselves, as discussed in Design Sheet 1.3.

The block structure
The tentative street positions now decided will start to define blocks. These must now be checked for size: make them as small as possible. The minimum practicable size depends on the forms of their perimeter buildings, and on the usage of the private outdoor spaces within the blocks themselves. Both factors are discussed in Design Sheet 1.4.

Intensity of use
Now we have located all the routes through the site, it is useful to estimate how intensely each is likely to be used by people from outside the site. We shall need this information when we come to consider the uses in the various blocks, in Chapter 2. For example, high levels of traffic flow might inhibit housing unless handled carefully in detail.

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Junction design
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Block shape
Overlooking at the corners can also be a crucial problem, if the blocks are densely built up. This has implications for both planning and massing which can be left till a little later. They are covered in Chapter 3.

Design implications
How to achieve permeability
1. Analyse the streets and blocks of the surrounding area, to establish the relative importance of all access points to the site (Design Sheet 1.1).
2. Locate new routes through the site (Design Sheet 1.2).
3. Analyse traffic roles of all the proposed new streets, and check that street widths and junction designs are acceptable to the traffic engineers (Design Sheet 1.3).
4. Check that the blocks defined by the new streets are of practicable sizes (Design Sheet 1.4).
1.1: Using existing links

The starting point for a permeable scheme is the existing system of links into and through the site from the surrounding area. Begin by analysing these links, and deciding how best to use them.

Permeability is important at two scales:
- links which connect the site to the city as a whole
- links which connect the site to its immediate local surroundings

Connections to the city as a whole
To achieve high permeability to and through the site from the city as a whole, we must connect it via the largest possible number of direct links to the system of main streets: those carrying through traffic linking the various parts of the city. So begin by finding the nearest main streets beyond the boundaries of your site, marking them on a detailed plan to a scale of not less than 1:10,000.

Connections to the main street system
Next, find all the links within this area which connect the site to the system of main streets. Compare them, to see which connect the site most directly to the main streets. This can be assessed by comparing the number of changes of viewing point necessary on journeys along each link from the main street system to the site. In the sketch below, link A requires only one change of viewing point and is therefore more direct than link B, which requires three.

Connections to immediate local surroundings
Next, within the same area defined by the main streets, consider all the links to the site; including those which do not reach as far as the main streets themselves. Count the number of connections along each one in turn, as shown below. The highest numbers will show which streets link the site most strongly to its immediate surroundings.

We now know the relative ability of all the existing links to connect the site both to the city as a whole and to the immediate local surroundings. This information can now be used to decide the relative importance of extending each link into and through the site, to achieve an appropriate balance between permeability at the city-wide and local scales. For instance, in Diagram 2, an east-west route would increase city-wide permeability, whilst in Diagram 3 a north-south street would have more effect on permeability at the local scale.

Once you have decided which links it is most important to extend into and through the scheme, you can begin to align the system of streets and blocks within the site itself, as discussed in Design Sheet 1.2.
1.2: Designing the street/block system

Give users a choice of routes through the site, by keeping perimeter blocks as small as possible.

Design sheet 1.1 revealed the most important links to the site. Starting with these, join the access points across the site, taking account of any existing routes through it.

If there are any existing buildings to be kept, note the positions of their fronts and backs. Make sure that public routes run at their fronts.

Check the block sizes you have created. Make them as small as practicable, depending on the uses they will house. If you already know these uses, check block sizes with Design Sheet 1.4. If you don't, 80-90 metre blocks will do for most purposes. They should only need minor adjustment later, when uses are finally decided.

Next, increase the sizes of any blocks which are too small, and subdivide any which are larger than they need to make the final layout as permeable as possible. Check with Design Sheet 1.3 to see that all the junction designs are feasible.
1.3: Street types and junction design

This Design Sheet shows how to estimate the approximate traffic capacities and carriageway widths of the roads in the scheme, together with their junction designs, prior to detailed consultation with traffic engineers and highway authorities.

Street classification

Both the spacing and the detailed design of junctions depends on the street types they connect. Urban streets are classified by traffic engineers according to their traffic role: the amount and type of vehicular traffic they carry (1). To classify the streets in your scheme, therefore, it is necessary to assess the vehicle flows which each will carry.

1 Urban street types

- Design for free-flowing traffic is dominant concern.

<table>
<thead>
<tr>
<th>All-purpose roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary distributor</td>
</tr>
<tr>
<td>Long distance through traffic, serves town as a whole.</td>
</tr>
<tr>
<td>District distributor</td>
</tr>
<tr>
<td>Through traffic linking main districts within town.</td>
</tr>
<tr>
<td>Local distributor</td>
</tr>
<tr>
<td>Links traffic within local 'environmental areas'.</td>
</tr>
<tr>
<td>Access road</td>
</tr>
<tr>
<td>Provides direct access to buildings and land within 'environmental areas'.</td>
</tr>
<tr>
<td>Local distributor</td>
</tr>
<tr>
<td>Access roads</td>
</tr>
<tr>
<td>- Major access</td>
</tr>
<tr>
<td>- Collector</td>
</tr>
<tr>
<td>- Minor access</td>
</tr>
<tr>
<td>Shared surfaces</td>
</tr>
<tr>
<td>- Access ways</td>
</tr>
<tr>
<td>- Mews courts</td>
</tr>
<tr>
<td>- Housing squares</td>
</tr>
<tr>
<td>Residential roads</td>
</tr>
</tbody>
</table>

 estimation of vehicle flows

In the case of major roads linking into the main city network, it is necessary either to carry out a traffic survey, or to obtain the relevant flow data from the local highway authority. On streets which carry only local traffic, approximate figures can be calculated from a knowledge of the uses in the buildings and land to which the streets give access.

<table>
<thead>
<tr>
<th>Building use</th>
<th>Vehicles (vph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwellings with 2 or more bedrooms</td>
<td>1 per dwelling</td>
</tr>
<tr>
<td>Dwellings with one bedroom</td>
<td>0.75 per dwelling</td>
</tr>
<tr>
<td>Elderly persons' dwellings</td>
<td>0.25 per dwelling</td>
</tr>
<tr>
<td>Schools:</td>
<td></td>
</tr>
<tr>
<td>pupils up to 12 years</td>
<td>1 per 4 pupils</td>
</tr>
<tr>
<td>pupils aged 12 or more</td>
<td>1 per 6 pupils</td>
</tr>
<tr>
<td>Places for further education</td>
<td>1 per 2 pupil spaces</td>
</tr>
<tr>
<td>Offices</td>
<td>1 per 10 sq.m. (gross) or part</td>
</tr>
<tr>
<td>Minor or existing warehouse or industrial unit</td>
<td>1 per 5 sq.m. (gross) or part</td>
</tr>
<tr>
<td>Shopping</td>
<td>1 per 10 sq.m. (gross) or part</td>
</tr>
<tr>
<td>Commuter car parks</td>
<td>1 per space</td>
</tr>
<tr>
<td>Short-stay car parks</td>
<td>2 per space</td>
</tr>
<tr>
<td>Churches</td>
<td>1 per 5 seats</td>
</tr>
<tr>
<td>Public houses</td>
<td>1 per 2.5 sq.m. public area</td>
</tr>
<tr>
<td>Clubs, halls and community centres</td>
<td>1 per 5 sq.m. (gross)</td>
</tr>
</tbody>
</table>

(Source: Surrey C.C.)

To calculate the approximate flow from table 2, add together the figures for vehicles per hour for all the uses concerned (the exact figures used may vary slightly from one highway authority to another). Figure 3 illustrates a practical application of this technique.

<table>
<thead>
<tr>
<th>Office block</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980 sq.m. (gross)</td>
</tr>
<tr>
<td>Public house</td>
</tr>
<tr>
<td>15 No. shops</td>
</tr>
<tr>
<td>23 No. 3-bedroom houses</td>
</tr>
<tr>
<td>32 No. 1-bedroom flats</td>
</tr>
<tr>
<td>Total vph</td>
</tr>
</tbody>
</table>

A maximum traffic flow of 467 vph allows a 6.7m road width, with waiting permitted, and direct access allowed. (See table 4)
Carriageway widths
Once the streets have been classified, estimate the carriageway widths required; as shown in table 4.

<table>
<thead>
<tr>
<th>Road type</th>
<th>Road width (2 lane, 2 way)</th>
<th>Maximum traffic flow vehicles per hour (vph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6m</td>
<td>6.7m</td>
</tr>
<tr>
<td>Primary, District and Local distributors, with no frontage access, no waiting, and negligible cross traffic.</td>
<td>1200</td>
<td>1350</td>
</tr>
<tr>
<td>District and Local Distributors and Access Roads with high capacity junctions, but restricted waiting and access</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>Local Distributors and Access Roads with waiting and direct access allowed.</td>
<td>300-500</td>
<td>450-600</td>
</tr>
</tbody>
</table>

Note that you can only have blocks below 90 metres in streets which only give access to housing; if you have not decided the scheme's uses yet, you will have to re-check the junction spacings after working through Design Sheet 2.1. The classification of street types also affects the detailed design of junctions, as shown in figure 6. Use this information to sketch in maximum building lines at the corners of the blocks.

Junctions
Next check the spacings between junctions from figure 5. This shows that 90 metre blocks between junctions will be large enough for most situations: we suggest you use this dimension for the block layout even for primary and district distributors. In these cases, traffic will not be permitted to use the intermediate intersections. But the layout will still be permeable for pedestrians; and may eventually be opened up into a more permeable vehicle system, should traffic engineering rules or street roles change in the future.

In practice, in consultation with traffic engineers, it may be possible to reduce dimension S to zero, at junctions between minor residential roads.
1.4: Checking block sizes

The purpose of this Design Sheet is to provide a quick way of checking which uses could be accommodated within the tentative street/block structure already developed. This is an essential preliminary to investigating the demand for different uses, to be covered in Chapter 2.

The minimum size of a perimeter block depends on two main factors:

- the private activities to be housed in the outdoor space within the block: usually private gardens, service access and parking or garaging.
- the form of the buildings around the block perimeter.

Because these factors vary with different building uses, this Design Sheet is divided into three sections, covering the following uses:

- non-residential uses
- flats
- houses with gardens

Each section contains a series of handy reference graphs displaying the relationship between three factors:

- the overall size of the block
- private outdoor space and parking or garaging provision within the block
- characteristics of the buildings around it

The graphs are based on rectangular blocks of the form sketched below. The ‘average block dimension’ referred to is the mean of two adjacent sides: \((A + B) / 2\) in the sketch.

Perimeter blocks with non-residential buildings

Worked examples

The graphs are based on continuous perimeter buildings. No allowance is made for space between fronts of buildings and backs of pavements, nor between backs of buildings and parking areas. If you want to include either of these, the average block dimension must be increased as shown below.

Example 1 (see pp. 21-23)

Given block size and required parking standard, which building height will enable the maximum area of building to be accommodated in the block?

- Start by locating the relevant block size (1)
- draw a line from it across the graph (2)
- locate the relevant parking standard (3)
- draw a line upwards from it (4)
- the nearest graph line below the intersection of (2) and (4) indicates which building height will achieve the maximum floorspace.

Example 2 (see pp. 21-23)

At a given building height, what is the minimum block size to achieve a given parking standard?

- Start by locating the desired parking standard (1)
- draw a line upwards from it to intersect the relevant building height line at (2)
- draw a line across from (2) to read off the minimum practicable block dimension (3).

Example 3 (see pp. 21-23)

Given block size and building height, what parking standard can be achieved?

- Start by locating the relevant block size (1)
- draw a line across to intersect the relevant building height line at (2)
- draw a line down from (2) to find the parking standard which can be achieved (3)
Parking standard: cars per gross square metre built space

Block sizes: non-residential buildings
Perimeter blocks with flats

Worked examples
The graphs make no allowance for gardens or parking spaces at the front, or for private outdoor spaces within the block. If you want to include these, the average block dimension must be increased as shown below:

Example 4 (See p23)
Given block size, garden area and required parking standard, which flat size will enable the maximum number of dwellings to be accommodated in the block?
- Start by locating the relevant block size (1)
- draw a line from it across the graph (2)
- locate the relevant parking standard (3)
- draw a line upwards from it (4)
- the nearest graph line below the intersection of (2) and (4) indicates which flat size to use to achieve the maximum number of dwellings.

Example 5 (See p23)
Given the area of the desired flat type, what is the minimum block size to achieve a given parking standard?
- Start by locating the desired parking standard (1)
- draw a line upwards from it to intersect the relevant flat area line at (2)
- draw a line across from (2) to read off the minimum practicable block dimension (3)

Example 6 (See p23)
Given block size and desired average flat area, what parking standard can be achieved?
- Start by locating the relevant block size (1)
- draw a line across to intersect the relevant flat area line at (2)
- draw a line down from (2) to find the parking standard which can be achieved (3).
Block sizes: flats

Parking standard: % dwellings

Average block dimension: metres

Block sizes: 2 storey flats

Parking standard: % dwellings

Average block dimension: metres

Block sizes: 3 storey flats

Parking standard: % dwellings

Average block dimension: metres

Block sizes: 4 storey flats

Parking standard: % dwellings

Average block dimension: metres

Block size: flats
Perimeter blocks with family houses

Worked examples

The graphs are based on terraces of 2-storey houses, and make no allowance for front gardens or front parking spaces. If you want to include these, the average block dimension must be increased as shown below.

Example 7 (See pp. 25-26)

Given block size, garden area and required parking standard, which house type will enable the maximum number of houses to be accommodated in the block?
- Start by locating the relevant block size (1)
- Draw a line from it across the graph (2)
- Locate the relevant parking standard (3)
- Draw a line upwards from it (4)
- The nearest graph line below the intersection of (2) and (4) indicates which house type to use to achieve the maximum number of dwellings.

Example 8 (See pp. 25-26)

Given house type and garden size, what is the minimum block size to achieve a given parking standard?
- Start by locating the desired parking standard (1)
- Draw a line upwards from it to intersect the relevant house type / garden size line at (2)
- Draw a line across from (2) to read off the minimum practicable block dimension (3).

Example 9 (See pp. 25-26)

Given block size, house type and garden area, what parking standard can be achieved?
- Start by locating the relevant block size (1)
- Draw a line across to intersect the relevant house type / garden size line at (2)
- Draw a line down from (2) to find the parking standard which can be achieved (3).
Block sizes: family houses with 50 sq.m. gardens.
Block sizes: family houses with 100 sq.m. gardens.
Chapter 2: Variety

Purpose
The last chapter discussed how to achieve greater permeability. But accessible places are only valuable if they offer experiential choice: *variety* is therefore the second key quality to be considered.

Different levels of variety
Variety of experience implies places with varied forms, uses and meanings. Variety of *use* unlocks the other levels of variety:
- a place with varied uses has varied building types, of varied forms.
- it attracts varied people, at varied times, for varied reasons.
- because the different activities, forms and people provide a rich perceptual mix, different users interpret the place in different ways: it takes on varied meanings.
Variety of use is therefore the key to variety as a whole. It must be considered early in design.

Variety and choice
The purpose of promoting variety is to increase *choice*. But choice also depends on *mobility*: people who are highly mobile can take advantage of a variety of activities even if these are spread over a wide area.

But in practice, who can afford high mobility?¹
- can children or poor people?
- or disabled or sick people?
- or parents with young children?
- or even women generally?
For people like these - probably the majority, taken together - real choice depends on a close *grain* of variety.

Why is this a problem?
Though their attitudes differ, both developers and planners want efficient environments. Developers are interested in economic performance, whilst planners want places which, amongst other things, are easy to manage. Both see their interests as served by two key concepts: *specialisation* and *economies of scale*. Together, these seriously coarsen the grain of variety².

Variety within *districts* is reduced, as they become specialised zones of single use.
How much variety?
With all these pressures against variety, it is pointless to agonise over exactly how much is needed: designers should simply get the most they can. Because of all the constraints, there is no danger of ending up with too much.

How to maximise it
The variety of uses a project can support depends on three main factors:
- the range of activities which want to locate there, which we shall call demand.
- the possibility of supplying affordable space in the scheme to house these activities.
- the extent to which the design encourages positive interactions between them.

Variety within blocks is reduced, as sites are amalgamated into larger units.

Variety within buildings is reduced, in the interests of easy management and corporate image.

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Variety within buildings is reduced, in the interests of easy management and corporate image.

Affordable space
No matter how much an activity wants to locate in a project, it cannot do so unless space is available at a price it can afford.

It is vital to grasp the simple fact illustrated in the graph above: if space in a scheme is available cheaply, many types of users can afford to locate in the place. If space is expensive, only a few types will be found.

To balance the books, schemes which are costly to develop will have to charge relatively high rents or purchase prices. They will be too expensive for most users.

Conversely, to encourage variety we must keep rents and purchase prices low. One important way of doing this is by keeping down the costs of the scheme. A wealth of information on cost control exists elsewhere, so we shall not deal with it here.

A second way of providing cheap space is by finding a source of subsidy. To most designers, this is a less familiar topic.
Subsidies
Subsidies may come either from outside the scheme, or from using some profitable element within it to subsidise other uses which cannot afford an economic rent. This second approach - called internal cross subsidisation - is illustrated by design briefs for New York's theatre district. Here, developers are encouraged to build extra offices, provided that a proportion of the extra profits goes to build theatre space, as shown below.
External and internal subsidies are discussed in Design Sheets 2.1 and 2.6 respectively.

Design implications
Total redevelopment is bad for variety because all rents are pushed up. But total lack of development is also far from ideal, because it implies that the area will attract neither up-market uses, nor those which need the functional advantages of new buildings. If we want areas of real variety - greengrocers and jewellers, for example - then we need a broad spread of rents, as illustrated below.

The role of old buildings
A third way of getting cheap space is by keeping suitable old buildings. When these were built, costs were relatively low, and little money is now tied up in them. Also, there is often limited demand from prosperous tenants to rent old buildings, because these lack modern facilities and offer no boost to tenant prestige. All these factors keep rents low.
Because of current construction costs and interest rates, however, even modest new buildings have to charge relatively high rents to break even. Redevelopment therefore implies that rents will rise considerably.

Thus old buildings should not automatically be kept. They must be carefully selected, to increase variety by housing uses for which demand actually exists. This has two implications:
- their layout should be appropriate to the uses concerned;
- their condition should be suitable for upgrading to an appropriate standard for the uses concerned, at costs which they can afford.
A balance of building age and condition - hard to achieve in practice - will generate a variety of rents, supporting a variety of uses. This will be sustainable over time: as the worst buildings are gradually rebuilt, others age and decline in condition; but the presence of a good proportion of medium-to-high rent stock discourages total redevelopment.
Interaction between activities
Variety is not achieved merely by dumping a mixed bag of activities on a site. To work well, the uses should give each other mutual support.

Mutual support
Some activities - primary uses - act like magnets, attracting people to a site. Concentrations of dwellings or workplaces are primary uses: nearly everyone has to go home, and to work, at frequent intervals. Large stores or markets have a similar effect: many people go to them quite often. In contrast, secondary uses are enterprises which themselves lack the pulling-power to attract people, but which live off the people drawn to the place by its primary uses.

Primary uses therefore support secondary uses, irrigating them with the pedestrian flows they need for survival. A simple example is the way a shopping centre works. The primary stores attract large numbers of people to the complex, whilst the smaller secondary enterprises - necessary for variety - feed off the pedestrian flow between these main magnets.

The time element
The time element is also important to this system of mutual support. Some secondary uses - often the most convivial ones, such as pubs and restaurants - need long working hours, perhaps from mid-morning till late evening, to make a living. They are obviously helped if their associated primary uses also draw people into the area over a long period. This usually requires a mixture of primary uses. Because of the way in which most people’s time is split between work and home, a mix of work space and dwellings functions well in these terms. The modern zoned city fails dismally.

Feasibility
A project’s pattern of uses arouses particularly strong interest amongst those with power over the environment, because it is both the basis of economic performance, and a key concern of planning control. In proposing variety of use, we are encouraging those with power over the scheme - developers and local authorities - to depart from their usual norms. This will only happen if we can present a convincing demonstration of the project’s feasibility, at three main levels:
- functional feasibility
- political feasibility
- economic feasibility
Functional feasibility
Some uses are incompatible because of factors like noise or traffic generation. These cannot be located close together. Other uses, however, are incompatible only because people see them as different in status. This problem can often be overcome by careful detailed design.

The potential advantages of mixing uses together, when status conflicts can be overcome, are illustrated below: the blank wall on the right, typical of small studio workshops, ensures total privacy for this urban garden.

Economic feasibility
To be economically viable, a project must fulfil one basic condition: its economic value when completed must be greater than or equal to the cost of producing it, plus any profit required by the developers concerned.

It is important to pre-empt likely criticisms, from both planners and developers, before they have a chance to harden. This means that we need detailed design studies showing the successful location of any contentious uses proposed, as a key part of the earliest design discussions with either party; as discussed in Design Sheet 2.3.

Political feasibility
Whenever the pattern of uses proposed departs either from accepted norms or from local planning policy, agreement from the local authority will depend at least partly on evidence of public support for the uses put forward. If the initial demand survey (Design Sheet 2.1) has been properly done, the pattern of uses should - at least in part - reflect such local demand as may exist. It is important to demonstrate, as strongly as possible, the support of the local interests which make up this demand.

To stand any chance of breaking through the low-variety norms current in today’s projects, it is essential for designers to understand the calculations which are necessary for establishing financial viability. These involve working out costs and values, and amending the design if necessary to balance the one against the other. These topics are covered in Design Sheets 2.4, 2.5 and 2.6 respectively.

But establishing economic feasibility is not merely a matter of juggling figures until they balance on paper. It is crucially important to identify actual development agencies willing and able to implement the scheme. There is a limited range of development agencies in existence, each with its preferred types of project and methods of operation. These must be taken into account in the scheme, as discussed in Design Sheet 2.1: in the last analysis, a proposal must appeal to some actual development agency, as well as making economic sense.

Design implications:
How to encourage variety

1. Take the block structure from Chapter 1 as the starting point for developing variety.

2. Considering the widest appropriate range of uses, assess both demand and agencies which could provide accommodation to meet it (Design Sheet 2.1)

3. Locate magnets so that pedestrian flow will foster those uses which need it (Design Sheet 2.2)

4. Locate remaining uses to minimise negative interactions between them (Design Sheet 2.3) and check tentative block size decisions made in Chapter 1.

5. Calculate all costs of scheme (Design Sheet 2.4)

6. Calculate project value (Design Sheet 2.5)

7. Check economic feasibility, and commitment of development agencies involved. (Design Sheet 2.6)
2.1: Establishing uses for the site

The first step in designing for variety is to establish which uses exert a demand for space on the site: there is obviously no point in proposing uses for which no demand exists. The purpose of this Design Sheet, therefore, is to show how to find out about demand.

A new role for designers

Traditionally, decisions about uses to include in a project have been seen as part of the patron's role. But this situation is changing; partly because economic recession, on both sides of the Atlantic, is forcing designers to move increasingly into project promotion in order to maintain workloads. In addition, the lack of development pressure in many inner city areas often leads to a situation where the key design question is 'what uses can be found for this piece of land?'. Nowadays, designers of all kinds find themselves grappling with this sort of issue.

Types of demand

Demand can broadly be divided into two categories:
- Economic demand
- Social demand

Economic demand is exerted from a wide catchment area. It is met by enterprises concerned usually have little power, and can easily be left out of account altogether if they are not considered early in the design process. Local authorities are good first sources of information about social demand:
- They are patrons for a wide range of social projects themselves.
- Their estates departments often receive enquiries for space from local organisations of all kinds.

In addition, they can often put you in touch with local neighbourhood groups or organisation requires space for some specific and known purpose.

Start with social demand

In our experience, it is best to begin by considering social demand. The enterprises concerned usually have little power, and can easily be left out of account altogether if they are not considered early in the design process.

Local authorities are good first sources of information about social demand:
- They are patrons for a wide range of social projects themselves.
- Their estates departments often receive enquiries for space from local organisations of all kinds.

In addition, they can often put you in touch with local neighbourhood groups or organisations. These can also be contacted through other sources:
- Local libraries
- Local newspapers
- Community bookshops

Use this combination of sources to assemble a list of accommodation for which a social demand exists; and do not forget to look for demand for outdoor space as well as for buildings. Quantify amounts of space as far as this is possible, and find out the realistic rents or purchase prices which these bodies can afford. Almost certainly, these figures will be low.

Investigating economic demand

For information about economic demand, we must turn to local estate agents: if possible, talk to several and compare their reactions. But estate agents try to minimise the economic risks associated with development projects. They therefore like projects containing uses for which a large and widespread demand exists, appealing to the widest possible number of tenants. This is not a recipe for variety.

Because of this inherent conservatism, it is counter-productive for the designer to discuss the question of demand without some aids to extending the discussion:
- The tentative design proposals from Chapter 1 will help to provoke a more lateral discussion, more concretely related to the specific site.
- So will the ideas about social demand. But most estate agents will regard this whole approach as 'arty': to retain their respect, it is essential that the analysis of social demand has been done in a hard-nosed realistic way.

To broaden the discussion further, it is useful to produce a checklist of all the uses you think are conceivable for the site; again including those out of doors. This can be based on the CT-SFB list of use categories, with the obviously unlikely ones removed.

Using these discussion aids, the following questions must be answered:
- Which uses are likely to be attracted to the scheme?
- Which development agencies are likely to build space for each use?
- Could any of the uses be accommodated in existing buildings, if there are any on the site?
- What ancillary supports does each use require? (e.g. car parking)
- What are the maximum and minimum areas of space likely to be demanded for each use?
- How much money can the space for each use be sold or let for?

(Remember that British estate agents still nearly always use Imperial measurements; check the units you are using, to avoid huge mathematical errors.)

If the space is to be let, what yield will it realise in investment terms? (Yield is a measure of the annual return on money invested in the project. For example, a 10% yield implies that the project will annually return 10% of the capital invested in it. Yield is sometimes quoted instead of yield because it makes for easier calculations - is merely the inverse of yield:

\[ Y = \frac{1}{(\text{yield} \times 100)} \]

- Are any of the uses likely to be supported or inhibited by the presence of any of the other uses? (e.g. no agency is likely to be enthusiastic about developing family housing next to a scrap yard.)

While you are at it, ask the estate agent's opinion about how much money the site owners might expect to get for it. You will need this information when assessing the financial viability of your proposals.

Planning controls

Once you have established the range of uses for which a demand exists, you must investigate any planning controls on the supply of space for each use. Now is the time to discuss your proposals with the local planning authority.
2.2: Concentrating pedestrian flows

Some uses — notably shops — cannot survive without concentrated pedestrian flows. Our permeable street/block structure encourages easy pedestrian access, but to get *concentrated* pedestrian flows we need extra magnets: facilities like large stores, compact markets or large car parks, which attract large numbers of pedestrians. If you find a demand for such uses in Design Sheet 2.1, use them to concentrate pedestrian flows.

The magnets must be located at such a distance from each other, and from any existing pedestrian concentrations, to make the flow between them available to other uses which need it (1,2). Some idea of the maximum spacing can be gained from shopping centre design: the effective range of magnets is 90 - 120 metres.

The linking streets must be carefully designed to get the maximum benefit from the pedestrian flow. Make them as narrow as you can (see Design Sheet 1.3) and design them so users can see goods displayed on both sides (3); making sure vehicle traffic is light, so people can easily cross from one side to the other (4).

Uses needing pedestrian flow must be located on the main inter-magnet links (5). The side streets off these links also have above-average pedestrian flows, but not enough to keep shops alive in high-rent new buildings. But put robust buildings here: as buildings grow older, and rents fall, these will attract a wider range of pedestrian-orientated uses (6).

This plan illustrates the process of concentrating pedestrian flows:

1. Locate existing pedestrian concentrations (A)
2. Position the magnet as far from A as practicable (B)
3. Position the second magnet, if there is one, as far from A and B as practicable. (C)
4. Make narrow linking streets between A, B and C, avoiding stepped frontages. Make sure these streets are not likely to carry heavy traffic.
5. Position shops, and other uses needing heavy pedestrian flows, along these streets (D).
6. Make a note to pay special attention to robustness of buildings in streets which link into D. (E)
2.3: Relating incompatible uses

Some uses are incompatible because of functional factors like noise or traffic generation. These cannot be located close together. But other uses are incompatible only because people see them as different in status. This Design Sheet suggests how to relate uses of different status in a small area with the minimum of conflict.

To minimise status conflicts, we must make sure that where different uses directly adjoin one another, they are approximately equal in status. The first step, therefore, is to assess the relative status of the various elements in the scheme. In large projects, this is a complex matter: status obviously varies between uses (for example, offices usually have higher status, in the eyes of most people, than do workshops). But often it also varies from front to back of the same use (for example, fronts of houses have higher status than their backs).

The easiest way to think this through is by using a matrix like the one below. Remember to include all relevant existing uses, either on your own site, or round the edges of your scheme on adjoining sites.

Once you are clear about the compatibilities and incompatibilities between them, the various uses in the scheme can be located as follows:

1. Take a plan, showing the block structure already designed, and note on it the positions of all the existing uses on and adjoining the site.
2. Work round the site, noting in each block all the uses which are compatible with the existing uses adjoining it.
3. By inspection, identify the new use(s) which have least choice of location, and fix them in position.
4. Note the effects of this decision on possible uses for the adjoining blocks.
5. Repeat steps 3 and 4 above, until all the uses have been positioned.
6. Check that this layout enables each use to be reached via streets which themselves contain uses compatible with it, and amend the layout if necessary.
7. If at any stage in this process compatibility cannot be maintained, then the use causing the problem must either be omitted from the scheme, or screened from other uses around it. To avoid disrupting the public street front where this occurs, consider whether the use concerned could be screened by another single-aspect use, to continue the public front. (This topic is discussed in more detail in Design Sheet 4.3).
8. Any incompatibilities which may unavoidably remain can be tackled through the detailed design of the buildings concerned. Chapter 5 will cover this in detail.

By this stage, we have developed the design to the point where we are able to measure the proposed areas of each use. With this information, we can proceed to consider the project's financial implications, as discussed in Design Sheets 2.4, 2.5 and 2.6.
2.4: Calculating project values

The first step in assessing the economic feasibility of a project is to calculate its economic value. This Design Sheet is about ways of working this out; both for elements of the project which are to be sold, and for those which are to be let.

An example
The necessary calculations are best explained with the help of a worked example. The project we shall use to illustrate all the points made in this Design Sheet is sketched below. We shall continue to use the same example in Design Sheets 2.5 and 2.6.

Project elements to be sold
For project elements to be sold - in this case the flats - the value is equal to the expected sale price. This is easily estimated:

- Step 1: establish the numbers of each type of unit to be sold.
  (12 flats in our example)
- Step 2: refer to the estimated selling price for each type, from Design Sheet 2.1.
  (£28,000 for each flat in our example)
- Step 3: simple multiplication will indicate the value:

\[
\text{Value of flats} = 12 \times £28,000 = £336,000
\]

Project elements to be let
There are various ways of calculating the value of those elements of the project which are to be let. The approach outlined below is the one most developers use: it is important to use this method because only by doing the same calculations as the developer can we predict whether our project will attract the development agency support necessary to make it actually happen. Using this approach, the value of each of the project elements to be let - shops and offices in our example - is calculated from the following formula:

\[
\text{Value} = \text{£ Annual rent roll} \times 100 \div \text{percentage yield}
\]

Alternatively if YP rather than Yield is being used:

\[
\text{Value} = \text{£ Annual rental} \times \text{YP}
\]

The calculation is made as follows:

**Step 1**
Establish the lettable area proposed. This has different implications for different uses:

- for flats, offices and flatted workshops, the figure to use is 'nett lettable area': the total internal area of the buildings, minus the area used for communal services and circulation. Usually, nett lettable area is approximately 0.8 x total building area.
- for single storey industrial units, or others where there are no corridors to be considered, take nett lettable area as equal to internal building area.
- for shops, the nett lettable area is equal to the internal building area; but it is necessary to divide this into 'zones', called A, B, C, and so on, each 6 metres deep, running parallel to the shopping frontage, as shown in the plan below.

For our example, the lettable areas are calculated as follows:

**Offices**
- gross area of offices (per floor) = 12m × (45 + 15)m = 12m × 60m = 720 sq.m.
- therefore total gross area of offices = 3 (storeys) × 720 sq.m.
- = 2160 sq.m.
- therefore nett lettable area = 2160 sq. m. × 0.8
- = 1728 sq.m.

**Shops**
- shop space must be divided into the zones mentioned above.
- Then:
  - lettable area (zone A) = 6 × 48 sq.m. = 288 sq.m.
  - lettable area (zone B) = 6 × 48 sq.m. = 288 sq.m.
  - lettable area (zone C) = 6 × 48 sq.m. = 288 sq.m.
Step 2:

Look up the estimated rental per unit area for each use, as established in Design Sheet 2.1. This is taken as a flat rate for all the lettable area, except in the case of shops. For shops, start with the annual rental for zone A. Zone B rents are half those for zone A, zone C half zone B, and so on. But note that the yield does not vary like this: it stays the same over the entire nett lettable shop area.

In our example, the annual rentals per sq.m. - which we established in Design Sheet 2.1 - are as follows:

- Offices: £100 / sq.m.
- Shops (zone A) £200 / sq.m.
- Shops (zone B) £100 / sq.m.
- Shops (zone C) £50 / sq.m.

Step 3:

Multiply annual rental per unit area \times nett lettable area to get the annual rent roll for each use. In our example, the calculations are as follows:

Annual rent roll for offices
= nett lettable area \times rent / sq.m.
= 1728 sq.m. \times £100 / sq.m.
= £172,800

Annual rent roll for shops:
Zone A: nett lettable area \times rent / sq.m.
= 288 sq.m. \times £200 / sq.m.
= £57,600

Zone B: nett lettable area \times rent / sq.m.
= 288 sq.m. \times £100 / sq.m.
= £28,800

Zone C: nett lettable area \times rent / sq.m.
= 288 sq.m. \times £50 / sq.m.
= £14,400

Therefore, total annual rent roll for shops
= £57,600 + £28,800 + £14,400
= £100,800

Step 4:

Look up the estimated yield (or YP) for each use, as established in Design Sheet 2.1. In our example, the figures are as follows:

- Estimated yield for offices: 10% (or YP = 10)
- Estimated yield for shops: 8% (or YP = 12.5)

Step 5:

Calculate the value of each use, using one of the formulae below:

- Value = annual rent roll \times 100 + percentage yield
- Value = annual rent roll \times YP

In our example, both these methods are illustrated in the calculations below:

Alternative 1:

Value = annual rent roll \times 100 + percentage yield

Value of offices = £172,800 \times 100 + 10
= £1,728,000

Value of shops
Zone A: £57,600 \times 100 + 8
= £720,000
Zone B: £28,800 \times 100 + 8
= £360,000
Zone C: £14,400 \times 100 + 8
= £180,000
Therefore, total value of shops
= £720,000 + £360,000 + £180,000
= £1,260,000

Alternative 2:

Value = annual rent roll \times YP

Value of offices = £172,800 \times 10
= £1,728,000

Value of shops
Zone A: £57,600 \times 12.5
= £720,000
Zone B: £28,800 \times 12.5
= £360,000
Zone C: £14,400 \times 12.5
= £180,000
Therefore, total value of shops
= £720,000 + £360,000 + £180,000 = £1,260,000

Step 6:

Add together the values of the separate uses, to arrive at the value of the project as a whole. In our example, the calculation is as follows:

Value of flats = £336,000
Value of offices = £1,728,000
Value of shops = £1,260,000
Therefore, total value of the scheme
= £336,000 + £1,728,000 + £1,260,000
= £3,324,000

The value of the project is only one of the factors determining whether or not it is financially feasible. Next we must calculate the project's costs: this is covered in Design Sheet 2.5.
This Design Sheet covers the second step in assessing economic feasibility: estimating the financial costs associated with the project.

The total cost of getting the project on the ground includes the following main elements:
- site acquisition costs
- construction costs
- professional fees
- cost of short-term funding

We shall illustrate the calculations involved through the same example used in Design Sheet 2.4:

Site acquisition costs
Establish what the owners of the site expect to sell it for. This is often quite difficult to find out, but one or more of the following approaches should succeed:
- Ask the owners, or their agents, directly: the obvious approach if the site is formally on the market.
- Ask other agents. They can often give a guide based on other land nearby which has recently changed hands. But remember that most estate agents still use Imperial measures, quoting land costs in £ per acre. Make sure you know which units are being used, or you will get bizarre results.
- If any scheme has already been put forward for the site, with the backing of the landowners, you can work backwards to find out the land value they must have assumed. If you find yourself in this situation, skip forward at this point, to the section entitled 'Maximum acquisition costs' in Design Sheet 2.6, where this process is explained with an example.

For our present purposes, we shall assume that our estate agent has advised us that the land will cost approximately €625,000.

Construction costs
Assessing construction costs is the speciality of the Quantity Surveyor, whose advice should be sought if available. If not, the following approach will produce a sufficiently accurate budget figure for these preliminary calculations.

Cost of new construction
First list the gross area of each proposed use, and measure the area of any new street system or other major external works in the scheme. In our example, the gross building areas are as follows:
- Flats: $1152$ sq.m.
- Offices: $2160$ sq.m.
- Shops: $864$ sq.m.

Finally, to calculate construction cost, use the following formula:

\[ \text{Construction cost} = \text{gross area} \times \text{cost per unit area}. \]

In our example, the calculations are as follows:
- Flats: $1152$ sq.m. x €300/sq.m. = €345,600
- Offices: $2160$ sq.m. x €490/sq.m. = €1,058,400
- Shops: $864$ sq.m. x €240/sq.m. = €207,360

Therefore total construction cost = €1,611,360.

Costs of altering existing buildings
The cost of altering existing buildings is far harder to estimate, because there is so much variation in layout and condition between one existing building and another. First carry out a condition survey, and then use QS advice or appropriate specialist references.
Cost of professional fees
This covers the cost of employing architects, quantity surveyors, structural and services engineers, estate agents and legal advisors. Most of these calculate their fees as a percentage of construction costs. To get an accurate fee estimate, first list the likely advisors needed, then look up the fee scales of the relevant professional institutions, and apply the appropriate percentages to the construction cost you already worked out. As a rough rule of thumb for new work, a total fee expenditure of 12-15% of the construction cost will be near enough for these early calculations.

In our example, we shall assume fees at 15% of construction costs:

\[
\text{Cost of fees} = f1,611,360 \, \text{(construction cost)} \times \frac{15}{100} = €241,704
\]

Cost of short-term funding
This is the cost of borrowing money to acquire the land, and get the project built, during the period before it can start producing any income. It is calculated on the average borrowing during the borrowing period. This is difficult to estimate accurately, but a guide is given by the graph sketched below, which shows (very roughly) how the short-term borrowing varies during the construction period.

\[
\begin{align*}
\text{Average Borrowing} & = \text{Initial borrowing} + \frac{\text{Final borrowing}}{2} \\
& = A + \frac{F}{3} + A + \frac{C}{2} + \frac{F}{3}
\end{align*}
\]

Then cost of short-term funding = \(B \times \text{years construction period} \times \text{compound interest rate payable}\).

The interest rate will vary from time to time. It will be set at some amount higher than the bank's Base Rate, by an amount which varies according to the type of project and the status of the borrower. Your bank manager will be able to suggest a realistic figure for your particular project.

In our example, let us assume an interest rate of 12% compound, and a construction period of 2 years.

As we have seen, Average Borrowing = \(A + \frac{C}{2} + \frac{2F}{3}\)

\[
\begin{align*}
& = €625,000 + (f1,611,360 + 2) + (2 \times £241,704 + 3) \\
& = €625,000 + €805,680 + £161,136 \\
& = €1,591,816
\end{align*}
\]

As we have seen, cost of short-term funding = Average Borrowing \(\times\) years construction period \(\times\) % compound interest rate \(\times\) 100.

\[
\begin{align*}
& = €1,591,816 \times 2 \times 1.25444 \\
& = £399,355
\end{align*}
\]

Total cost
Having calculated the costs of acquisition, construction, fees and short-term funding, add them all together to arrive at the total cost of getting the project on the ground:

\[
\text{Total project cost} = €3,777,419
\]

Profit
If the patron for your project is a private-sector development agency - as in our example - then you will have to make an allowance for the developer's profit. This is taken as a percentage of the total project cost calculated above. The actual percentage will vary according to the state of the development market, but is usually somewhere between 15% and 20%; if the profit is lower than 15%, then the chances are that you will have difficulty making the project happen. At 20%, you can be fairly sure of success.

For our example, let us aim for a developer's profit of 20%:

\[
\text{Profit required} = \text{total project cost} \times \text{profit\%} \times 100 \\
= €2,877,419 \times 20 \times 100 \\
= £575,484
\]

By this stage, we have thought the project through to the point where we have estimated, in financial terms, both its value and its cost. Now we can relate these two figures together, to assess whether or not the project is financially viable. We shall show how to do this in Design Sheet 2.6.
2.6: Checking economic feasibility

The project will be financially feasible if its finished value (plus any extra subsidies that can be attracted to the scheme from outside) is greater than or equal to all the costs involved in producing it (plus any necessary developer's profit). In Design Sheet 2.4 we calculated the value of the project, and in Design Sheet 2.1 we noted whether any external subsidies were likely to be available. So now we have all the information we need to check the project's financial viability.

**Example**

A project is only financially feasible if

\[
\text{(Value + subsidies)} > \text{or} = \text{(costs + profit)}
\]

In our example in Design Sheets 2.4 and 2.5, we calculated figures for value and costs as follows:

- value = £3,324,000
- subsidies = £0
- costs = £2,877,419
- profit = £575,484

Therefore, \((\text{value} + \text{subsidies}) = \£3,324,000\)

Since \((\text{value} + \text{subsidies}) < \text{(costs + profit)}\), the project is not financially feasible as it stands. But it only falls short by £128,903: what, if anything, could we do to retrieve the situation?

**How can we make the project feasible?**

There are three main ways of making the project more viable:

- altering the mix of uses to include more profitable elements.
- putting more accommodation on the site.
- rethinking the factors which affect value and cost: rents, yields, acquisition cost, building cost, fees, short-term funding and profit.

** Altering the mix of uses**

Some of the uses in our example are more profitable than others. We can see this by calculating the profit/sq.m. of each use, as in the table below:

<table>
<thead>
<tr>
<th>Use</th>
<th>Shops Zone A</th>
<th>Shops Zone B</th>
<th>Shops Zone C</th>
<th>Flats</th>
</tr>
</thead>
<tbody>
<tr>
<td>construction cost (£/sq.m.)</td>
<td>490</td>
<td>240</td>
<td>240</td>
<td>300</td>
</tr>
<tr>
<td>fees at 15% construction cost</td>
<td>73.5</td>
<td>36.0</td>
<td>36.0</td>
<td>45.0</td>
</tr>
<tr>
<td>short-term funding (£/sq.m.) (from design Sheet 2.5)</td>
<td>70.6</td>
<td>34.6</td>
<td>34.6</td>
<td>43.2</td>
</tr>
<tr>
<td>total cost (£/sq.m.)</td>
<td>634.1</td>
<td>310.6</td>
<td>310.6</td>
<td>388.2</td>
</tr>
<tr>
<td>value (£/sq.m. nett) (from Design Sheet 2.4)</td>
<td>1000</td>
<td>2500</td>
<td>1250</td>
<td>625</td>
</tr>
<tr>
<td>profit (£/sq.m. nett)</td>
<td>365.9</td>
<td>2189.4</td>
<td>939.4</td>
<td>314.4</td>
</tr>
</tbody>
</table>

The bottom line of the table shows the profit contributed to the project by each square metre of each use. The viability of the scheme can be improved by replacing less profitable uses by more profitable ones.

For example, the profitability of flats is £185.2/sq.m., whilst for offices it is £365.9/sq.m. So every sq.m. of flats we replace by offices will generate an extra profit of £365.9 - £185.2 = £180.7.

Now, the extra profit required to make the scheme viable is £128,903. This can be achieved by replacing 128,903 / 180.7 = 713 sq.m. of flats by offices, to produce a scheme like that sketched below.

In practice, this would reduce the area of flats to such an extent that probably no development agency would be interested in them: variety would be reduced. If this is the case, we shall only be able to keep the relatively unprofitable elements of the scheme by adopting a different approach: generating more profit by increasing the total area of building on the site.
Putting more on the site

We can calculate the additional area of offices necessary to keep the flats, as follows:

- Extra profit per extra sq.m. of offices = €365.9
- Extra profit needed to make scheme viable = £128,903
- Therefore extra area of offices needed = extra profit needed ÷ extra profit per sq.m. offices
  = 128,903 ÷ 365.9
  = 352 sq. m.

This would imply changing the form of the scheme as sketched below.

Provided that planning permission would be granted for these extra offices, and given that they could successfully be let, this approach has created a financially viable scheme which still maintains variety by keeping the entire mix of uses for which a demand was established. Clearly the same approach can be extended to create so-called 'planning gain': subsidising unprofitable uses by building a greater area of the profitable ones.

For example, suppose that we have found a demand for a local community hall, and established that money could be raised for running costs, but not to pay any rent: effectively, therefore, the hall's commercial value is nil. Despite this, the hall might still be funded; by further increasing the area of profitable uses on the site. For example, we can calculate the extra area of offices which would be needed to fund the hall, as follows.

Let us assume that the extra cost of the scheme due to the hall (including construction costs, fees and short-term funding) is £150,000. In addition, let us assume that the hall takes up space previously occupied by one shop and one flat; so the profit of any scheme containing the hall will be further reduced by the profit which would have been contributed by one shop and one flat. This lost profit must now be calculated, as follows:

Each shop contributes the following profit:
- zone A: 36 (sq.m. area) × 2189.4 (£/sq.m. profit) = £78,818
- zone B: 36 (sq.m. area) × 939.4 (£/sq.m. profit) = £33,818
- zone C: 36 (sq.m. area) × 314.4 (£/sq.m. profit) = £11,318
- therefore total profit contribution for one shop = £78,818 + £33,818 + £11,318 = £123,954

Each flat contributes the following profit:
- 60 (sq.m. area) × 185.2 (£/sq.m. profit) = £11,112

So the total economic disadvantage caused to the scheme by including the community hall is the total cost of the hall itself (£150,000) plus the loss of profit from the shop (£123,954) and the flat (£11,112) which it replaces.

This totals £285,066; so to make the scheme viable, we shall have to build enough extra offices to generate this £285,066 extra profit. The necessary area of offices can now be calculated as follows:

- extra profit generated per sq.m. of offices = €365.9
- therefore extra area of offices needed to generate £285,066 profit = 285,066 ÷ 365.9 = 779 sq.m.

This produces a viable scheme of the form sketched below:

But adjusting the scheme to make the figures show an adequate profit does not automatically mean that the project will be attractive to the necessary development agencies. For example, we have located the community hall in the part of the scheme which we envisage being funded by a local builder/developer. We must check whether this would be acceptable to the developer or not, and whether the management problems it might cause could be successfully overcome. To make variety viable, therefore, we need to keep a constant focus on three different aspects of the project:
- the physical design (whose variety we are trying to maximise).
- the financial balance sheet (which indicates whether such a scheme could potentially be developed).
- the management requirements of the development agencies involved.

To achieve real variety, all three aspects must be developed together.
The case of social housing

The economic consideration of a social housing project will be rather different: in most countries, the assessment of the financial viability of such projects is unrelated to projected rental income. In Britain, for example, consideration at project level is primarily in terms of development costs.

Local government in Britain now rarely purchases land for housing, though some 'general family' housing, as well as accommodation for a wide variety of 'special needs' groups, is provided by registered housing associations. These associations are funded either by local authorities or more usually by the Housing Corporation, which is a central government agency.

Local Authorities themselves are now required to demonstrate a cost/value comparison for their schemes, based on estimated cost and projected value for the scheme. Many projects, however, still proceed with costs well in excess of value.

Proposals for all housing association projects are considered against a scale of Total Indicative Costs (TICs). Scales are regionally weighted and regularly uplifted to take account of inflation. It is intended that TICs should be indicative costs, rather than cost limits, and the funding authority may agree to a level of scheme costs at tender stage which is well in excess of the appropriate scale figure, in recognition of particular development difficulties, whilst having regard to the ill-defined criterion of 'value for money'.

TICs include land acquisition costs, construction costs and professional fees. The new-build TIC matrices relate storey height and design occupancy - but not floor area - to cost. Rehabilitation matrices relate sizes of dwellings to cost.

The funding authority can only agree to the purchase of land at a price within the valuation set by the District Valuer, who is a local government official. To test the viability of a scheme, it is necessary to estimate construction costs and professional fees in order to establish whether the residue of the TIC figure represents a realistic acquisition cost, as illustrated in the example below.

Example

A housing association is considering developing a project in outer London (TIC region). The vendor requires the District Valuer’s agreed valuation of £100,000 as the price for the site, on which it is proposed to build six no. five-person (design occupancy) two-storey family houses, and six no. two-person flats in a three-storey block.

The TIC for a five person two-storey house in outer London is £34,900, and for a two person flat in a three-storey block it is £26,000. Construction costs for the project, including external works and car-parking, are estimated at £235,000. The architect’s fees are to be 6% of the construction costs, the quantity surveyors require 2% and the structural engineers 1%

The total government funding (TIC) available amounts to:

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>£1,611,360</td>
</tr>
<tr>
<td>6% architect’s fee</td>
<td>£96,680</td>
</tr>
<tr>
<td>2% QS fee</td>
<td>£4,700</td>
</tr>
<tr>
<td>1% engineer’s fee</td>
<td>£2,350</td>
</tr>
<tr>
<td>Total</td>
<td>£109,250</td>
</tr>
</tbody>
</table>

Thus the residue of the TIC will cover costs, together with legal fees of 1-1.5% so the project is viable in financial terms.

In practice, provided the vendor is prepared to sell for housing association development, the District Valuer’s valuation is usually sufficiently conservative to permit development. High value land, however, can rarely be used for housing association development; though in recent years packages have been put together on relatively prestigious sites, where it has been possible to include elements of housing association rental housing with private and shared equity housing, as well as commercial development

When all else fails

Sooner or later, if the figures cannot be made to work out, there will be a temptation to alter the assumptions on which they are based: to convince ourselves that the scheme has such environmental quality that higher rents and lower yields could be achieved, or that costs could be cut by clever design, and so on. But there is no point in using unrealistic figures just to avoid facing facts: in the end, all this will achieve is a lot of abortive work.

However, now that the schedule of accommodation is beginning to firm up, it is certainly appropriate to check the assumptions you made at the beginning:

- check rents and yields with the estate agent, in the light of the design decisions already made. The value of the scheme will be particularly sensitive to changes in yield: a small decrease here will generate a lot of extra value.
- it is not worth spending too long thinking about construction costs, except for making a note of the obvious fact that if viability is difficult to achieve, then the scheme will have to be cheap. The QS will not be able to help you much further at this stage, because you do not have enough detailed information about the physical design to make detailed costings possible.
- finally, this is the stage at which to argue about acquisition costs. As a first step, you will have to work out the price you could afford to pay for the land to make the scheme viable.

Maximum acquisition cost

Let us return to our original (unviable) example, and call the maximum viable acquisition cost 'x'. Then the total cost of the project, as explained in Design Sheet 2.5, is obtained by adding the following components:

- acquisition cost (x in our example)
- construction cost (£1,611,360)
- fees (£241,704)
- short-term funding, calculated as follows:
  - Short term funding = average borrowing × years construction period × % compound interest rate ÷ 100
  - average borrowing = acquisition cost + (construction cost + fees + (x × 2 + 3))
  - x = £1,611,360 ÷ 2 × (£214,704 ÷ 2 + 3)
  - x = £805,680 + £161,136
  - x = £966,816

Therefore short-term funding

= (x + £966,816) × 2 × 0.1344 (from compound interest tables)
= 0.2688x + £259,880
Therefore total cost

= 1.2688x + £2,112,944

and profit (at 20% of total cost)

= 0.254x + 422,588

Total value of project (see Design Sheet 2.4) = £3,324,000

As before, no external subsidies are available. For the project to be feasible, therefore,

(value + subsidy) > (cost + profit)

therefore

£3,324,000 + £0 = (1.2688x + £2,112,944) + (0.254x + 422,588)

therefore 1.5228x = £788,468

therefore x = £517,775 (say £515,000). So if the land can be acquired for £515,000 rather than our original estimate of £650,000, then the project will be viable.

By this stage in the design process, we have made decisions about a feasible schedule of accommodation for the project, generating as much variety as possible; and we have related the various uses together to minimise negative interaction between them.

Later stages of design, covered in the following chapters, will concentrate on making responsive physical form; but it is essential that the design is checked for feasibility at every stage in its development. From now on, physical and financial design should go hand in hand.
Chapter 3: Legibility

Introduction
So far, we have discussed how to achieve greater permeability and variety. But people can only take advantage of the choice which those qualities offer if they can grasp the place's layout, and what goes on there. Legibility - the quality which makes a place graspable - is the next topic to explore.

Different levels of legibility
Legibility is important at two levels: physical form and activity patterns.
Places may be read at either level separately. For example, it is possible to develop a clear sense of the physical form of a place, perhaps enjoying it only at an aesthetic level. Equally, patterns of use may be grasped without much concern with form. But to use a place's potential to the full, awareness of physical form and patterns of use must complement one another. This is particularly important to the outsider, who needs to grasp the place quickly.

Why is legibility a problem?
The legibility of both form and use is reduced in modern environments. This is easily seen by comparing the traditional city with its modern counterpart.

Legibility and the traditional city
Before the twentieth century, cities worked well in terms of legibility. Places that looked important were important, and places of public relevance could easily be identified. This was true of outdoor spaces and buildings alike.

The biggest open spaces were related to the most important public facilities:

Legibility and the modern city
The modern city is legible only in the sense that 'buildings cannot lie': large office blocks, owned by pension funds and insurance companies, occupy key city centre positions; expressing the power of big financial institutions. But these bureaucratic enclaves - irrelevant to how most people use the city - visually overwhelm publicly-relevant places and facilities, confusing important activity patterns.

This confusion is made worse because important public buildings and publicly-irrelevant private ones often look alike.

Why is legibility a problem?
The legibility of both form and use is reduced in modern environments. This is easily seen by comparing the traditional city with its modern counterpart.
Separating pedestrians from vehicles
Finally, the desire to separate pedestrian and vehicular routes - remarked on in Chapter 1 - makes both central and suburban areas far less legible for people on foot. In the suburbs, pedestrians are all-too-often dragged confusingly round the private backs of the houses, between mute fences and planted privacy screens. Offering little to remember, such places are hard to grasp.

In the town centre, pedestrians are expected to follow ill-defined paths, sometimes underground, sordid and alienating, threaded tortuously up and down through the gaps between vehicular roads.

Achieving greater legibility
Legibility is being continuously eroded, so increasing it is an important objective, affecting the design of both physical layouts and patterns of use. In practice, it is easiest to start by considering layout. We shall return to activities later in this chapter.

Legible physical layouts
The point of a legible layout is that people are able to form clear, accurate images of it. Note that it is the user, rather than the designer, who forms the image: the designer merely arranges the physical layout itself. Various researchers have explored the content of these images; using such techniques as interviews, asking directions to places, and getting people to draw maps from memory, like the one below.

Overlapping images
Analysis of data like these reveals a considerable overlap between different people's images of a given environment, enabling a shared image to be mapped. An example - 'the Boston everyone knows' - is shown below.

Key physical elements
Certain sorts of physical features play a key role in the content of these shared images. Kevin Lynch - the American planner who pioneered studies of this topic in the 1960s - has suggested that these features can be grouped into five key elements, as illustrated below.
**Paths**

Paths are amongst the most significant of these elements. They are channels of movement - alleys, streets, motorways, railways and the like - and many people include them as the most important features in their images of the city.

**Nodes**

Nodes are focal places, such as junctions of paths: examples extend from roundabouts to market squares.

**Landmarks**

In contrast to nodes, which can be entered, landmarks are point references which most people experience from outside.

**Edges**

Edges are linear elements which are either not used as paths, or which are usually seen from positions where their path nature is obscured. Ralph Erskine's Byker wall is an example of the first type, whilst the second includes elements like rivers, railway viaducts and elevated motorways.
Districts
Paths, nodes, landmarks and edges constitute the skeleton of the urban image, which is fleshed out with areas of less strongly differentiated urban fabric. The distinction between skeleton and flesh comes over strongly in the eighteenth century engraving of Paris shown below. The flesh itself is organised into districts: medium-to-large sections of the city, recognisable as having some particular identifying character. A composite residents' map of districts in part of Boston is shown on the right.

Using the elements
Firstly, though the elements are themselves abstractions rather than concrete forms, a designer aware of their importance for legibility is helped to focus on the kinds of physical forms worth taking as models for legible new layouts.

Secondly, thinking in terms of these elements helps designers analyse the key image-forming features - both actual and potential - in their projects' existing surroundings: research suggests that familiarity with these concepts enables reasonably accurate prediction of the features of a place which are likely to form key parts of its users' images. Design Sheet 3.1 explores how this can be done in practice.

This kind of analysis is all the more useful when the designer can get a wider public involved in it. Ways of doing this are discussed in Design Sheet 3.2.

Combining new and existing elements
The first step in design is to develop the project to make more legible the area of which it forms a part, by relating the new design to existing elements on the site and in its surroundings. Because these cannot be moved, they must be taken as fixes for developing the design. The implications of existing paths, nodes, edges and landmarks are discussed in Design Sheet 3.3; whilst those of existing districts are covered in Sheets 3.4 and 3.5.

Elements at different scales
As well as playing a role in the legibility of the city as a whole, each district needs to be internally legible. At a smaller scale, the district will itself contain minor paths, nodes, edges and landmarks. So these concepts are relevant even to small sites, which make no obvious contribution to the image of the city as a whole.

Having related the scheme to significant existing elements, we turn our attention to the new elements within the project itself. It is sensible to start by considering paths: as we have seen, they are often the most important features in people's images of places; and in any case our starting point for design development is the permeable path system worked out in Chapter 1.
Reinforcing paths
There are two objectives to be achieved in reinforcing path legibility:
- to give each path a strong character, easily distinguished by users
- to bring out the relative importance of each path, as decided in Design Sheet 1.2.
The design implications of these objectives are discussed in Design Sheet 3.6.

Reinforcing nodes
By this stage, the positions of all the nodes are fixed. The next step is to decide how far the legibility of each should be reinforced. This depends on two main factors:
- the functional roles of the linking streets (as discussed in Design Sheet 1.3).
- the level of public relevance of the activities in the adjacent buildings.
The design implications of both factors are discussed in Design Sheet 3.7.

Design implications

How to achieve legibility

1. Take the street/block layout and schedule of accommodation from Chapters 1 and 2 as the starting point for developing legibility.

2. Assess the existing legibility potential of the site and its surroundings (Design Sheet 3.1)

3. Check this assessment against the views of a wider public, as far as resources permit (Design Sheet 3.2)

4. Adjust the project's street/block layout to make the best use of the legibility potential of existing elements on and around the site (Design Sheet 3.3)

5. Assess which district the site belongs to, and the consequent design implications (Design Sheet 3.4)

6. Where the project's district has strong path themes, develop an appropriate vocabulary of building heights and street widths for the new design (Design Sheet 3.5)

7. Check that path enclosure is adequate for legibility (Design Sheet 3.6)

8. Reinforce legibility of nodes within the scheme, according to their relative importance (Design Sheet 3.7)

9. Introduce intermediate markers into the path system if necessary (Design Sheet 3.8)
3.1: Legibility analysis

Since nowhere is totally illegible, start by finding out the existing potential of the site and its surroundings. Look for any existing activities and forms which could be used to make the place more legible, and record them - and how they might be used - on a plan. You should cover any nearby areas which can be seen from the site, as well as the area of the site itself. Since the new design should contribute to the legibility of its surroundings as well as being legible in itself, pay special attention to any parts of the site which can be seen from anywhere outside it.

It is often helpful to use Lynch’s checklist of elements - paths, nodes, landmarks, edges and districts - to stimulate this analysis. Typical factors to look for include the following:

- **Paths:**
  - record any routes which adjoin or cross your site, noting their relative intensity of use, as discussed in Design Sheet 1.3.
- **Nodes:**
  - note any place where paths meet; recording the relative importance of each path, and the public relevance of any associated buildings.
- **Landmarks:**
  - record any publicly-relevant activities, either in buildings or in outdoor spaces.
- **Edges:**
  - record any distinct limits to areas with different patterns of use or visual character.
  - record any strong linear barriers.
- **Districts:**
  - record areas with different patterns of use.
  - record areas with different visual characters, and decide what makes the differences; overall building forms, materials or details.

Do not let this list become a straightjacket: it is quite wrong to assume that every area contains each type of element in the list.

The drawing on the right shows the use of this approach to analyse the legibility potential of a redevelopment site at Oxford Railway Station. This records one designer’s opinions about legibility, both potential and actual. The next step is to check, as far as resources allow, whether the elements recorded in the analysis actually make the place legible to its users. Ways of doing this are discussed in Design Sheet 3.2.
3.2: Legibility and the user

It is important to check your own assessment of the site's legibility against the views of a wider public, as far as resources permit.

Who should you approach?
To make sure the exercise will be useful, the people you interview must be carefully selected:
- Choose people who regularly use your site, or its immediate surroundings. What you need is detailed information: general views about the town as a whole are of little use for site-specific design.
- Approach as wide a range of the site's users as possible. Try to balance out sexes and age groups in your 'sample'.
- Whichever technique of enquiry you use, aim to explore the views of about 20-30 people.

What are you trying to investigate?
The purpose of your investigation is to test and modify your ideas about the site's legibility, as developed in Design sheet 3.1. So begin by listing all the ideas to be tested, from the annotated 'problem and potential' and 'response' plans in Design Sheet 3.1. Then consider which techniques of enquiry might best elicit the information you need.

Local education resources
Mental mapping exercises are now quite common in secondary environmental education: you may find that a local school or college has already done work on your area, and has a thesis covering your site in detail. If not, they might help if the work fits into their curriculum. This would probably give a more rigorous coverage than you could achieve yourself.

Local workplaces, cafes and pubs
Ask people to help you during a break: this is the most likely way to get people drawing their own maps. It is often useful to provide a standard xeroxed sheet showing some important nearby features. You are not after complete recall, and should stress that accuracy is not the answer. You are after how people see the area, not how it is: the end product is likely to be something like the example shown below. Aim for 20 to 30 maps. summarising oft-mentioned features and overlapping boundaries.

Street corners
Ask questions about the place, with one or two photographs to stimulate conversation. You will be lucky to get answers from more than one in ten people, but in some situations this may be the only way of contacting regular site users. But remember that the police may be suspicious of people conducting public interviews: if you intend to use the 'street corner' approach it may save embarrassment if you tell the local police station what you are doing in advance. Policemen are often mines of useful information anyway.

By this stage, you should have a clear idea about the potentials and problems of your site in legibility terms. The Design Sheets which follow show ways of using this information to develop your design in more detail.
3.3: Combining new and existing elements

The last two Design Sheets highlighted the legibility potential of existing elements on the site, or visible from it. Now use this information to develop the tentative layout worked out in Chapters 1 and 2, to make a legible scheme which will also contribute to the legibility of the area around it.

Legibility depends on the relationships between elements, even more than on the design of the elements themselves. The forms and positions of the existing elements noted in the legibility analysis are already fixed. So the only way they can be used in developing the legibility of the place is by relating the layout of the new scheme to them as legibly as possible.

The first step towards achieving this legible relationship is to take the tentative layout of streets, blocks and uses developed in the last two chapters, and superimpose it on the legibility analysis plan worked out in Design Sheet 3.1. Without losing the practical block sizes and shapes developed in Design Sheet 1.4, adjust the positions of the street/blocks and the uses they house, to form the most legible relationships with the existing elements. At this stage, concentrate on putting the overall skeleton of the project together in the most legible way. Do not worry about the design of the individual parts of the scheme as yet.

Work through the existing elements as outlined below:

**Existing paths and nodes**
Make sure they are all defined by the edges of the blocks.

**Existing landmarks**
Allocate publicly relevant uses to landmark buildings, and adjust street alignments to make the most positive use of them. Various approaches are possible:
- focus streets on them.
- position new nodes adjoining them, thus using each landmark as a focus for several streets.
- incorporate them into streets as intermediate markers.

These ideas are illustrated on the right.

**Existing edges and districts**
These need not be considered yet. Their implications will either be too detailed to be relevant at this stage or - in the case of linear barriers - they will impose themselves on the design whether you want them to or not.

After working through this process, the project’s layout will have been adjusted to make the best use of the legibility potential of the existing elements on and around the site. The next step is to develop the legibility of the new elements. This is discussed in the Design Sheets which follow.
3.4: District location

Design Sheets 3.1 and 3.2 noted whether any of the legibility potential of the site or its surroundings was due to the area being perceived as organised into districts. This analysis must now be taken a stage further; firstly to decide which district the site itself belongs to - if this is not already obvious - and secondly to investigate the implications of this district setting for the design of the new scheme.

Which district is the project in?
This may be obvious (1). But the site may lie at the junction of districts, potentially linked to either (2). Or a large site might be regarded as a new district (3).

If it is not obvious which district the project belongs to, consider the following:
- district character often depends on consistent patterns of uses. Is this the case with any of the districts to which the project might relate? Do the uses in the scheme make it easier to integrate with one district rather than another?
- district character often depends on the repetition of typical building themes: heights, frontages, materials, details and so forth. Do any of the design decisions which have so far been made fit more easily into one district than another?
- the various possible districts may differ in economic terms: some may be declining, others static or buoyant. If so, does this imply which district the project must seem a part of, in order to attract the variety of uses investigated in Design Sheet 2.11?

Having decided to which district the project belongs, the next step is to assess whether this has implications for designing the massing, street layout and public space enclosure with which this stage of design is concerned. This depends on whether such factors are important to the district's character. Where they are, Design Sheet 3.5 discusses how to use them in design. Where they are not, go straight on to Design Sheet 3.6...
3.5: Districts with strong path themes

If massing and street enclosure are important to the district’s character, they must be investigated in more detail. Analyse these factors in the project’s own district, and in those adjoining it. Note plan dimensions, and enclosure in both plan and section. The purpose of this exercise is to home-in on a range of dimensions which are typical of the project’s own district, and clearly distinct from those in adjoining areas; thus reinforcing the differences which distinguish one district from another. The sketches on the right show how this might be done.

This process will suggest a vocabulary of street dimensions to support the existing district character. To maintain and develop the legibility of the city as a whole — which is helped by clearly distinguishable districts — this vocabulary should be used in the new project unless one of the following considerations applies:

- **a district with a very distinct, homogenous character may contribute to the legibility of the city as a whole; but its homogeneity may make it illegible internally. In this case, ignoring the district’s themes in the new design may increase the internal legibility of the district, without significantly weakening legibility at the city scale. But this depends on the size of the scheme: large projects which ignore district themes may erode district character altogether.**

- **more positively, if the scheme is of particular public relevance within a homogenous district, it may be appropriate to emphasise it by ignoring the district’s themes, as in the example below:***

Finally, the district’s path vocabulary should be checked against the criteria for path enclosure given in Design Sheet 3.6. These should only be overridden when there is no other way of sufficiently reinforcing the district character. So consider whether this reinforcement could be achieved with detailed design, as discussed in Chapter 5.
3.6: Path enclosure

There are two objectives to be achieved in designing path enclosure:

- to give each path a strong character, easily distinguished by users
- to bring out the relative functional importance of each path, as decided in Design Sheet 1.3.

A path's legibility is crucially affected by its enclosure in plan and section. Height/width ratios of less than 1:3 seem weakly enclosed (1,2), so avoid them where possible. Where this is difficult, enclosure can be increased by planting (3).

Enclosure is affected by the continuity in plan of the enclosing elements (4), and by the form of the path as a whole (5,6).

Strong enclosure is most easily achieved with buildings (7). But this may cause problems at the corners of blocks: particularly with housing, privacy may be destroyed by overlooking between windows of adjacent dwellings at the internal angle (8). This is often solved by leaving a gap at the corner of the block.

With small blocks, this produces a large number of gaps, and consequently reduces street enclosure (9). These gaps can be closed by walls, trellises or trees (10). But these contribute no activity to the street, which becomes correspondingly less memorable. L-shaped corner houses, partly single-aspect to avoid overlooking, can also be used.

Corners can also be closed with single-aspect flats (11, 12). Where a gap is left, it will help if the corner house has its entrance at the side, to reduce the length of blank wall on the 'gap' street (13). Finally, check that no paths are confusingly similar. Problems here can be solved at a detailed architectural level (as discussed in Chapter 5) and by giving the paths concerned perceptually different markers, as discussed in Design Sheet 3.8.
3.7: Nodes

By this stage, the positions of all the junctions and the uses in the buildings around them have been fixed. The next step is to decide which junctions need special reinforcement, and how this should be done.

All junctions are potential nodes, but they should not all be given equal significance. The appropriate degree of emphasis for each node depends on three main factors:

- the functional roles of the streets forming the junctions (as discussed in Design Sheet 1.3): the more important the functional role, the greater the spatial emphasis required to maintain the congruence between legibility of use and legibility of form (1).
- the activities in the adjacent buildings: for the same reason, the more publicly-relevant these are, the greater the spatial emphasis required (2).
- the expectations set by other nodes within the district concerned: these establish a vocabulary from major to minor nodes, within which the new one should fit if its relative importance is to be grasped easily by its users (3).

New street/block structure, no major nodal spaces needed.

Splayed corners can help at crossroads because they focus the buildings on the centre of the space (5). Splayed corners also give the junction a greater sense of enclosure because they start to form a concave shape (6). But be careful not to increase the height/width ratio above 1:3.

Offsetting the junctions also increases the sense of enclosure: as you approach the node, there is a building immediately ahead closing the view (7). But there is the danger of reducing visual permeability, so keep the offset as small as possible (8). Splayed corners and set-backs can help by deflecting the eye towards the next path, as well as increasing the concavity of the space still further (9).

The forming of a concave nodal space is one of the most emphatic ways of increasing the legibility of the junction. The urban square or circus is one of the strongest examples of this. It can be used at a variety of scales (10, 11, 12).
Where nodes are large, there are more possible entrance positions. If the wall defining the entrance path continues uninterrupted, to form the wall of the node (13) then the node itself may read as a mere widening of the path. With entrances located away from its corners (14) the node seems more distinct from the paths leading into it. This effect is strengthened if it is impossible to see straight through from entrance to exit (15). But here the increase in spatial definition must be weighed against the possible loss of visual permeability.

Larger nodes usually have higher ratios of enclosing wall to street opening on plan, but are more difficult to enclose in section. Because of greater plan enclosure, height/width ratios can be opened up to about 1:4 before the enclosure seems too weak (16). Effective width can be reduced by trees or walls (17), or height can be increased by roof pitches, balustrades or changes in ground level (18).

Though contrasting, both these examples use the ideas we have outlined:
- compact planforms, with strong enclosure in section and plan,
- entrances positioned to emphasise the node as an element distinct from its surroundings,
- entrances designed for minimum interruption of the node's enclosing surfaces.

In both the places shown, designers have allowed the forms of buildings and planting to be dictated by the need for legible urban places.
3.8: Marker sequences

Design Sheet 3.6 distinguished paths from one another by differences of width and enclosure, while Design Sheet 3.7 discussed nodes, which act as markers to help users locate themselves within the path system as a whole. But in some situations, further intermediate markers are needed to show users where they are along the path concerned, and to give a sense of getting somewhere. When streets are straight and junctions are frequent, the path is unlikely to need other markers for its own legibility. But it may contain publicly-relevant uses, treated as landmarks to make their own roles legible, and thereby forming extra street markers. If these are sited at junctions, they will benefit from their visual exposure to several routes, and will in turn contribute to the legibility of the junction, supporting visual permeability still further.

If such landmark buildings are not located at junctions, then they should be sited to be visible from a distance. They will need to project forward on plan, or upwards or downwards in elevation, relative to the adjacent street fronts.

When siting markers in a curved street, slightly different considerations apply. Junctions may not be visible from each other, so they may need to be supplemented by extra markers to achieve a legible street. The widest spacing of these markers can be decided as shown in the drawing on the right:

- starting from junction 1, draw the longest possible sight line towards junction 2 until it hits the building line at A.
- draw an arrow pointing back from A towards 1 as shown, to indicate that a marker is needed somewhere between 1 and A.
- from A, draw the longest possible sight line onwards towards the second junction, until it hits the building line again, at B. Draw an arrow back towards A, to show that a marker is needed between B and A.
- continue drawing sight lines, and arrows, until the second junction (2) is reached.
- then repeat the procedure working back from the second junction (2) towards the first, plotting points X (with arrow pointing back towards 2) and Y (with arrow back towards X).

A continuous visual chain of markers will be formed, using the minimum number of markers, if one is placed anywhere in each of the zones where the arrows point towards each other (Y+CA, X+CB in the example).

Now all the markers are positioned, their individual design must be considered. To maintain congruence between legibility of use and legibility of form, try to associate marker features with publicly-relevant activities. Whether this is possible or not, ensure that the markers stand out visually from their surroundings: ways of achieving this will be discussed later, in Design Sheet 5.3.
Chapter 4: Robustness

Introduction
Places which can be used for many different purposes offer their users more choice than places whose design limits them to a single fixed use. Environments which offer this choice have a quality we call robustness.

Why is robustness a problem?
Whether we like it or not, the ultimate power of deciding how a place should be designed lies in the hands of whoever pays for it: the patron. Patronage is almost never controlled by the direct users of the place, who therefore have little say in its design.

Patrons are not usually interested in promoting user choice, because they are each concerned only with some particular aspect of a user's life: the user as rent payer, or office-worker, or car driver and so on. Because the particular activities defined by the patron get most of the designer's attention, projects are usually designed rigidly around them by tailoring the pattern of spaces so that the desired pattern of activities can take place as efficiently as possible, without interfering with each other.

Problems inside buildings
Inside buildings, this leads to a tendency for designers to provide specialised spaces for the different activities. This specialisation, to serve the patron's interests, often makes it more difficult for other activities to take place: this reinforces the effects of the patron's lack of interest in user choice.

Problems in public outdoor space
In public outdoor space designers tend to employ the same approach; thinking in terms of specialised spaces for different activities, separated off from one another. But activities in public space are public activities: they rarely need to be separated from one another for reasons of privacy. Indeed, in public space, it is the activities themselves which act as the most important supports for other activities: people come there to experience other people. So if public space is chopped up into separate compartments for separate activities, most of its robustness is removed.

What can designers do about this?
Designers cannot change the way patronage works, but they do not need to make the problem worse by the way they design. Given that patrons have the power, and will use it primarily to further their own interests, there is still nearly always some room for manoeuvre in designing for robustness, even when patrons are not prepared to pay extra for it.

Robustness and normal costs
Robustness can be increased, within normal cost limits, merely by careful design of the things which would have to be included anyway. Since it costs no more, this approach to robustness should always be pushed as far as possible.

Where shall we begin to design?
Robustness is equally important indoors and out, but its design implications for buildings are different from those for outdoor places. Particularly in urban situations, the activities in outdoor places are strongly influenced by what goes on in the buildings round their edges. So we shall take the buildings as our starting point, working outwards from them into the adjacent outdoor places.

In the context of buildings, it is useful to distinguish between large-scale and small-scale robustness.
Large-scale robustness

Large-scale robustness concerns the ability of the building as a whole, or large parts of it, to be changed in use.

Taking advantage of robustness at this scale usually involves resources which are not easily available to most people. But, indirectly, large-scale robustness can offer more choice to ordinary users in the long run. As buildings grow older, and move down-market, it becomes financially feasible for them to accommodate a greater range of uses, as we saw in Chapter 2. Large-scale robustness ensures that this is also physically feasible, and therefore makes it easier for the variety of uses in the area to increase.

Small-scale robustness

Small-scale robustness concerns the ability of particular spaces within the building to be used in a wide range of ways.

This is the scale of robustness most relevant to the majority of ordinary users. It is important because it has a direct effect on the day-to-day choices most people can make.

Design implications at different levels

Because it is concerned with major changes of use, large-scale robustness has implications for the overall design of the building, which need to be considered early on. Small-scale robustness involves design decisions of a more detailed kind: though they are of critical importance to users, they can safely be left till later. We shall therefore begin by designing for large-scale robustness.

Designing for large-scale robustness

We cannot predict the likely changes in use which might occur during the expected life of a building: even in the short run, predictions of this kind are notoriously unreliable. It is more practical to learn from buildings which have successfully coped with changing uses. But the lessons to be learned are different for family houses than for other building types.

Family houses

The most important factor affecting the large-scale robustness of a given house design is the floor area it provides. So robustness is supported by opportunities for enlarging the house as a whole. This has many design implications, which are explored in Design Sheet 4.1.

Other building types

Experience suggests that there are three key factors which support long-term robustness:
- building depth
- access
- height

Building depth

The vast majority of building uses require natural light and ventilation. Buildings which are too deep for this cannot easily change in use.

Access

All building uses need some links to the outside world. So the number of access points is a key factor governing how easily a building can adapt to a variety of uses.

Building height

The importance of access also affects building height: in a tall building, the upper floors have restricted links to the outside, and are therefore less suitable for a wide range of uses.

Preferred configuration

Between them, these three factors define a preferred building configuration for achieving large-scale robustness:
- shallow in plan
- many points of access
- limited height

Of course, not all buildings can take this form: an international swimming pool, for example, wouldn’t work with such a configuration. But only a small proportion of the building stock consists of buildings with such specialised requirements. And even those usually have less specialised parts which could use our preferred arrangement.

The design implications of these topics are covered in Design Sheet 4.2.
Internal organisation

As a starting point for designing the internal organisation, we have to accept the patron's view of how the building will be used. We must locate activities together, and give them spatial enclosure, in a way which patrons will accept as efficient for achieving their own objectives. We shall not discuss how to do this: it is already part of our current design tradition.

But this still leaves some freedom, because there are usually several design alternatives for achieving an efficient plan. If we are to use this freedom to build in as much additional robustness as we can, we must take some extra factors into account.

In most buildings, the various parts have different potentials for contributing to robustness. Two sorts of areas need special attention:
- hard/soft
- active/passive

Hard and soft areas

Most buildings contain spaces which house shared facilities such as staircases, lifts and vertical service ducts. Usually these spaces are 'hard': they are least likely to change their functions during the building's life. These hard zones must be positioned where they will not restrict the use of the remaining space. Ways of achieving this are covered in Design Sheet 4.4.

Active and passive areas

To an important extent, the potential for robust outdoor spaces depends on what goes on in the parts of the building immediately next to them. This must be taken into account when planning the buildings themselves.

Some activities within the building may benefit from being able to extend outwards into adjacent public outdoor space. When this occurs, they will contribute to the activity in the public space itself.

Other indoor activities may contribute to the level of outdoor activity: visual contact with them can make the place more interesting for spectators.

Any indoor area which can contribute to outdoor activity in either of these ways is called an active area. At this stage, we must decide which elements of our scheme have this active quality. So far as possible, we must ensure that the ground floor of the building, where it abuts public space, is occupied by these active areas. This is discussed in Design Sheet 4.3.

Small-scale robustness

Designing for small-scale robustness involves working at two levels:
- adjusting room sizes and shapes within the general spatial layout already decided.
- designing each room in detail.

Room size

Very small rooms can accommodate very few different activities, whilst very large ones can cater for a wide range. But above a certain size, as shown in the graph below, further increases begin to be less and less effective in accommodating more activities.

Small-scale robustness involves working at two levels:
- adjusting room sizes and shapes within the general spatial layout already decided.
- designing each room in detail.

Room shape

Room shape also affects the number of different activities which can take place in a given area. Compact rooms are better than long thin ones in this regard, and are therefore more cost-effective in terms of the choices they provide.
Detailed room design
As well as the room's size and shape, its detailed design has an important impact on the number of different activities it can house. If carefully considered, factors like the positioning of doors, windows, socket outlets and radiators can contribute significant increases in robustness at no extra cost.

Robust room sizes, shapes and details are covered in Design Sheet 4.5.

Design for alteration
Finally, it is important to make it practicable to change as many as possible of our internal layout decisions during the life of the building. This is largely a matter of designing the physical fabric of the building so that it can easily be altered.

Outdoor spaces
Now we have decided the internal arrangement of the buildings, we can turn to the adjacent outdoor spaces, both public and private.

Private garden space
Outdoor space which is private, within the perimeter block, greatly increases the robustness of the surrounding buildings, particularly when these contain housing. Detailed garden design should be left to the users, but garden robustness is also affected by broader issues, which are discussed in Design Sheet 4.6.

Public outdoor space
The design of public outdoor space is a complex matter. We begin by considering the edges of the space, because it is here that most activity takes place: for most people, in most places, the edge of the space is the space.

Having considered the activities at the edges, we can turn our attention to designing the main body of the space.

Designing the edge of the space
We begin by capitalising on the active elements already located on the ground floors of the surrounding buildings. Ways of helping these to animate the adjacent edge of the outdoor space are discussed in Design Sheet 4.7.
Designing within the space
The principle for supporting robustness is to design settings which, as far as possible, enable a variety of activities to co-exist in the public realm without inhibiting each other. This particularly affects the way we handle vehicular and pedestrian activity.

Vehicular activity
Usually, a major activity in the central parts of public spaces is vehicle circulation. Ways of designing so that vehicles do not inhibit other users of the space are discussed in Design Sheets 4.8 and 4.9.

Pedestrian activity
Most spaces are colonised from their edges. Where spaces are wide and there is no vehicular activity, the parts furthest from the edges may have little going on. Ways of animating the central parts of such places are explored in Design Sheet 4.10.

The importance of microclimate
Finally, activities out of doors need appropriate microclimatic settings. These are covered in Design Sheet 4.11.

Design implications

How to achieve robustness

1. Select the most robust configuration for any family houses in the scheme (Design Sheet 4.1)

2. In other buildings, locate all the elements of accommodation together in plan and section, working within the following constraints:
   - fit as much accommodation as possible into the preferred building configuration (Design Sheet 4.2)
   - make sure that ground floor areas abutting public outdoor space are occupied by active areas, so far as possible (Design Sheet 4.3)
   - position hard zones where they will not restrict the use of the remaining space (Design Sheet 4.4)

3. Adjust room sizes and details to maximise small-scale robustness (Design Sheet 4.5)

4. Design private open space for housing (Design Sheet 4.6)

5. Design the edges between buildings and public space to support as wide a range of likely uses as possible (Design Sheet 4.7)

6. Design all public spaces in detail, as follows:
   - busy vehicular streets (Design Sheet 4.8)
   - shared street spaces (Design Sheet 4.9)
   - pedestrian spaces (Design Sheet 4.10)

7. Check the microclimatic design (Design Sheet 4.11)
4.1: Robust family houses

In many areas, one of the commonest types of development is the family house with garden. This has a particular potential for robustness, which must be supported in the detailed design.

The most important factor affecting the robustness of a given house design is the area of space it provides (1). So robustness is supported by cheap straightforward construction, providing more space for a given cost; and by opportunities for enlarging the house as a whole (2). In all house types, this has implications for roof design: make sure its construction and geometry will allow easy conversion to useable space; and plan the original internal layout to make roof access easy (3).

Terraced houses are the most difficult to extend horizontally, because additions can only be made at the front and back. With narrow frontages (4), below about 6.5 metres, front or back extensions begin to block light and air from the original rooms; easy roof conversion is particularly important here. Extra frontage makes horizontal additions possible; but only if the original design allows for access (5). Garden sizes must allow for any potential horizontal extensions (6).

Semi-detached houses allow extensions at one side (7) and - with frontages above 6.5 metres - at front and back as well (8). A free space of at least 4 metres at the side is needed to allow pedestrian access past the minimum width of an average sized room extension (9).

Detached houses offer more possibilities for extension than do other types. If the free space surrounding the house is at least 6.5 metres wide, an extension may be built onto any side (10). But remember that the first priority is to provide good space standards in the first instance, because not all users are able to extend their houses.
4.2: Preferred building configuration

The large-scale robustness of a building depends on three key factors:
- access
- depth from window to window
- height

Make sure the building is sited to allow easy external access to as much as possible of the ground floor. If there is no back access from the inside of the perimeter block, then provide a direct vehicular access to the back of the plot, from the public street, either past or through the building. If this is not required in the short term, at least make it possible later, without wholesale demolition. Maximise the direct frontage between building and public space, to allow as many separate front doors as possible. Again, if this is not necessary in the short term, make it easy to achieve later on.

Indoor space is most robust when it can be naturally lit and ventilated. Robust buildings are therefore shallow in plan: the most robust depth is between 9 and 13 metres. Below 9 metres, the building is too shallow for a central corridor, and this limits the possible internal arrangements. Above 13 metres, the space is too deep to allow subdivision into small rooms, unless some are internal. So organise as much of the building as possible into a 9-13 metre depth, keeping those uses which will not fit as separate as possible. In this way, at least the major part of the building will have a high level of large-scale robustness.

Next check how high this robust part of the building needs to be: robustness is reduced when the building is higher than 4 floors. If there is too much accommodation to fit into this height, then two approaches are possible: make the building higher or increase its depth. If the depth initially considered was less than 13 metres, then increase it to that figure. But if the area is still too small, it is better to increase height than to make the building still deeper. With a higher building, only the part above 4 floors loses robustness. With a deeper building, the robustness of every floor is reduced.
4.3: Active building fronts

The public edge of the building should house activities which benefit from interaction with the public realm, and can contribute to the life of the public space itself.

The first step is to locate as many entrances as possible in such positions that comings and goings are directly visible from public space (1).

The next step is to analyse the schedule of accommodation to see whether it contains any uses which could benefit from spilling out into public space (2). If such uses exist, then locate them on the ground floor at the front. If they require more space than is available in this location, still put the surplus at the front, but on the first floor (and if this is still too small, overflow to the second floor (3) and so on).

Even if there are no uses which would benefit from links with public space, most buildings contain activities which can contribute to the animation of the public space itself (4). Make sure that these uses, rather than stores or lavatories, occupy the ground floor front position. Design Sheet 4.7 discusses how these activities can, if necessary, be protected from overlooking whilst still animating the public edge.
If the building contains no uses which could contribute to animating the public edge, or if such uses as there are must be walled off for operational reasons, try to expand the schedule of accommodation beyond that originally envisaged by the patron, to include active edge uses (6,7,8). This will obviously require the patron’s co-operation, which is more likely if the extra uses benefit the building itself in some way, financially or otherwise. Since the most ‘blank’ buildings - supermarkets, multi-storey carparks, theatres - are often in city centre locations, where space on the public front is particularly valuable, such benefit can be provided surprisingly often. Even if this can be achieved, there may still be occasional blank walls. Design Sheet 4.7 discusses how these may be turned to good account.
Most buildings contain spaces which house shared facilities, such as staircases, lifts and major vertical service ducts. Usually these spaces are hard: they are the least likely to change their functions during the building's life. These hard zones must be positioned where they will not restrict the use of the remaining space.

In buildings with less than about 15 metres frontage, group the hard zones together (1). Leave the rest of the space uninterrupted, so that it can easily be subdivided in many different ways (2), or split into separate units, such as flats or small office suites (3).

When building frontage exceeds 15 metres, repeat the hard zones, spacing them no farther apart than 20 metres (4). Up to this spacing, the scheme can either be used as a number of separate buildings - each with adequate services, access and fire escape (5) - or can function equally well as a single unit (6). Whichever arrangement is required in the short term, it can be adapted later.
4.5: Interiors: small-scale robustness

Having developed the basic organisation of the building, the next step is to design individual spaces which, whilst being suitable for their initial purposes, are also capable of being put to the widest possible range of alternative uses.

A very high proportion of the most common activities can fit into rooms about 14 m² in area: average sized rooms.

So use any freedom there may be in the schedule of room sizes in the brief, to make as many rooms as possible of this size (1). The dimensions of circulation spaces are also important for robustness: a small increase in the minimum circulation area may make them suitable for a wider range of activities, whilst still performing their basic linking functions (2,3).

For a given area, rectangular rooms with plan proportions between 1:1 and 1:2 can accommodate the widest range of activities. Shallow rooms - with their windows on the long side - can easily be subdivided into spaces with natural light and useful proportions, whilst deep rooms are more easily combined into larger spaces of useful shape. So give any rooms which exceed 14 m² a shallow form, so that they can be subdivided into smaller ones (4). Make only the smaller rooms deep, and avoid separating them by structural walls, so they can easily be combined into average sized rooms if the opportunity arises (5). Average sized rooms themselves are best square, so they can be combined or subdivided (6).
Larger spaces will seem appropriate to a wider range of uses if they can be read as being built up from a number of average sized spaces (7). Such spaces can provide an appropriately-scaled setting for individuals or small groups as well as being useful for larger gatherings (8). Rooms of this kind also lend themselves to physical subdivision, temporary or permanent, if required (9).

The range of alternative settings within a given room or circulation space - and therefore its robustness - can also be increased by adding sub-spaces of different character, such as bay windows, ingles and window seats (10,11,12). These enable users to adopt a range of relationships to the main activity in the space: participation, observation, withdrawal. The sub-spaces can be quite small (13).

It is important that room design should maximise the opportunities for alternative furniture layouts. The most useful zone for furniture is round the edge of the room, so minimise the intrusion of doors into this area (14). For the same reason, provide reveals to windows (15,16). Finally, remember that built-in furniture freezes room layout, and therefore reduces the range of possible uses. Avoid it where you can.
4.6: Housing: private gardens

Outdoor space which is private, within the perimeter block, greatly increases housing robustness. Detailed garden design should be left to individual users, but garden robustness is also affected by broader design issues.

An area between 60-100 square metres is enough for both sitting out and for children's play, whilst 25 square metres is only adequate for passive activity. A family of four can become self-sufficient in vegetables with an area of 160 square metres (1).

The best garden shape depends on the height and the aspect of the dwellings as these factors will affect sunlight. As a general rule, the more nearly the back of the dwelling faces north, the longer the garden must be to achieve adequate sunlight (2). But check each case with sunpath diagrams: see Design Sheet 4.11.

With family houses, the garden should directly adjoin the back of the house, with easy access from as many rooms as possible (3). With flats the same applies for ground floor units, which can easily have private gardens: other flats can only have gardens separated from the dwelling. If at least 25 square metres is allowed for each upper-floor flat then the space can either be separate plots or a communal garden: users can have the choice. Add extra allowance for access paths, and for children's play (4).

Parking and circulation at 120% = 18 x 21 sq.m. = 378 sq.m.
Garden space = 15 x 30 sq.m. = 450 sq.m.
Frontage = 36.5 metres
Therefore garden depth = 23 metres.

Garden robustness depends on privacy, so make sure that at least part of the space is not overlooked from next door, opposite or above. Always draw sections right across the block to check this, and to decide the positions and heights of fences, walls, pergolas, planting, canopies and garages to maintain privacy (5).

Rear spaces can be larger if additional communal gardens are required, but should never accommodate public through routes.

Rear access - or side access in semi-detached houses - increases the garden's potential for a range of activities, from horticulture to boatbuilding, because large and messy loads can be taken in and out without going through the house. If rear garages or parking spaces which could later take garages are directly attached to the garden, they can be used in conjunction with the garden itself for a wide range of extra activities (6). But privacy - and therefore robustness - are destroyed if the back access becomes a public through route. So keep vehicle entrances small and obviously private.
4.7: The edge of the space

To increase robustness, the edge between buildings and public space must be designed to enable a range of indoor private activities to co-exist in close physical proximity with a range of outdoor public activities. This has a variety of design implications, depending both on the building activities concerned, and on the nature of the activities in the public space.

First, consider whether the building activity would itself benefit from claiming adjacent public space, and allow for it in the edge design. Common examples include residential balconies (1), terraces to pubs and restaurants (2), and display areas for shops (3).

Elsewhere, however, an important function of the edge is to preserve the privacy of the indoor activity, so that users will not feel the need to screen themselves totally from the public space, thus negating any contribution that their presence might have made to the experience of the space itself. This privacy can be achieved by horizontal distance (4), level change (5), or a combination of both (6).

In locations where public activity is sufficiently intense, watching other people becomes in itself one of the most common activities. This mostly happens at the edge of the space, which offers a sense of refuge as well as a prospect of what is going on (7); the greater the proportion of edge to the area of the space, the greater the opportunities (8). The feeling of refuge can be increased by an indented building line (9). But be careful not to reduce the prospect by making the nook too deep.

The usefulness of the edge as a support for people-watching is greatly increased by the provision of places to sit. These need not always be single-purpose seats: if properly dimensioned, niches (10), string courses (11) and column bases (12) can work very well as seats and do not look forlorn when not in use.
If seating is at a slightly higher level than the space itself then prospect is enhanced (13,14). The edge potential is still further improved if parts of it can be protected from the weather (16).

Arcades are ideal for this (17, 18): the ultimate is the arcade raised above the level of the adjacent space to give a greater view (19).

This can be of commercial advantage to buildings which claim the edge (15).
4.8: Busy vehicular streets

Footpaths have a complex role to play in supporting pedestrian use against the inhibiting effects of vehicular traffic. In addition to the edge zone discussed in Design Sheet 4.7, they need two further zones: a central one for pedestrian movement, and a buffer zone between this and the vehicular space (1).

![Diagram of pedestrian movement zone]

The width of the pedestrian movement zone must be appropriate to the level of pedestrian traffic involved. Between this movement zone and the vehicular space, allow a zone for amenities such as street trees, seating, bus shelters, telephone kiosks and cycle racks. Not all of these can be justified in all situations, but leave space for others to be added later.

![Diagram of amenities zone]

To encourage pedestrians to use vehicular streets, it must be made easy for them to cross the road. Most people prefer to cross at ground level, rather than by subways or bridges. Provide safe crossing points (4), making them as visually prominent as possible (5), and minimise road widths at these positions. All crossing points should cater for handicapped people, and where there are traffic signals these should be timed in favour of the pedestrian as far as possible.

![Diagram of safe crossing points]

In noisy vehicular streets, seclusion and quiet can be achieved by providing relatively small spaces, set back from the building line. To benefit as many people as possible, these spaces are best located in areas of high pedestrian activity. To reduce danger and vandalism at night, they should be brightly lit; and either surrounded by buildings with night-time as well as day-time use, or be tightly managed in security terms. To reduce the impact of traffic, the open frontage of such a space is best kept to the minimum necessary to maintain a street prospect. This is improved if the space is raised above street level (6).

![Diagram of seclusion spaces]
4.9: Shared street spaces

In some situations - mostly residential - and with careful detailed design, streets can be made robust enough for the space to be shared by vehicles and pedestrians.

The shared street is only possible where traffic flows are less than 250 vehicles per hour, and the majority of the traffic has its destination within the area itself. No area of streets designed on the 'shared space' principle should be more than 500 metres from a 'normal' vehicular street (1). Each street in the area should have directional changes every 50 to 60 metres: the small-block structure advocated in Chapter 1 is ideal (2), but additional changes in direction may be necessary (3). Two-way traffic should be encouraged throughout the area, to reduce vehicle speeds.

The road section should be kept narrow (4), with occasional widening for passing places, rather than the other way round. Adequate parking for residents and visitors must be provided, and on-street parking should be of right-angle form: this demands greater attention from drivers, and provides better play spaces when cars are absent (5).

Kerb distinctions, with their emphasis on separating vehicles from pedestrians, should be eliminated, and replaced by paving to reduce the linearity of the space. There must be many elements to reduce vehicle speeds, but, rather than arbitrary devices, it is important that these are seen by drivers as giving advantages to other users of the area: trees, children's play equipment or parked cars (6). But it is important that drivers can see children: raised obstructions should be lower than 750 mm (7).

The design ideas outlined above are all used in the 'Voorverf' streets now common in the Netherlands. They may sometimes conflict with traffic regulations elsewhere, but they illustrate what is functionally practicable when regulations can be relaxed (8).
4.10: Pedestrian spaces

Only exclude vehicles from a public space in the following situations:
- if the vehicles inhibit pedestrian activity (which is rarely the case, except in busy commercial streets)
- if there is an alternative vehicular route near by.

Where pedestrian streets are less than 7 metres wide, design their edges as described in Design Sheet 4.7. Wider streets or pedestrian squares need further supports for people to colonise the centre of the space. These should incorporate seating (1). Locate seating parallel to pedestrian flows: on wider streets with active uses on both sides, arrange seating down the centre of the space (2). In squares establish likely desire lines for pedestrian flows and then arrange seating to take advantage of the people-watching potential of these positions. Remember that people also like to stand or lean in similar locations (3).

Seating can take the form of chairs or benches (often called primary seating) or secondary features like steps, walls or planters. Provide as much primary seating as possible - never less than 10% of the total number of seats - and ensure that there is at least 300 linear mm of seating for each 3 square metres of open space (4). It is important to allow for choices of seating configuration, with as much seating as possible raised a little above the level of the surrounding paved areas. Avoid locating seats lower than their surroundings, as this markedly reduces their potential prospect. Include moveable seats and tables wherever management can cope. The implications of various seating arrangements are explored in diagram 5.

Selected seat shapes

**Straight slabs**
Okay for unassociated singles, and for observing events directly in front.
Allows for swivelling into conversational orientation for couples, but some knee knocking probably results.
Poor for group interaction. People standing often clog pedestrian route.

**Single pods**
Okay for single occupant or (depending on size) 2-4 unassociated singles: by permitting back-to-back seating, users may be able to 'tune out' others.
Poor for couple interaction because of size limitations and difficulty of swivelling. Poorest for group interaction.

**Single corner units**
Angle accommodates two conversationalists without knee-knocking.
Not easy for those on the ends, but can work for interaction among four people.
While several people still have to stand, better than straight slabs or pods for small-group interaction: those standing will probably not obstruct adjacent routes.

**Multiple corner units**
Best: accommodates a variety of demands.

**Circles**
Good for unassociated singles. Curve sets adjacent users slightly askew from each other, helping 'tuning out'.
Conversation possible between couples, but since they must swivel against the shape, less comfortable than straight slab. Poorer yet for third party who must balance on one buttock to stay in the act (the tighter the radius, the greater the problem). As bad as the straight slab, for group interaction.
Selected seating arrangements

Strict linearity
Distance from events for detached viewing, to enable seat to form a 'refuge'.
People on ends can swivel easily for conversation.
Person on end can turn back on immediate neighbours, to 'tune them out', without making eye contact with people on next bench.

1.2m max
3m min
1.2m max
3m min

Where rows of benches flank a passageway, place them at least 3m. apart, so that interaction between people sitting on opposite rows will not make the passageway awkward for others to use.

Right angles
Avoid clumsy overlaps.
Similar distances apply as with strict linearity.

Clusters
Vary as much as possible to accommodate many combinations of distance and orientation, including service for the occasional loner.

Source: Rutledge, 1980

Market as a series of small double-loaded streets, creating a high proportion of new edges within the space.

Seating is not the only means of encouraging people to colonise the centres of spaces. A pavilion building of public use - or even a monument (6) - could provide the necessary supports. At a smaller scale, market stalls and information kiosks can draw people to the centre, particularly if they incorporate seating and shelter (7,8).

Trees can form smaller enclosures within the main space: like edges, these can provide the combination of refuge and prospect which encourages people to claim the space. The base of the tree canopy must be at least 2.5 metres above ground level (9). To make a robust series of spaces between trees, plant them on a roughly square grid about 5 metres apart. This will form the outdoor equivalent of the 'average sized rooms' discussed in Design Sheet 4.5, each capable of supporting a wide range of activities without obstructing pedestrian movement. Do not worry that a grid pattern will seem monotonous: it is simple in plan, but complex in perspective (10,11).
4.11: Microclimate

The range of activities in an outdoor place - and hence its robustness - depends partly on its microclimate: particularly windspeed and sunlight. Begin by asking the local meteorological office for data on windspeed and direction, for the weather station nearest to the site.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Windspeed m/s</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calm, light air</td>
<td>0-1.5</td>
<td>Calm, no noticeable wind</td>
</tr>
<tr>
<td>Light breeze</td>
<td>1.6-3.3</td>
<td>Wind felt on face</td>
</tr>
<tr>
<td>Gentle breeze</td>
<td>3.4-5.4</td>
<td>Wind extends light flag, hair is disturbed, clothing flaps</td>
</tr>
<tr>
<td>Moderate breeze</td>
<td>5.5-7.9</td>
<td>Raises dust, dry soil, loose paper; hair disarranged.</td>
</tr>
<tr>
<td>Fresh breeze</td>
<td>8.0-10.7</td>
<td>Force of wind felt on body, drifting snow becomes airborne, limit of agreeable wind on land.</td>
</tr>
<tr>
<td>Strong breeze</td>
<td>10.8-13.8</td>
<td>Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant, windborne snow above head height (blizzard).</td>
</tr>
<tr>
<td>Near gale</td>
<td>13.9-17.1</td>
<td>Inconvenience felt when walking</td>
</tr>
<tr>
<td>Gale</td>
<td>17.2-20.7</td>
<td>Generally impedes progress, great difficulty with balance in gusts.</td>
</tr>
<tr>
<td>Strong gale</td>
<td>20.8-24.4</td>
<td>People blown over by gusts</td>
</tr>
</tbody>
</table>

Adverse ground level wind conditions are most frequently associated with buildings significantly taller than their surroundings.

Windspeed is important partly because it affects temperature. For example, a 50 kph wind at minus one degree centigrade has six times the cooling effect of still air at minus twelve degrees centigrade. Fig. 1 summarises the effects of windspeed on human activity, and therefore on the robustness of the space. The clear implication is that we should design to keep windspeeds below 5 metres per second.

To be absolutely sure that windspeed problems are minimised, use a wind-tunnel to experiment with possible improvements. This will require a model of the site and its surroundings, covering a scale radius of at least 100 metres, at a scale of at least 1:200. Figure 3 shows the type of information which such a test can contribute.

People tend to follow the sun across a space; seeking or avoiding it according to the climate. The amount and position of sunlight in the space depends on the latitude concerned.

These diagrams are available for different latitudes, and allow shadow projections to be calculated.

The areas of sunlight and shade can be altered by design adjustments at a variety of scales: building mass, open space width, level changes, trees or other features within the space.
Chapter 5: Visual appropriateness

Introduction
Our earlier decisions about planning and massing have determined what the design should look like in general terms. Now we must focus on its appearance in more detail.

This is important because it strongly affects the interpretations people put on the place: whether designers want them to or not, people will interpret places as having meanings. When these meanings support responsiveness, the place has a quality we call visual appropriateness.

When is this important?
Visual appropriateness is particularly important in the places which are most likely to be frequented by people from a wide variety of different backgrounds; particularly when the place's appearance cannot be altered by the users themselves. Both indoors and out, therefore, visual appropriateness is mostly important in the more public spaces of the scheme. So far as public outdoor space is concerned, it is particularly relevant to the outside of the buildings which define the public realm.

What makes the visuals appropriate?
The interpretations people give to a place can reinforce its responsiveness at three different levels:
- by supporting its legibility, in terms of form and use.
- by supporting its variety.
- by supporting its robustness, at both large and small scales.

Legibility of form
In Chapter 3, we designed the mass of the building to reinforce the legibility of the area in which it is located. The detailed appearance must now be designed to reinforce this objective. For example, if the building is intended to be visually integrated into its surroundings, it is important that users should interpret its detailed design as having a family resemblance to the buildings around it.

But there is a problem here: different groups of users may have different opinions about whether two given buildings share a similar character or not. One group may pay a great deal of attention to proportions, and to overall visual structure; whilst another may depend on more detailed cues: similarity in window and door design, for example.

Legibility of use
In Chapter 3, we considered how to locate uses to improve their legibility. The detailed appearance of the place must help people read the pattern of uses it contains. For example, a town hall should look like a town hall, and a house should look like a house, to as many users as possible. But here too there is a problem: what looks like a town hall to one group of people may look like a factory to others.

Or people may read it as a town hall, but still interpret it as an inappropriate kind of town hall: bureaucratic rather than democratic, for example. If a place is interpreted in this negative way, its users are far less inclined to adopt an active and exploratory attitude towards it. Its potential for responsiveness is correspondingly reduced.
Variety
In Chapter 2, we considered how to make it possible for a wide variety of uses to co-exist in an area. The detailed appearance of the buildings must help this to happen, by making the image of the area seem appropriate as a setting for each of the uses concerned.

There is a problem here as well. People may not mind having a town hall across the street, but if they interpret it as a factory, they may be less enthusiastic.

Large-scale robustness
In Chapter 4 we considered how a building could be designed to accommodate a wide range of uses. Its detailed appearance must reinforce this potential, by looking appropriate for all these uses.

Here there is yet another problem: how can a building be designed to look like several things at once? And how can it still make clear what it actually houses at any given time?

Small-scale robustness
At a smaller scale, Chapter 4 also considered ways of designing particular spaces within a building, or out of doors, so they could be used in a range of different ways. Thus a given house, for example, could be used by people with a wide range of different lifestyles. But this too raises problems: how can such a building be designed so that people from a range of different backgrounds will each see it as an appropriate home?

The role of detailed appearance
It should by now be clear that by overcoming these problems the detailed appearance of the scheme has an important role to play in supporting responsiveness: it is neither a mere by-product of the plan, nor a matter of artistic whim.

This idea that elevations have specific tasks to perform is an unfamiliar concept to most designers. To stop it being forgotten, it is necessary to write a detailed performance specification for the objectives which each of the scheme’s publicly-visible surfaces is to achieve. This is covered in Design Sheet 5.1.

How can these objectives be achieved?
To encourage these interpretations to be made, we must understand how people interpret places.

How do people interpret places?
People interpret visual cues as having particular meanings because they have learned to do so. But people do not learn in a social vacuum. A great deal of learning, both formal and informal, is shared by groups of people; whose members will therefore tend to make similar interpretations of a given place.

But members of different social groups may well make different interpretations of the same place. This happens for two main reasons:
- their environmental experience differs from that of other groups.
- their objectives differ from those of other groups.

For example, many British people have been brought up in streets like the one sketched below.

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- their environmental experience differs from that of other groups.
- their objectives differ from those of other groups.

For example, many British people have been brought up in streets like the one sketched below.
This is the predominant kind of housing which such people have experienced; so new buildings which contain similar visual cues, like the one sketched below, will probably be interpreted as housing.

But it is people's objectives which determine whether a building which looks like this will be interpreted as appropriate housing or not. For example, some groups may be intensely concerned with changing their social status, and may regard housing which takes its cues from the traditional street as inappropriately working class. For others, it may have a comforting familiarity.

This means that if we are to design visually appropriate places, using cues which different groups of users are likely to interpret as supporting legibility, variety and robustness, we have to enquire into the likely experience and objectives of the place's users, looking for visual cues relevant to each user group.

Which cues do we need?
To support legibility, we need cues which will be interpreted as relating the building concerned to its context: either reinforcing or standing out from the paths, nodes, landmarks, edges or districts concerned. We call these contextual cues. Variety and robustness, on the other hand, are both concerned with the ways in which the project is used. To support these qualities, we need cues which will be interpreted as appropriate to the various uses concerned. We call these use cues. Ways of finding appropriate cues of both kinds are discussed in Design Sheet 5.2.

Using the cues in design
Once these sets of cues have been found, the final step is to use them to attain the objectives outlined in Design Sheet 5.1; employing the contextual cues to achieve objectives about legibility, and the use cues to support objectives about variety and robustness.

Ways of using contextual cues are explored in Design Sheets 5.3 and 5.4, whilst Sheet 5.5 considers use cues. The final process of bringing all the cues together into a detailed design is covered in Design Sheet 5.6.

Design implications

How to achieve visual appropriateness

1. Take the design from Chapter 4 as the starting point for developing visual appropriateness.

2. Establish detailed objectives for each publicly-visible surface in the scheme, specifying which of the responsive qualities are to be communicated to each relevant user group (Design Sheet 5.1)

3. Find the necessary vocabulary of contextual cues and use cues needed to achieve these objectives (Design Sheet 5.2)

4. Consider implications of contextual cues in achieving objectives about legibility (Design Sheets 5.3, 5.4)

5. Consider implications of use cues in achieving objectives about variety and robustness (Design Sheet 5.5)

6. Employ contextual cues and use cues in the final design of each surface (Design Sheet 5.6)
5.1: Detailed appearance: a specification

We have already designed the location and massing of the various parts of the project to support responsiveness. The next step is to design its publicly-visible surfaces to communicate the project's variety, legibility and robustness to a wide range of users.

Begin by making a drawing to show all the surfaces - elevations, roofs and floorscapes - whose detailed design is to be considered at this stage. Axonometrics are quick and useful for showing all these surfaces on one drawing.

Next consider all the publicly-visible surfaces, one by one, to decide which qualities each surface should communicate to whom. For each surface work through the qualities one at a time, as outlined below; remembering that every quality is not necessarily relevant to every surface.

Variety
- consider all the surfaces in the scheme which might need special design attention to prevent the image of one proposed use being seen as an inappropriate setting by its neighbours.
- for each of these surfaces, define the development agencies which might be put off by an inappropriate setting.
- record the design objectives implied by these factors, as illustrated on the drawing below.

Legibility
Begin by recalling the decisions about legibility of form made in Design Sheets 3.5, 3.6, 3.7 and 3.8. Then consider each publicly-visible surface in the scheme, recording any of these decisions which are relevant to it, as illustrated in the example below.

To reinforce character of central Newcastle, and make clear role as major public building, to as many people as possible.
Mostly relevant at long range across River Tyne.

Small-scale robustness
- review the proposed uses of the indoor and outdoor spaces defined by each surface.
- consider all the interest groups using the building or outdoor space concerned; paying particular attention to those who might be dissuaded by an inappropriate image.
- record the design objectives implied by these factors, as illustrated on the drawing below.

To seem appropriate, as neighbour, to (i) small workshop tenants and voluntary sector developers, and (ii) potential residents (young singles and couples) and private and voluntary sector housing developers.

Roof:
To reinforce character of central Newcastle, and make clear role as major public building, to as many people as possible.

Wall:
To seem appropriate, as neighbour, to (i) small workshop tenants and voluntary developers, and (ii) potential residents (young single persons and couples) and private and voluntary sector housing developers. To reinforce visual character of edge set up by adjoining workshops, to as many people as possible. To seem appropriate for (i) exhibition use, to potential (mostly commercial) exhibitors, and (ii) small workshop use, to potential tenants and voluntary sector developers.

Floorscape:
To seem appropriate, to as many people as possible, as a setting for boating, strolling and river-watching.

Large-scale robustness
- review the likely future uses - as explored in Chapter 4 - for the interior and exterior spaces defined by each publicly-visible surface.
- consider the interest groups who would benefit from being aware of the place's potential for these uses (this will include developers, tenants and purchasers of space for the uses concerned).
- record the design objectives implied by these factors, as illustrated in the drawing below.

To seem appropriate for (i) exhibition use, to potential (mostly commercial) exhibitors, and (ii) small workshop use, to potential tenants and voluntary sector developers.

The full specification

Roof:
To reinforce character of central Newcastle, and make clear role as major public building, to as many people as possible.

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Floorscape:
To seem appropriate, to as many people as possible, as a setting for boating, strolling and river-watching.

By this stage each publicly-visible surface will have its set of objectives. The next step is to look for visual cues with which to achieve these objectives, as discussed in Design Sheet 5.2.
5.2: Looking for visual cues

Design Sheet 5.1 worked out how we want the scheme to be interpreted by various interest groups. The next step is to look for cues to support these interpretations. These cues are of two kinds:
- cues associated with particular places, which are needed to achieve objectives about legibility. We call these contextual cues.
- cues associated with particular uses, which are needed to achieve objectives about variety and robustness. We call these use cues.

**Contextual cues**

In Design Sheet 5.1, we considered each publicly-visible surface in the scheme, and decided whether to associate it with any particular path, node, landmark, edge or district. Now we must look for visual cues associated with any such context.

Begin by deciding where to look for these cues. Where the objective is to make the surface reinforce - or stand out from - a particular path or edge (as decided in Design Sheets 3.3 and 3.6) look for cues in that section of the path or edge from which the relevant surface can be seen, as sketched below.

Where the objective is for the surface to act as - or reinforce - a landmark (as decided in Design Sheets 3.3 and 3.8) look for cues in the area from which it will be seen, as sketched below.

Where the objective is to make the surface reinforce - or stand out from - some particular node or district, as decided in Design Sheets 3.4, 3.5 and 3.7, look in that area itself for cues to be used, and in adjoining areas, with which it might be confused, for cues to be avoided.

In each case, draw the relevant boundaries on a plan. Then walk round the relevant areas, looking for cues any recurring visual features which people are likely to notice. The list below, compiled from various studies from a variety of cultures and backgrounds, forms a useful checklist of noticeable features.

- vertical rhythms
- horizontal rhythms
- skylines
- wall details (material, colour, patterning etc.)
- windows
- doors
- ground level details

Work through all the factors in the list, noting in sketches or photographs any recurring forms which exist. It is important to record these cues in an organised way, so that they can easily be referred to when designing. A useful format is illustrated on the next page: it shows some of the cues to be used, and others to be avoided, to reinforce the character of a particular district.

**Use cues**

In Design Sheet 5.1, we worked out objectives about variety and robustness. Now we must find use cues to support these.

Most uses are associated with a variety of building images, each with its associated range of visual cues. For each of the objectives decided in Design Sheet 5.1, check through the list of relevant interest groups, to decide which of these building images is likely to be familiar to each group, and which they might aspire to: these are probably not the same. Again, check your own ideas about this with representatives of the interest groups concerned, so far as resources permit.

For each interest group, find as many examples of both the familiar and the preferred images of the relevant use as you have time for. Then use the checklist of noticeable features, as explained above, to generate a set of potential cues which could be used in design: the process is similar to that illustrated on the next page.

By this stage, we have focussed on the cues which are associated with the particular contexts and uses which are relevant to the objectives decided in Design Sheet 5.1. Various ways in which these cues can be used in different situations are discussed in Design Sheets 5.3, 5.4, 5.5 and 5.6.

It is difficult to predict which particular interest groups will notice which particular cues. To include cues relevant to a wide range of groups, therefore, aim for a design vocabulary which includes as many as possible of the different types of features listed above. Finally, consider whether any of the cues you have found might be interpreted as negative by any of the interest groups thought relevant to the particular objective concerned. If so, avoid these cues when designing.
Large scale cues

Typical of own district

Typical of adjoining districts

avoid where possible

Small scale cues

Typical of own district

Typical of adjoining districts

avoid where possible

Vertical rhythms

Horizontal rhythms

Skylines

Windows

Wall details

Ground level details
5.3: Contextual cues: the surrounding area

In Design Sheet 5.1, we decided whether the new surface should reinforce or contrast with the visual character of its context; which was itself investigated in Design Sheet 5.2. Now we shall explore ways of using cues to achieve either objective.

The cues which were found when analysing the visual character of the context, in Design Sheet 5.2, were of two kinds:
- elements (such as wall details, windows, and door and ground-level details).
- relationships between elements (such as vertical or horizontal rhythms, and skyline relationships).
Both elements and relationships can vary from being all similar to being all different. It is useful to consider the four key possibilities illustrated below:

A visual character formed by similar elements arranged in similar relationships is illustrated above (1).

In this situation, the introduction of new relationships and/or new elements will make the new surface stand out from its context (2).

To reinforce the existing visual character in this situation, use many of the existing elements and relationships in the new design (3).
When there are many relationships as cues, but few common elements, the visual character is formed by different elements arranged in similar relationships (7).

When there are few cues of either kind, the visual character is formed by different elements arranged in different relationships (10).

In this situation, contrasting elements will have more effect than contrasting relationships, in making the new design stand out from its context (5).

In this situation, altering relationships will have more effect than altering elements, in making the new design stand out from its context (8).

In this situation, a new design with either recurring elements or recurring relationships will contrast with the existing context (11).

To reinforce the existing character, use as many of the existing element cues as possible in the new design (6). But the relationships between them need only be tentatively decided: they can be adjusted later to make the design richer, as discussed in Chapter 6.

To reinforce the existing character, use as many relationship cues as possible (9). But the elements need only be tentatively decided: they can be adjusted to make a richer design, in Chapter 6.

To reinforce the existing character, it is important to avoid setting up similar relationships or similar elements within the new design (12).
5.4: Contextual cues: the adjacent buildings

This Design Sheet suggests how to use a new design to unite adjoining buildings of disparate character, when this has been decided as an objective in Design Sheet 5.3. The important cues are those from the adjacent buildings: it is they which have the most direct visual relationship with the new design.

Start with large-scale cues. If the buildings on either side have any such cues in common, use these as a starting point (1). If they do not, see if you can use some from one side, and some from the other (2).

A further approach is to use the new building’s large-scale cues to bridge between those of the buildings on either side (3).

Next consider the smaller-scale cues. There are two possibilities here:
- Use cues from both sides, but particularly from the side whose large-scale cues were least used (4).
- make gradual transitions between cues on either side (5).

These very different examples both show buildings used to unite the visual characters of those on either side (6, 7).
5.5: Use cues: supporting variety and robustness

This Design Sheet suggests ways of combining the use cues from Sheet 5.2 to achieve the objectives about variety and robustness developed in Sheet 5.1.

- Begin by analysing any large-scale patterns of buildings in the sets of cues for each use - skylines, vertical and horizontal relationships and so forth - looking for cues in one set which are similar to those in the others, and which could therefore be used to form the main visual structure of the design. This ability to recognise useful similarities is more of an art than a science: it develops with practice.

- Once the large-scale skeleton of the design has been established, work down through the smaller-scale cues - for example windows, entrances and ground-level details - again looking for similarities among cues for the various uses, to develop a detailed design for the surface concerned.

- Finally, check the resulting design - so far as resources permit - against the views of whichever interest-groups are relevant to the particular objective concerned.

The use of this process to meet the performance specification developed for the Newcastle example, in Design Sheet 5.1, is illustrated in the remainder of this Design Sheet.
In the process of choosing potential cues, as described in Design Sheets 5.3, 5.4 and 5.5, it will usually have become clear that some objectives can be met by a wide range of cues, whilst others can only be achieved with a very restricted range. To avoid abortive work when using the cues in design, it is important to begin by considering those objectives which can only be addressed with a restricted range of cues.

The first step, therefore, is to arrange the objectives in order, beginning with those which can only be addressed by a few cues, and ending with those which can be satisfied by the widest range. Once this has been done, start designing by selecting large-scale cues to satisfy the objective which has the most restricted range of appropriate cues. Then test whether the chosen cues are appropriate for the second objective, then the third, and so on; modifying the emerging design as necessary to meet as many of the objectives as possible. Then repeat this process with the small-scale cues, gradually building up the design in more and more detail, as illustrated in the example on this page and the next.

### 5.6: Contextual cues and use cues together

This Design sheet covers the complex situation which arises when we have to use contextual cues and use cues together, to satisfy the performance specification developed in Design Sheet 5.1.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Cases</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>To seem an appropriate continuation of the quayside edge character formed by the exhibition centre, to as many groups as possible.</td>
<td>Vertical rhythms: Exhibition centre verticals at 7m. centres (top). As yet, only verticals in flats are staircases, too widely spaced (bottom). Make intermediate verticals: domestic bays, one per flat.</td>
<td>Project stairs, with vertical bays for each flat.</td>
</tr>
<tr>
<td>To seem appropriate as housing to the widest possible range of single people and young couples.</td>
<td>Horizontal rhythms: Exhibition centre has each floor horizontally expressed. Use this as starting point. Horizontal divisions will help express individual flats, reducing institutional image. No problem.</td>
<td>Express the different floors, bringing out the ground floor particularly strongly.</td>
</tr>
<tr>
<td>To seem appropriate as part of Newcastle city centre from across river, to as many groups as possible.</td>
<td>Skylines: Skyline only seen across river at long range. Make mostly flat, as in exhibition centre. Flat skyline potentially institutional. Encourage domestic associations close to, with gables over bays. Bring out classical potential through grouping of bays and gables.</td>
<td>Make flat long-range skyline, with gables over pairs of bays.</td>
</tr>
<tr>
<td>To seem appropriate as an outdoor leisure setting, to as many groups as possible.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

To seem an appropriate continuation of the quayside edge character formed by the exhibition centre, to as many groups as possible.

To seem appropriate as housing to the widest possible range of single people and young couples.

To seem appropriate as part of Newcastle city centre from across river, to as many groups as possible.

In the process of choosing potential cues, as described in Design Sheets 5.3, 5.4 and 5.5, it will usually have become clear that some objectives can be met by a wide range of cues, whilst others can only be achieved with a very restricted range. To avoid abortive work when using the cues in design, it is important to begin by considering those objectives which can only be addressed with a restricted range of cues.

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### Objectives

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<th>To seem appropriate as an outdoor leisure setting, to as many groups as possible.</th>
</tr>
</thead>
</table>

### Windows

- Make windows reflect form of exhibition centre advertising display units.
- Use sliding sashes, proportioned as in local classical precedents.
- Many dwellings of all types use sliding sashes: no problems.
- Domestic classical associations quite appropriate for leisure setting: no problems.
- Make windows sliding sashes, with classical proportions.

### Wall details

- Make infill to bays, and under ground floor windows, coloured as exhibition centre stripes.
- Make rustications at ground floor, as in local classical precedent.
- Brick widely used for all housing types, but avoid dark colours associated with nearby run-down buildings.
- Classical associations may be too 'serious'. Emphasise lightness and colour in bays and staircases.
- Make walls of light-coloured brick, with rusticated ground floor. Infill panels coloured to reflect exhibition centre cladding.

### Ground level details

- Continue brick/block patterned paving along quay, as for exhibition centre.
- Ground level details cannot be seen across river: no problem.
- Imply private space for housing by changing paving to smaller scale, plus some planting, near building edge.
- Use paving patterns and trees to define static spaces for lingering.
- Make brick/block patterned paving, with approx 4m. bays, smaller scale near building edge, with trees at approx 8m. centres.
Quayside housing project, Newcastle, England
Chapter 6: Richness

Introduction
So far we have discussed ways of making major decisions about the layout and image of a building or outdoor place. But there is still room for manoeuvre in terms of detailed design. We must make the remaining decisions in ways which increase the variety of sense-experiences which users can enjoy. We call this quality richness.

Design for all senses
For most people, sight is the dominant sense. Most of the information we handle is channelled through our eyes, so a large part of this chapter is concerned with visual richness. But richness is not a purely visual matter: other senses also have design implications:
- the sense of motion
- the sense of smell
- the sense of hearing
- the sense of touch

How do users choose?
There are only two ways people can choose from different sense-experiences if the environment itself is fixed:
- by focussing their attention on different sources of sense-experience on different occasions.
- by moving away from one source towards another. The effectiveness of each method depends on whether the sense concerned can be directed in a selective way, or whether it picks up information indiscriminately, from all sides at once. The senses vary from totally indiscriminate to highly selective, as shown in the diagram below:

![Diagram showing selectivity vs. indiscriminateness of senses]

The sense of motion
Choice of kinetic experience can only be gained through movement, so kinetic richness implies different possibilities for moving through a place. It is therefore mostly relevant to large spaces: outdoor places, and circulation routes within buildings.

The sense of smell
Because the sense of smell cannot be directed, choice of olfactory experience can only be achieved by moving away from one source towards another. So this is another potential for richness which is only possible in relatively large places.

The sense of hearing
We have only limited control over what we hear: the act of hearing itself is involuntary; though we can distinguish between sounds, concentrating on one rather than another. Aural richness can be achieved in small spaces, therefore, but only at the cost of imposing it on everyone there. This means it is best restricted to spaces large enough for people to escape altogether from the sound sources involved.

The sense of touch
Touch is both voluntary and involuntary in character: we can choose what we want to touch merely by moving a hand, but only by moving away can we avoid being touched by a breeze or a sunbeam. So richness of surface texture can be packed into the smallest of spaces, but variety of air movement and temperature should be reserved for large ones.

Designing for non-visual richness
Because current design thinking is almost entirely preoccupied with visual concerns, there is little useful theory about designing for non-visual richness. This is an area where research is urgently needed: in the meantime, all we can offer is a series of examples, as starting points for further exploration. These examples form the subject of Design Sheet 6.1.

The sense of sight
Vision is both the dominant sense in terms of information input, and the one most under our control. We have only to move our eyes to change what we look at.

This gives visual richness a double importance: it is what the rest of this chapter is about.
Why is visual richness a problem?
The visual monotony of many recent environments is now widely recognised, so designers' and patrons' attitudes are changing. But after fifty years of neglect, the principles of designing for visual richness have been forgotten. With no principles to go on, designers can only base their work on examples of richness from the past.

The basis of visual richness
Visual richness depends on the presence of visual contrasts in the surfaces concerned. The most effective means of achieving such contrasts depends on two main factors:
- the orientation of the surface concerned
- the likely positions from which it will be viewed

The design implications of these factors are discussed in Design Sheet 6.2.

Using contrasts to achieve richness
By this stage in design, the surfaces of the scheme already contain visual contrasts, formed by the cues used for achieving visual appropriateness in Chapter 5. It is these cues which must be developed to gain further richness if necessary.

The richness already achieved in Chapter 5 depends on the number of visual elements present in each surface, and on the relationships between them.

For example, if a particular surface consists of only one element, as illustrated below, it contains no choice of things to be looked at, and therefore no visual richness.

As the number of elements in a given surface increases, so does richness. By the time the surface contains about five elements, there is plenty of choice of things to look at, so the surface seems rich, as sketched below.

But when the number of elements exceeds a certain level, the various elements begin to be read together, as a single pattern or super-element. When this happens, richness of experience is reduced. As a rough guide, this is likely to happen when the number of elements concerned exceeds about nine, as sketched below.

In this situation, richness can be increased by making larger-scale subdivisions of the surface concerned, so that the elements will no longer all be read together, but are separated into groups of between five and nine. Below five, richness is low because there is insufficient choice of things to look at; while above nine, the whole ensemble will still be read as a single super-element, with no visual choice.

The practical implications of this rough-and-ready rule vary according to two key factors:
- the likely range of distances from which the surface concerned will be viewed.
- the length of time during which each view will be experienced.

The next step in designing for richness is therefore to assess these two factors for each of the surfaces concerned. This is covered in Design Sheet 6.3.
Viewing distance
The range of likely viewing distances affects the range of scales at which richness must be considered. Where the surface will be seen at long range, large-scale richness is necessary; whilst at close range, richness must be achieved by small-scale elements and subdivisions. So to maintain richness from long-range to close-range we need a hierarchy of elements from large-scale to small-scale. This topic is explored in Design Sheet 6.4.

Viewing time
Where people are likely to view a particular surface from a given position for a long time, it is important that the surface concerned should continue to seem rich for as long a period as possible. Ways of achieving this are discussed in Design Sheet 6.5.

The cost of richness
Richness does not always cost more than plainness. Surprisingly often, plainness requires an additional skin to be added; or visual simplicity is achieved by complex and expensive secret fixings. In practice, though, close-range richness often does cost more. This is not surprising: neither designers nor builders are used to it nowadays, and it takes longer to design. Extra construction costs will be minimised by our policy of designing richness only for relevant viewing positions. In this way, we shall ensure that any extra money is spent in a cost-effective way. But it is important that the techniques and materials we use are also as cost-effective as possible.

Techniques and materials
In the past, close-range richness was feasible only because craftsmen were paid very little. Happily, this is no longer the case: for most buildings, we must find ways of enriching places which take advantage of modern production techniques, and accept modern labour costs. Some feasible approaches are listed below:
- when using mass-produced components, consider the range available, rather than arbitrarily repeating a single element.
- consider revealing construction and fixings, rather than hiding them.
- for close-range richness, use materials with inherent surface variety.
- consider how richness might be increased by harnessing the builder's initiative.
- recycle craftsmanship: re-use the richness from the past, which we can no longer afford.

The Design Sheets which follow show examples of these approaches.

Design implications

How to achieve richness

1. Take the detailed design from Chapter 5 as the basis for developing further richness.
2. Decide which locations have potential for non-visual richness, and design for kinetic experience, smell, hearing and touch (Design Sheet 6.1)
3. Analyse the various surfaces of the scheme, to assess the most appropriate strategies for achieving visual contrasts (Design Sheet 6.2)
4. Analyse likely viewing distances and times for each surface, and the relative numbers of people concerned (Design Sheet 6.3)
5. Develop each of the surfaces designed in Chapter 5; increasing its richness, if necessary, over its full range of viewing distances (Design Sheet 6.4)
6. Develop extra richness for those surfaces which are likely to be viewed for long periods (Design Sheet 6.5)
7. Check feasibility in terms of materials and techniques, and amend design if necessary.
6.1: Non-visual richness

Current design thinking is almost entirely preoccupied with visual concerns: there are very few places designed specifically for the non-visual senses, and still less theory about how such places could be designed. This is a topic which urgently needs investigation: in the meantime, all we can do is offer some examples, as a starting point for further exploration.

**Sense of hearing**

In this house by Charles Moore, the floor finishes are designed to make different sounds underfoot, whilst the volumes of the various internal spaces are designed to provide a variety of reverberation times. The result is a rich acoustic environment throughout the house as a whole.

**Sense of touch**

Portland Square, by Lawrence Halprin, uses water to provide a rich range of tactile experiences. This is also achieved in Helen Teague's project for an infants' school, with its variety of different floor textures and door handles.

**Sense of smell**

A large formal herb garden seen through a narrow doorway cut into a high yew hedge. The beds are filled with highly scented plants, whose aroma is concentrated within the wind-free hedged enclosure. In urban places, remember the potential of cafes, bakeries and the like: give them the opportunity of opening up to the space outside.

**Sense of motion**

The Centre Pompidou, by Piano and Rogers, uses escalators to provide a variety of movement sensations; experienced in relationship both to close-up parts of the building itself, and to distant city views.
6.2: Visual contrasts

Visual events depend on visual contrasts, which can be created by differences of colour or tone on a two-dimensional surface, or by three-dimensional variations of the surface itself. The relative effectiveness of these approaches depends on two main factors:
- the orientation of the surface concerned
- the likely positions from which it will be seen.

Use contrasts of colour or tone on floor or ground surfaces which have to be flat (1); or on surfaces or materials which are unsuitable for three-dimensional modelling (2); or where a flat surface is all that can be afforded (3).

Horizontal projections are important to richness when people are likely to be walking parallel to the building, and near to its surface, as in street architecture (7). Richness at high level, from close to, also depends on such projections (8). From further away, high level richness depends most on vertical projections (9), usually visible only in outline or silhouette.

Use three-dimensional variations where strong light will sharpen contrasts (4); or where a self-coloured material lacks strong colour contrasts, or where a material is unsuitable for colouring (5); or in addition to colour in especially significant areas (6).
6.3: Viewing distances, numbers and times

Appropriate decisions about visual richness must take three main factors into account:
- the range of distances from which the various parts of the scheme can be seen.
- the relative numbers of people likely to see the building from each different viewing position.
- the length of time during which each view will be experienced.

To contribute to visual richness, elements have to be visible. What users can see depends partly on how far away from the building they are. So begin by analysing the range of distances from which each part of the building can be seen. Remember the viewpoints of the occupants of adjoining buildings (1, 2).

To make sure that investment in richness is used to the best effect, it is important to know the relative numbers of people likely to experience each of the views noted so far (3). Note also any surfaces which may be viewed for long periods, for example by people waiting for buses; or, at closer range, by people waiting to be admitted at entrances (4).

Record the viewing distances, numbers and times on the elevations developed in Chapter 5 (5). The next step is to design appropriate levels of richness for the various situations thus defined. This is covered in Design Sheets 6.4 and 6.5.
6.4: Implications of viewing distance

In Design Sheet 6.3, maximum and minimum viewing distances were noted for each part of the building. This information must now be used to design appropriate levels of richness for each of the areas concerned.

Begin by considering the maximum viewing distance for each surface concerned. Draw the surface to the size it will appear when viewed from that distance (1).

If, when drawn to this size, the surface shows less than five distinct visual elements, then redesign it to include more, up to a maximum of nine (2). If it has more than nine, then redesign it to group some of them together, to read as having between five and nine elements (3).
Next draw the elevation to about three times the previous scale, showing all the elements which are visible at this scale. Check how many elements are revealed.

If less than five, subdivide into between five and nine sub-events. If more than nine, then group some of them together (4).
Continue to redraw the surface concerned, to approximately three times the previous scale (5). At each stage, check the subdivision of elements as previously described. Continue this process until you reach a scale appropriate to the shortest viewing distance.

Finally, check the effects of viewing angle on richness: if many visual events are masked, add more in the form of projections, as described in Design Sheet 6.2, but again working within the vocabulary of cues developed in Chapter 5 where possible.
6.5: Implications of viewing time

Where people are likely to view a particular surface from a given position for a long time, as pin-pointed in Design Sheet 6.3, then the design from Sheet 6.4 should be developed still further. It is important that the surface concerned should continue to seem rich over a long period. This can be achieved in three main ways:
- through greater visual complexity.
- through visual riddles.
- through interpretation.

These examples show surfaces designed with a high level of visual complexity, within which many alternative patterns can be discovered over time.

French Revolution monument, Ljubljana, Yugoslavia.

Visual riddles, as in these examples, engage people's creative imagination in making sense of them. Why is that one stone out of place? (2). And why does that old sculpture appear in the middle of this window? (3).

In these examples the surfaces are made to yield more information by the addition of extra interpretative material.

This example shows the elevation designed in Sheet 6.4, developed by using all three of the approaches outlined above.
Chapter 7: Personalisation

Introduction
In the previous chapters, we have covered ways of achieving the qualities which support the responsiveness of the environment itself, as distinct from the political and economic processes by which it is produced. This is not because we do not value the 'public participation' approach: from our point of view, it is highly desirable. But we have already explained that even with the highest level of public participation, most people will still have to live and work in places designed by others. It is therefore especially important to make it possible for users to personalise these existing environments: this is the only way most people can achieve an environment which bears the stamp of their own tastes and values. Paradoxically, this calls for considerable effort from the place's original designer. This chapter is about how to apply that effort in the most effective way.

Personalisation and legibility
There is a secondary reason for supporting personalisation: it makes clearer a place's pattern of activities. This is particularly valuable in robust environments, accommodating a wide variety of uses, changing over time. By encouraging each user to dress the building differently, personalisation can make each use explicit.

Current trends
Personalisation seems to be increasing nowadays, partly because of an ever-increasing range of cheap ways of changing buildings' external appearance. Under certain circumstances, the combined effects of these changes become a political issue: the kind of transformation shown below generates heated planning debates about control versus individual choice.2

Types of personalisation
Users personalise in two ways:
- to improve practical facilities.
- to change the image of a place.

Chapter 4 has already covered ways of enabling users to adapt buildings' practical facilities, so in this chapter we shall concentrate on personalising the image of a place.

Why personalise images?
People personalise a building's image for two main reasons:
- as an affirmation of their own tastes and values: affirmative personalisation
- because they perceive its existing image as inappropriate: remedial personalisation

From our standpoint, affirmative personalisation must clearly be supported. Sometimes, designers deliberately encourage remedial personalisation, designing inappropriate images to incite personalisation3.

This is only a problem where personalisation is not thought through as an integral part of the original scheme: we shall return to this later in the chapter. First we must explore the process of personalisation itself, and how it can be encouraged.
Constraints on personalisation
Personalisation is affected by three main factors:
- tenure
- building type
- technology

Tenure
Personalisation is unlikely to happen unless the user of a place has a claim to its occupation, whether by custom or legal fiat. The way this claim is controlled - particularly by the building's owner - has radical effects on whether and how personalisation takes place. The balance of power between user and owner is set by the tenure system:

Tenure affects two key aspects of personalisation:
- the money spent on it
- its permanence

Though designers will know the initial tenure of their projects, remember that the robust buildings we advocate will probably change their tenure system over time. Since it costs little more to encourage personalisation, architects should allow for the full range of tenure, except for specialised building types where tenure is unlikely to change.

Building type
People mainly personalise places they regularly use for long periods: in practice, homes and workplaces. Nearly all buildings, at least in part, contain either homes or workplaces, or may do so in the future. Most buildings, therefore, should be designed to encourage personalisation.

Though most buildings should encourage personalisation, all but the smallest have public areas which will probably not be personalised because nobody stays there long enough. These places are often the areas of most public significance, and their lack of personalisation will call for extra richness, as covered in Chapter 6.

Technology
Supporting personalisation includes making it physically easy. This means that the technology of the design should be well-matched to the expertise of the likely users. Since expertise is hard to predict, it is best to use materials and techniques which unskilled people can easily master, at least where personalisation is most likely.

Where does personalisation happen?
In personalising a place, users are both confirming their tastes and values to themselves, and communicating them to others. The former occurs mostly inside a user's space, and the latter across its boundary, real or implied. This boundary separates the user's private domain from the public realm: it enables us to make the important distinction between private and public personalisation.

Private personalisation
The physical elements supporting personalisation within a space consist of internal surfaces and focal elements. These are covered in Design Sheet 7.1.
Public personalisation
Some personalisation communicates across the private/public boundary, affecting the public realm. This mostly happens at physical gaps in the boundary:
- thresholds (covered in Design Sheet 7.2)
- windows (covered in Design Sheet 7.3)

Public impact
If a building is not designed specifically to accept it, a high level of personalisation may be detrimental to its public role; eroding the balance between pattern and variety sought in Chapter 6. Personalisation may overwhelm too fragile a pattern altogether.

Patterns of personalisation
Personalisation is not random. People personalise only the space they control, so - as the above picture shows - patterns of personalisation reflect patterns of tenure. These are predictable: even with highly robust buildings it is not difficult to establish the most likely possibilities. Once this is done, the probable effects of personalisation can roughly be estimated, to see whether they are likely to disrupt the qualities already designed into the scheme. Design Sheet 7.5 explores how this can be done, and how the design might be modified to encourage personalisation without destroying either visual appropriateness or richness.

Design implications
How to encourage personalisation
1. Take the design from Chapter 6 as the starting point for developing the project to support personalisation.
2. Develop the detailed design of internal surfaces (Design Sheet 7.1)
3. Develop the detailed design of thresholds, both internal and external (Design Sheet 7.2)
4. Develop the detailed design of windows (Design Sheet 7.3)
5. Develop the detailed design of external surfaces. Assess likely effects of publicly-visible personalisation, and amend the design if necessary (Design Sheet 7.4)
7.1: Internal walls

Internal walls can be personalised in two main ways:
- by decorating their surfaces
- by using them as display settings

For convenient display, the wall should be easy to fix things to. The core material should be soft enough to take 'hammer and screwdriver' fixings, but hard enough to carry extensive shelf units. Smooth flat surfaces are best for wallpapering. To make this easier, opportunities for picking out details in different colours - which require articulated surfaces - are best at tops and bottoms of walls. Picture rails make it easy to hang things and - if wide enough - can be used as display shelves.

Picture rails can also define an ambiguous zone between ceiling and wall, which can be painted in with either; thus providing easy opportunities to change the apparent proportions of the room (2,3). Some low-level projections, such as radiators, may be unavoidable for practical reasons. They should be flat-topped so that things can be stood on them. Grooved tops allow plates and photos to lean without special supports (4) but are still OK for books. Where fireplaces occur, they have special significance for display; lending the symbolic importance of the hearth to objects placed on them (5).
7.2: Thresholds

A threshold is a physical link between different people's domains. It is therefore a key area for the display of a person's or group's own values.

In housing, front gardens offer the largest scale of threshold space, so include them where possible (1). Where this cannot be achieved, small unit paving at the building edge can easily be adapted for planting (2).

Porches offer scope for 'picking out' (3) and make potential spaces to shelter objects on display (4): if you omit them, leave clear wall spaces around the front door to allow later additions (5). Walls adjacent to front doors are also frequently personalised, even in non-residential buildings, so fixings should be made easy here.

Threshold spaces to front doors inside buildings can also support personalisation (6). The more private thresholds to individuals' rooms will be more squeezed for space, but display over the door may be possible (7). The door construction itself is also important: exposed construction lends itself to picking out, and makes it obvious where to fix embellishments.
Like thresholds, windows are important for personalisation because they form physical links between private and public worlds. They offer three main kinds of potential:

- for display through them
- for external display associated with them
- for alterations to the windows themselves.

There are three main kinds of display from inside: objects stood on the cill, things suspended from the head and curtains. Cills should be of hard rot-proof material, wide enough to take plant-pots etc. (1). Heads and jambs should take fixings easily. Internally, leave space over the windows for pelmets, and at the sides so that curtains can be drawn right back (2).

External displays are usually window boxes or shutters. Shutters affect window spacing (5). Window boxes affect how the windows will open. They must open for cleaning and plant maintenance, but should not open outwards to avoid damaging plants - if these are to be visible from inside - or inwards because of internal cill displays. Sliding windows - vertical or horizontal - are therefore best. Building in fixings for window boxes can remind users of the possibility, and add richness even when not used (6).

Small objects can look lost in a big pane of glass. Glazing bars can be used to frame them appropriately, but remember that people often display a single main object centrally placed: avoid obscuring it with a central glazing bar (3). Curtain displays are almost invariably symmetrical, and look best against a symmetrical arrangement of glazing bars (4).

Despite their other advantages, glazing bars limit painted displays on the windows themselves (7). Window frames which need painting give opportunities for personalisation through colour selection: as with doors, the more complex they are, the greater the opportunities for 'picking out' (8). But do not take this to extremes: limit the areas requiring maintenance and make it easy to carry out, on upper floors, from inside.
7.4: External surfaces

External surfaces should be designed to encourage personalisation. But when the surfaces are publicly visible, they should also be designed so that personalisation will not destroy the visual appropriateness and richness developed in Chapters 5 and 6.

Some parts of a building's external surfaces are more easily accessible than others (1,2,3): it is here that opportunities for personalisation are most available to the ordinary user.

External surfaces which require maintenance give automatic opportunities for personalisation (4). These are increased if the areas concerned are articulated to support picking-out (5). But balance the proportion of such surfaces against the costs of maintenance. And remember that large wall areas which need maintenance will interfere with opportunities for personalising the surface with climbing plants (6).

On a drawing, simulate the types and degrees of personalisation which you think people are likely to carry out. Check whether any of the design characteristics which are important for visual appropriateness might be obliterated (7). If so, reinforce them with as many design features as possible. Even if some features are changed, this reinforcement will increase the likelihood that enough will remain to make the visual appropriateness read through.

Where key features are positioned between different users, even the fiercest personalisation is unlikely to obliterate them (8).
Chapter 8: Putting it all together

Purpose
This chapter works through the Design Sheets, in the order followed in the previous sections of the book; showing how our approach can be used to design a complex project on a large city-centre site.

The site
Covering an area of 5.6 hectares, the site lies near the centre of Reading: a thriving town with a population of about 150,000, some 30 miles west of London, along the M4 motorway to Bristol.

The site adjoins the southern edge of the town’s commercial centre. Its southern boundary is formed by a major inner distribution road, giving good road linkage to the rest of Reading, and to other towns nearby. Bridge Street - which links this distribution road to the heart of the town centre - bisects the site itself.

Historical background
For the last two centuries the site - once an area of marshland adjoining the River Kennet - has been used by a brewery. Originally, the brewers were attracted to the area by the ready availability of water; necessary both for the production process and for transport. Neither of these factors is important nowadays, and the brewery has now moved its production areas to another site on the outskirts of the town; thus releasing its city-centre site for redevelopment.

As yet, however, the site has not been cleared: it still contains a variety of buildings, mostly from the nineteenth century. Three of them - a house attributed to Sir John Soane, a fine maltings and a former stable block - are listed by the Department of the Environment as having special architectural and historical importance.
Design aims

Naturally enough, the opportunity to redevelop such a large site so near the town centre has aroused a great deal of debate in both commercial and environmental circles. Our own intention is to design a responsive piece of town, whilst still generating a land value acceptable to the brewery, and giving a normal level of commercial profit to the development agencies involved.
The starting point for a permeable scheme is the existing system of links into and through the site from the surrounding areas. This sheet analyses links between the site and the city as a whole, and links with the immediate local surroundings.

Figure 1 explores the relative importance, in both city-wide and local terms, of all the site’s potential links. Clearly it is crucial to connect any new scheme into those links which achieve a high score in this analysis; though in the case of this particular site, there is at this stage no reason not to connect to all the existing links. It is particularly important to maintain and develop the pedestrian connections through the south and west edges of the site, to prevent the Inner Distribution Road forming an impermeable barrier.
Links to the site: current situation

This sheet and the next illustrate the point at which each link joins the site itself, noting any significant implications from the previous analysis. The letters which denote each link are the same as those used in the analysis.

A. St Mary's Butts
The major vehicular link to north Reading and to the northern section of the Inner Distribution Road.

B. Chain Street
Typical of the narrow streets running north-south through the central shopping area. The most direct pedestrian connection from the site to the shops in Broad Street.

C. Yield Hall Lane
A narrow street joining Minster Street close to its connection with shops in Broad Street and King Street. Currently used as access to a multi-storey car park on our site.

D. Thorn Lane
A narrow link to the existing shopping area. Less direct than B or C.

E. Queens Road
The major vehicular link to east Reading, continuing the southern section of the Inner Distribution Road. Well connected to the local area to the east of the site.

F. London Street
A major vehicle link to south Reading.

G. Crossland Road
An alley which bends to join Letcombe Street, for service access only. The least important link to the site.
H. Letcombe Street
Joins Southampton Street, but also useful for local connections.

I. Southampton Street
As the name implies, a major vehicular link to the south.

J. Subway
Runs under the Inner Distribution Road to Katesgrove Lane. An important pedestrian link to housing south of the site. At present, does not extend across the river into the site.

K. Towpath
Runs under the Inner Distribution Road. Eventually links to housing areas to south and west, so should remain as a useful pedestrian link: it is particularly important to reinforce the limited connections across the Inner Distribution Road.

L. Footbridge
Runs over the Inner Distribution Road, to Coley Place. Again, this link is important since it is now the only pedestrian connection to the large housing areas to the west of the site.

M. Towrite's Yard
Vehicle access to Castle Street, and thence to the Inner Distribution Road. The only potential vehicular access to west Reading. Well connected to the local area west of the site.

N. Vachel's Almshouses
Pedestrian access to Castle Street.

O. Gap through Castle Street
A minor link for vehicles, but useful as a pedestrian route to and from the nearby Civic Centre.
The street/block system

Having analysed the system of links, the next step is to connect them to a preliminary street/block structure within the site. Since the uses to be included in the scheme have not yet been established, it is not possible to decide street widths and junction designs, nor to check block sizes.
Uses and their compatibility

Having established a preliminary street/block system, the next step is to consider the variety of uses to be included in the scheme. To investigate demand, we consulted estate agents, and representatives of the local authority and various local organisations. The results of these enquiries suggested demand for the following uses:

- shopping.
- offices.
- residential (from small flats to 3-bedroom houses).
- indoor leisure facilities.
- TV studio/community theatre.
- canal basin.
- pubs.
- car parking.

Data from the various interviews were recorded on the pro-forma illustrated on the right. The likely interactions between the various uses were explored in the matrix below, which suggested the strategic location of uses sketched out on the next page.
Having analysed the likely interactions between the various uses proposed for the scheme, the next step is the strategic allocation of uses to approximate locations in the street/block system.
The shopping layout

Once the various uses are roughly located within the street/block system, it is time to pay particular attention to the positioning of magnets to support any secondary uses which need pedestrian flows.
Having established a revised layout to support variety, the next step is to check whether or not the proposal is financially viable.

The data for calculating the costs and values of the various elements in the scheme were taken from builders' price books and from estate agents, as discussed in Design Sheets 2.4 and 2.5. These data, together with the formulae for calculating total costs and values, were then put into a 'Visicalc' electronic spreadsheet, using an Apple 2-plus micro-computer. This enabled the economic feasibility of the scheme to be continually monitored as the design developed. A print-out from the Visicalc is shown below.

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<th>NUMBER</th>
<th>GROSS AREA</th>
<th>NET AREA</th>
<th>LAND PRICE</th>
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Reference Design Sheets 2.4, 2.5 and 2.6
Street classification and dimensions

With the exception of Bridge Street, all the streets in the scheme are classified as access roads. Because of the different uses to which they give access, these are further classified into all-purpose and residential access roads.

Carriageway widths

Each access road carries a different intensity of traffic. This must be calculated, as shown in Figure 1, so that carriageway widths can be determined.

Junction spacings

Most of the junctions in the proposed layout are already satisfactorily spaced for the street types concerned: only those onto Bridge Street are open to question. However, our own traffic consultants suggest that the use of mini-roundabouts - already proposed, by the highway authority, for the existing Bridge Street junctions - should make the new junctions feasible. This will need detailed negotiation with the highway authority as the design develops.

Detailed junction design

Allowing for the traffic-slowing effects of the mini-roundabouts on Bridge Street, all the necessary set-backs, visibility splays and junction radii can be accommodated in the design of the footpaths concerned. There is no need to alter the building lines already proposed.

The pedestrian network

Nearly all the streets are designed for combined vehicular and pedestrian use. They will later be designed in detail so that vehicles will not dominate pedestrian users. Because of the limitations of some of the existing accesses to the site, and the positions of existing buildings to be retained, some pedestrian-only routes are unavoidably proposed. All of them, however, are treated as truly public spaces, defined by building fronts.

In addition, the new shopping routes are restricted to pedestrian use to meet the developer's requirements. These are nonetheless wide enough to become combined pedestrian/vehicle spaces should the opportunity later arise.

Reference Design Sheet 1.3

<table>
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<tr>
<th>Peak hours</th>
<th>Non peak hours</th>
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</thead>
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<td><strong>Office</strong></td>
<td></td>
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<tr>
<td>0.5 Bridge Street (west)</td>
<td>271sq.m. gross</td>
</tr>
<tr>
<td>1.0 New Fobney Street (south)</td>
<td>712sq.m. gross</td>
</tr>
<tr>
<td>0.5 Short stay car park</td>
<td>30 spaces</td>
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<tr>
<td><strong>Housing</strong></td>
<td></td>
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<tr>
<td>0.5 Fobney Street (north)</td>
<td>11</td>
</tr>
<tr>
<td>0.5 Housing/flats (west of Fobney Street)</td>
<td>51</td>
</tr>
<tr>
<td><strong>Total vph</strong></td>
<td>1106</td>
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</table>

1106 vehicles per hour (vph) allows either
- 7.3m carriageway with restricted parking and access,
- 6.0m carriageway with no frontage access and no parking.

Argue for service traffic at non-peak hours.
Now that proposals for use-locations and street layout are firming up, it is necessary to check that the various blocks are of an adequate size to house the uses proposed for them.

This block contains only offices. It is 4 storeys high.

Total gross floor space (approx) = 7890 sq.m

Parking standard required: 1 car per 100 sq.m. nett floor space; of which 50% will be in multi-storey car park.

On site, therefore, we need 1 car per 200 sq.m nett floor space.

Average block dimension = (90 + 46) / 2 = 68 m. From graph above (see Design Sheet 1.4) parking standard available per car = 120 sq.m.

This is more than adequate, and allows extra space for planting, seating and so forth.
Summary: the scheme after considering permeability and variety

Office and residential
Both blocks contain offices on eastern side, towards Bridge Street, with residential. Some existing buildings retained. Mixed uses helped by subdivision into four blocks. Parking inside blocks.

Mixed-use block
Primarily office use incorporating existing Seven Bridges. Shopping on eastern side utilising major pedestrian flows.

Shopping use
Street frontage retained but block too small to develop. West side must be shops to link to major department store.

Retail block
Small unit shops on east and south sides. Magnet store on SW corner; essential to generate development of smaller shops.

Blocks combined
Existing link used as rear service access.

By this stage, the layout of streets and blocks has been decided in some detail, and the volumes of the buildings housing the various uses have been checked, to produce a financially feasible scheme. This plan summarises the design decisions made so far.

Residential block
Fronting onto canal basin and public square. Parking possible at rear.

Residential and Leisure
Too small for residential perimeter block. Develop canal basin to give prospect for adjoining housing, to counteract negative image of adjacent Inner Distribution Road.

Sports Hall
Rehab. of existing malthouse

New bridge
As access to multi-storey car park

Block too small
To be developed separately. Combine with car park but incorporate pedestrian link at ground level.

Mixed-use block
Unit shops on north and west sides to use pedestrian flows, residential on south and east overlooking river. As a result of funding restrictions, only storage over shops. But design to accommodate housing later.

Multi-storey car park
Essential to support shops. Easy vehicular connection to Inner Distribution Road. Sum allowed in feasibility calculations for relocation of Bus Depot which presently uses the site. Northern edge has single-aspect offices to animate riverfront

Mixed-use block
Offices on north and west, residential on south side overlooking river. Unit shops on east side to use pedestrian flows from car park. Servicing and parking inside block.

Leisure block
Island retained as open space with new pub.

Office block
Important corner site, but too small for anything but a pavilion building. Atrium form to allow necessary building depth.

Theatre/TV Studio
Money allowed for conversion of existing malt-house for Reading Enterprise group.
Legibility analysis

Now that the design has been developed to support variety, the next step is to consider the legibility of the scheme. As a first step, we analysed the legibility of the site and its surroundings as they exist at present.
Legibility checks

The next step was to check our own initial analysis of legibility against the views of other people. The results of the process are tabulated in Figure 1. This shows that the designer's own analysis predicted 8 out of the 10 most frequently-mentioned features; but the checking process greatly enriched the designers' eventual view of the site's legibility potential, as summarised on page 125.
District implications

The western part of the site is cut off from its eastern and southern surroundings, and is different in use from the district to the north of it: it was decided to treat this as a new district in its own right.

In order to encourage the shops to take off in an area not previously associated with shopping, the developers wanted the eastern part of the site to read as part of the established commercial district.

Figure 1 summarises these district decisions.

The central commercial district has strong path themes: the north-south streets have very much smaller dimensions than those running east-west. The forms of the streets were analysed, as shown in Figure 2, to arrive at a vocabulary of street forms to be used in the eastern part of the site.
Figures 1, 2 and 3 illustrate legibility decisions related to different types of nodes.

**The Triangle**
A space whose large size - necessary because of the existing car park and minor waterway - is inappropriate, in legibility terms, for its modest functional significance.

**Maltings Place**
A large space, appropriate in legibility terms for its high public relevance, but weakly enclosed by two-storey housing on two sides.

**The Oracle / Courage Street intersection**
A space of key significance to shoppers.

**Courage Street / Yield Hall Lane**
Because of its curved planform, the Courage Street / Yield Hall Lane sequence needs an additional marker. Figure 4 shows how this was positioned.
Summary: layout adjusted to achieve legibility

By now, the design has been developed to make it as legible as possible. The revised proposals are summarised in this axonometric.
A working model, quickly and cheaply made from scrap polystyrene, allows the emerging design to be evaluated from a variety of viewing positions.
Robust terraced housing

This sheet shows the decisions made to support robustness, in the design of the terraced houses and gardens on the south side of Maltings Place.
A robust block

This sheet shows the preferred building configuration advocated in Design Sheet 4.2, used to design the mixed-use block fronting Bridge Street, to the south of Courage Street.
Robust internal planning

The interior of the Bridge Street offices is now developed further, locating the hard and soft zones to promote large scale robustness.
Animating the car park edge

The public face of the Yield Hall multi-storey car park is animated by the addition of a single-aspect block of small flats, facing south-west over the river. The interface between the flats and the public space is designed to support a variety of outdoor activities.

Reference Design Sheets 4.3 and 4.7
This sheet shows how the project's largest public outdoor space is designed for a balance between pedestrian and vehicular use, at both public and residential scales.
Visual appropriateness: a performance specification

This sheet sets out the objectives to be achieved in designing the street elevations of the mixed-use block fronting Bridge Street, south of Courage Street.

Courage Street and Bridge Street elevations.

Objectives to support variety:
- to be interpreted, by the widest possible public, as a part of Reading's established commercial area.
- to be interpreted, by potential investment institutions, as an efficient modern office building.

Objective to support legibility:
- to be interpreted, by the widest possible public, as contrasting with Seven Bridges House.

Objectives to support robustness:
- to be interpreted as appropriate for domestic use, by potential residents of this area of the town.
- to be interpreted as an appropriate base by both large commercial and small professional office tenants.
- the ground floor to be interpreted as an appropriate base by potential office or shop tenants.
Using large-scale cues

Here the basis of the Bridge Street office elevation is developed, using large-scale cues to achieve the objectives outlined on the previous page.

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<tr>
<th>Objectives</th>
<th>Cues</th>
<th>Design conclusion</th>
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<tbody>
<tr>
<td>To be interpreted, by the widest possible public, as a part of Reading's established commercial area.</td>
<td>Vertical rhythms</td>
<td>Bays help 'domestic' interpretation. But must be implied (see commercial area precedent above) rather than physically projecting, to help internal planning.</td>
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<tr>
<td>To be interpreted, by potential investment institutions, as an efficient modern office building.</td>
<td>Horizontal rhythms</td>
<td>Many buildings with flats over shops - both new and old - have this type of horizontal rhythm. No problem.</td>
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<td>To be interpreted as an appropriate base by both large commercial and small professional office tenants.</td>
<td>Skylines</td>
<td>Make ground floor largely glazed. Stress horizontal divisions between ground and first floors, and between second and third floors.</td>
</tr>
<tr>
<td>The ground floor to be interpreted as an appropriate base by potential office or shop tenants.</td>
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</table>

- Vertical rhythms:
  - In existing commercial area, dominant verticals are bays at four to eight metres centres. Six metres will fit the office plan already developed: take this as starting point.
  - The house has no bays: a good contrast, so no problems.

- Horizontal rhythms:
  - In existing commercial area, dominant horizontal, run between ground and first floors, and between second and third floors. Take this as starting point.

- Skylines:
  - In existing commercial area, dominant skyline has dormers of varied designs. Use this as starting point, but imply with changes of material rather than major projections, to help internal planning.

Conflicts with 'modern' image. Use hi-tech enamelled steel to stress mansard behind dormers. Reinforce modern image with curtain walling to staircases: join to steel mansard via stepped gable.
Using small-scale cues

The further build-up of the Bridge Street office elevation, using small-scale cues to finalize the design developed on the previous page.

Objectives
To be interpreted, by the widest possible public, as a part of Reading's established commercial area.

Cues
To be interpreted, by the widest possible public, as contrasting with Seven Bridges House.

To be interpreted, by potential investment institutions, as an efficient modern office building.

To be interpreted as an appropriate base by both large commercial and small professional office tenants.

The ground floor to be interpreted as an appropriate base by potential office or shop tenants.

To be interpreted as appropriate for domestic use, by potential residents of this area of the town.

Design conclusion

Windows
In existing commercial area, windows are mostly vertical sliders, without intermediate glazing bars, in vertical openings between 1.5:1 and 2.5:1 proportion. Use this as a starting point.

Potentially too similar. To contrast, use tallest commercial area proportion and avoid intermediate glazing bars and timber construction.

Many modern offices use metal vertical sliding sashes: no problem.

This type of window is associated with both large and small tenancies: no problem.

No serious problem with domestic image, but keep windows as small as possible consistent with 'modern office' image: four per bay suits both flat and office plan.

Use four metal sliding sashes per bay, without intermediate glazing bars, in vertical openings about 2:1 proportion.

Wall details
Typical walls in existing commercial area are of horizontally-striped brick or stone. Colours red, yellow, white. Use this as starting point.

To contrast with red brick of Seven Bridges House, use yellow brick, or white block or stone, as wall material.

Problem: 'old-fashioned' associations. Could be overcome by emphasising 'modern' curtain walls in key positions: doors, access halls.

'Corporate' tenants can relate to curtain walling, 'professional' users to traditional elements. No problem, but needs care to get balance right.

No serious problem with domestic image, but keep windows as small as possible consistent with 'modern office' image: four per bay suits both flat and office plan.

Reading has many precedents for housing with brick, with contrasting striped brick walls. Blockwork likely to be interpreted as 'cheap': use mostly brick.

Make walls of yellow brick, with contrasting bands of brick or (in small quantities) facing block or light-coloured stone.

Door and ground level details
Existing commercial area has varied entrances: no obvious cues. Ground floor piers mostly square, in polished granite, with contrasting colours at base and head.

Largely glazed ground floor, with granite piers, will contrast strongly with Seven Bridges House. No problem.

To avoid granite piers being interpreted as 'old-fashioned', make infill glazing of obviously 'modern' design.

Vary entrance designs, to give small tenants their own unique front door. But vary within strong overall pattern (e.g. symmetrical) to help alternative interpretation as single large building.

Ground floor must support interpretation as shops or offices. A square grid of glazing has associations with both uses.

Make square piers in polished granite. Infill with hi-tech glazing, on a square grid. Vary entrance designs, within strong overall pattern (e.g. symmetrical).
Bridge Street offices: the final elevation
Non-visual richness

This sheet illustrates two places in the scheme which have particular potential for non-visual richness.
Analysing viewing positions

This sheet takes the Bridge Street elevation developed in the previous pages, and analyses the various positions from which it can be seen.
The elevation at various distances

Having worked out the viewing positions for the Bridge Street elevation, the next step is to make drawings to simulate what could be seen from the various distances concerned.

In both cases the numbers of elements are acceptable for richness, so no changes are required.

The next drawing required is at 1:20, this has been shown earlier, and so it is not repeated here. On analysis this drawing reveals too many similar elements in the ground floor, glazing.

The drawings below at 1:50, to the left side, too many similar elements in this ground floor, glazing. On the right side is shown our attempt to group them without undermining the objectives set up in Visual Appropriateness.

Reference Design Sheet 6.4
An office entrance

This sheet further develops the richness of one of the Bridge Street office entrances: a position where the building is likely to be seen at close range for considerable periods.
Interior personalisation

Design decisions to support the interior personalisation of the Maltings Place houses

- Space above window for pelmet.
- Sliding sash windows to allow window boxes. Timber bay framing for easy fixing of window display elements.
- Picture rails wide enough to be used as display shelves, with grooved tops to support plates and similar objects.
- High-level shelves, particularly good for display of glass objects seen against the light. Also helps to define window nook as alternative focus to the room (see Design Sheet 4.5)
- Alcove in brick walls convenient to locate and fix shelves.
- Wide tiled cill for display.
- Zone between ceiling and wall, which can be painted in with either, to change the apparent proportions of the room.
- Fireplace with shelves and niches for display.
- Panelled timber doors, which can be 'picked out' in different ways.
Exterior personalisation

This sheet shows the design decisions made to support the exterior personalisation potential of houses along the north side of Maltings Place.

Reference Design Sheets 7.2, 7.3 and 7.4
Notes

Introduction
1. This attitude is deeply ingrained in the tradition of modern architecture. It goes back at least as far as Gottfried Semper, and comes through very strongly in the ideas of Otto Wagner. For discussion of this aspect of Wagner's work, see Geretsegger and Peintner (1979).

Chapter 1.
1. See Dept. of the Environment and Dept. of Transport's Design Bulletin 32 (1977), Dept. of Transport's Roads in urban areas (1966), and Noble (1983). Unless otherwise stated, the tables in Design Sheet 1.3 are taken from the above publications. A key point to remember is that these standards are advisory rather than mandatory. They are currently (1985) under review, and research has raised a number of questions about them.

Chapter 2.
1. The many factors affecting the unequal opportunities for car ownership in Great Britain, for example, are explored in Bates (1978, 1981).
2. For further discussion of this topic, see Bentley (1983a).
3. For useful information on cost control, see Bathurst and Butler (1980). For the importance of time considerations, see Heery (1975).
5. See Markus (1979).
6. See, for example, Bowyer (1979).
7. For a discussion of this topic, see Barrett (1979).
8. For a comprehensive list of land uses and building types, see RIBA (1969).
10. For a comparison of different valuation approaches, and much other useful information, see Williams (1976).
11. The yield of an investment is simply the relationship expressed as a percentage, that the income derived from it bears to the capital price paid out for it. (Booth, 1984, 34).
12. See, for example, Spon (1984).
14. Because of Britain's uncertain economy, it is now the usual practice to make an additional allowance for the cost of short-term finance for a notional period - often taken as six months - during which the project is completed but as yet unlet. This extra cost of interest during the letting period is calculated as 100% of the total project cost, for six months, at the rate of interest used for the rest of the cost calculations.
   For example:
   Interest during letting period: 100% of £10,000,000 for 6 months at 12.75% = £637,500.
15. See Baker (1976). For information on the provisions of the Housing Act, 1980, which apply to registered Housing Associations, see Housing Corporation Circular 11/80 (Sept 1980).
16. The TIC system was introduced in 1982. TIC matrices for both rehab and new build are revised quarterly, and published by the Housing Corporation. For detailed guidance on preparing schemes for housing association development, see the current Housing Corporation Schemework Procedure Guide, which is frequently updated.

Chapter 3.
1. For a discussion of the value of achieving congruence between patterns of form and activity, see Steinitz (1968).
2. Lynch (1975) p 21, Fig 5.
3. Ibid, chapter 3.
4. Ibid, p169. Fig 56.
5. Ibid, pp 144 et seq.

Chapter 4.
1. See, for example, Tutt and Adler (1979) or Neufert (1980).
2. The importance of tradition and precedent in coping with complex problems is explored in Shilts (1981). A similar argument, related specifically to design problems, is put forward by Alexander (1971).
3. Duffy et. al. (1980).
5. For a discussion of this topic, see Whyte (1980).
6. Duffy et. al., op. cit.

Chapter 5.
1. For discussions of this important factor, see Bonta (1979) and Broadbent (1977).
3. This is explored in Douglas (1978, 1982).
4. See, for example, Berger and Luckmann (1966) and Moore (1983).
5. For an interesting example, see Hanson and Hillier (1982).
6. See Appleyard (1969) and Moore (op. cit.)

Chapter 6.
1. See, for example, Gibson (1966).
2. This concept is discussed in Miller (1956).
3. For an account of these aspects of the design see Filler (1978).
4. In Greenacre Park and Paley Park - two tiny spaces fronting busy vehicular streets in New York City - falling water is used to create white noise, countering traffic noise intrusion. On occasions when the water has been turned off, people have quickly begun to leave. Greenacre Park is discussed in Project for Public Spaces (1982). See also Whyte, op. cit. 143
Suggestions for further reading

Introduction
The Responsive Environments approach to design starts from the idea that there are important relationships between social life and the arrangement of the built environment. *The social logic of space*, by Bill Hillier and Julienne Hanson, gives a comprehensive account of the spatial aspects of this relationship. Although it is not an easy read, this book is of great importance to all architects and urban designers.

It is also important for designers to understand why the qualities which support responsiveness are so often difficult to achieve in modern designs. In the end, this is largely due to the operations of the powerful economic interests which fund the property development industry: a thorough and well-written account of how this industry works is presented in David Cadman and Leslie Austin-Crowe's *Property development*. A vehement critique of the development process, well worth reading, is put forward in *The property machine*, by Peter Ambrose and Bob Colenutt.

There is a sad dearth of attempts to explain how this development system affects the pattern of physical form. Alison Ravetz's book *Remaking cities* is the widest available exploration of this topic, and should certainly be read; whilst Ian Bentley's short paper *Bureaucratic patronage and local urban form* focusses on the relationship between the investment aims of large financial institutions, the physical forms of city centre buildings and public places, and current architectural ideas. Though sketchy, the same author's *User choice and urban form* is interesting because it relates the impact of institutional funding directly to the qualities of permeability, variety and legibility.

Permeability
It is helpful to understand the historical roots of the interests and attitudes which currently combine to reduce permeability. *The fall of public man*, by Richard Sennett, is a seminal book, and is essential reading. Though sketchy, the same author's *The uses of disorder*. Not specifically about architecture or urban design, this book nevertheless uses many built-form examples, and makes stimulating reading.

There is a disappointing lack of literature about practical principles for achieving variety, though both Dmitri Procos's *Mixed land Use* and Eberhard Zeidler's *Multi-use architecture in the urban context* give lots of examples at various scales. These books are both worth looking through, if only because of the boost to morale which comes from seeing that variety can still be achieved.

Part two of Jacobs's *Death and life of great American cities* is interesting because it relates the impact of institutional funding directly to the qualities of permeability, variety and legibility.
beyond what we ourselves have space for, see Architects' Journal's Funding for construction. A broader exploration of this topic is to be found in R.D.B. Booth's Early perspectives in the valuation of property. This is a clear, entertaining book. Written by a valuer, it scythes through the undergrowth of jargon which so often obscures the subject. It is also cheap enough to be on any designer's bookshelf.

Legibility
Our own rules of thumb for achieving legibility owe much to Kevin Lynch's pioneering book The image of the city. This should certainly be read: again, it is a cheap paperback which should be on every designer's shelves. Christian Norberg-Schulz, focussing on basically the same elements as Lynch, offers suggestions in Existence, space and architecture as to why these elements are important; and then illustrates them across a variety of scales. In addition, it is well worth reading Chapters 2, 3 and 4 of Barrie Greenbie's Spaces, for its interpretation - and illustration - of topics such as districts and paths.

For a wealth of historical examples of legible urban places - described measured and illustrated - it is hard to beat Camillo Sitte's The art of building cities. Long out of print, this is still available from libraries. Another ancient book long overdue for republication is Raymond Unwin's Town planning in practice; which has nothing to do with town planning as understood today. It is important because it observes and analyses historical urban places, deriving principles from them which it uses to achieve legibility in what, at the time, were new residential developments.

A more contemporary book of historical examples is Edmund Bacon's Design of Cities. This is a lightweight general reader on the development of urban form, but has some useful explanations, together with copious illustrations of the use of publicly-relevant buildings to promote legibility. Beware of its emphasis on enormous urban interventions.

Useful reminders about the importance of small-scale factors in achieving legibility are given by Gordon Cullen in his Townscape. It is difficult to discern any real structure to this book, but its value lies in the meticulous observation and illustration of ways in which legibility can be achieved at a detailed level. In addition, Townscape argues strongly that designers should consider the sequences in which places will be experienced by their users.

Cullen often points to the role of signs, trees and so forth in achieving legibility. For the use of signs, try Robert Venturi's Learning from Las Vegas: the principles are usually more valuable than the examples here. For trees, read Henry Arnold's Trees in urban design: highly recommended for its advice on how to use trees to define, emphasise and subordinate spaces. There are many illustrated examples, mostly from the United States, plus technical backup on issues like maintenance, economics and soil characteristics.

One of the greatest enemies of legibility is the currently usual tendency for designers to treat all projects as though they were of equal public relevance. All too often, this leads to every unimportant office block being designed as though it were the city hall. An excellent cure for this disease is to read The architecture of the city by Aldo Rossi, which focusses on the crucial distinction between publicly relevant buildings and spaces, and the rest of the urban tissue. Beware, though: from the responsiveness point of view, Rossi's ideas are far more relevant than his own projects.

Robustness
Many books and articles have been written on the subject of 'user control'. Mostly, however, these consider the patron as the user. In practice, therefore, the design ideas they promote consist usually of gadgets to save space or devices to make building management easier. Few of these have any real potential for increasing robustness from the user's point of view. For a wide-ranging account of how technology feeds on this ambiguity, see Mechanisation takes command by Siegfried Giedion. Housing flexibility, by Andrew Rabeneck and others, gives a good survey of well-intentioned proposals; but most of them fall into the trap outlined above.

Moving out of doors, an exhaustive account of how outdoor places are used is given in William Whyte's Social life of small urban spaces. This small book is the culmination of many years spent observing and recording, particularly in New York. The work is well illustrated and easy to read, with many practical suggestions about the design and management of small public places.

Whyte's work gave rise to an organisation called Project for Public Spaces Incorporated. Operating in the USA, PPS undertakes detailed design and management projects to help public spaces support a diverse range of activities. As part of this effort, PPS has published many reports and films. The list is too long to give in full, but the address to contact for details is given in our bibliography.

Much helpful advice about achieving robustness in larger outdoor spaces, such as parks, is given in Albert Rutledge's inappropriately titled book A visual approach to park design. Much more than a merely visual approach is put forward here, and the book offers useful methods for observing and recording how public places are used.

Several useful ideas for the design of the interface between buildings and outdoor spaces, as well as for detailed design within outdoor spaces themselves, are suggested in Christopher Alexander's Pattern language. This puts forward 253 patterns for the design of the built environment, intended for use by lay people and professionals alike. Patterns 69, 88, 92, 93, 105, 106, 114, 119, 124, 125, 126, 140, 160, 164, 165 and 166 all offer interesting problem statements and suggested solutions to issues concerned with robustness.

In many situations, one of the key issues in achieving robust outdoor spaces involves working out ways of enabling pedestrians and vehicles to co-exist in comfort. In The woonerf in city and traffic planning, Dirk Grotenhuis gives very detailed information about the philosophy, design, management and legislation needed to achieve spaces of this kind in the Netherlands. This booklet will help readers to gauge the possibility of making similar advances in countries where planning and highways legislation is less supportive. In convincing the relevant authorities, it will be helpful to know about the detailed assessments of how these places have worked out in use, given by the Netherlands Ministry of Transport and Public Works in their report From local traffic to pleasurable living.

Visual appropriateness
Our whole approach to visual appropriateness stems from the idea that definitions of 'good design' vary between different social groups, and that each of these different definitions is perfectly valid for the group which holds it. This is often quite difficult for professionally-trained designers to grasp. A useful first step for anyone who has this difficulty would be to read the clearly-written arguments put forward by Peter Berger and Thomas Luckmann in The social construction of reality.

The concept of reality as socially constructed is related
to the issue of aesthetics in Janet Wolff's *Aesthetics and the sociology of art*, which argues convincingly that matters such as aesthetics are strongly rooted in factors like class and cultural background. Wolff herself uses few specifically architectural examples, so it is also helpful to read Juan Bonta's *Architecture and its interpretation*, which gives a fascinating account of how radically different interpretations of the same buildings arise even within a specifically architectural subculture. Michael Thompson's *Rubbish theory* illuminates this situation by showing the financial payoffs which accrue to those trend-setters who can manage to manipulate the ways in which buildings are interpreted: buy it as a slum, sell it as part of the national heritage.

Because people's cultural experience plays a crucial role in the interpretations they make, it is useful for designers to be aware of the processes by which class and cultural background. An insight about the way interpretation works. But very few specifically architectural examples, so it is also helpful to read Juan Bonta's *Architecture and its interpretation*, which gives a fascinating account of how radically different interpretations of the same buildings arise even within a specifically architectural subculture. Michael Thompson's *Rubbish theory* illuminates this situation by showing the financial payoffs which accrue to those trend-setters who can manage to manipulate the ways in which buildings are interpreted: buy it as a slum, sell it as part of the national heritage.

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Books of related interest

Urban Design: Street and Square
Cliff Moughtin
A textbook and useful reference to the main elements of urban design: public buildings, streets and squares.
Spring 1992 224pp illus 220 x 220mm paper
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Robert Venturi
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Architecture

The authors – whose varied experience spans across architecture, planning, landscape architecture, urban design and property development – first examine what is meant by the concept of a ‘responsive environment’, and then provide a step-by-step guide on how to achieve it in real-life design. The book demonstrates the physical qualities that support users’ freedom of choice, in terms of how places can be used, understood and personalised.

The unique contribution of this book is to show – with copious sketches and diagrams – how social qualities such as these can be designed into buildings and outdoor places.