Survey Manual

Buildings & Urban Areas

2013

Space Syntax

Space Syntax

21 Brownlow Mews
London
WC1N 2LA
United Kingdom

T +44 (0) 20 7400 1320
F +44 (0) 20 7400 1333

london@spacesyntax.com
www.spacesyntax.com

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1 Introduction

This manual explains the rationale behind field observations and surveys. It explains the different methods used by Space Syntax Limited (SSx), and goes on to outline the theoretical issues, which underlie the field work.

At SSx field observations are adapted on a project basis. Observers should carry out their work according to the project brief given to them by the consultant. They should pay specific attention to the aims and objectives of the project, and have these in mind as they carry out the observations.

This is a manual of general procedures, and a theoretical background to field observations. It is not an inflexible standard.

1 .1 WHY WE OBSERVE

We observe in order to see how much we can learn about our surroundings without taking into account intent. If you asked individuals in the City of London about their pattern of movement, they would probably give you an answer in terms of the purpose of their journey. However, the purpose of an individual's movement within the urban landscape does not constitute the sum-total of the activity contained within it. Collective activity gives rise to a pattern of use and movement, which is independent of the intentions of the individual. Through observation, you can retrieve objective evidence about the built environment.

An important and valuable means of representing an urban area's prevailing conditions is to undertake a survey of the physical make-up of the area in question. This is, in fact, a research tool used across the disciplines, which can be especially powerful in representing a researcher's intuitions. The most common form of this type of representation is the land use map. For example, in the City of London many theoreticians and planners have intuitively believed that the attractiveness of Leadenhall Market is due to the retail facilities available in the area. This intuition is based on the area's observable characteristics, and has often been presented as a 'given'. Without objective evidence it remains only that: an intuition. It is only subjectively verifiable by going to the area and observing the characteristics for oneself.

By surveying the area's land use and by generating a graphical land use map we can make this intuition more objective. It is easy to verify that Leadenhall Market does in fact offer a unique density of retail facilities within its larger context. However, these are only representations, while such tools can objectively confirm a characteristic of an urban area, they are not an explanation of that characteristic.

1.2 BUILDINGS AS SEARCH STRUCTURES

Despite the fact that most of the techniques described in this manual are applicable to the analysis of buildings as well as urban areas, it is important to note the distinctive nature of studying building activity. Whereas the population in the urban fabric is generally composed of different groups of people, in buildings, on the other hand, the types of groups that inhabit them depend on the buildings' use. Spatial configuration within the building will then define the way that categories of users, in a more or less controlled way, relate to each other and give rise to the concepts of inhabitants and visitors, programmed and unprogrammed activity, and conservative and generative buildings.

Some building types are quasi-public spaces. Hospitals, for instance, and even more so railway stations, approximate urban space in the freedom with which the public can move and enter them. Although hospitals are growing more fearful of this phenomenon, and tend to fence off more sensitive departments such as maternity wards.

Compiling data using building observation methods gives a more rigorous and objective understanding of buildings as search structures - spatial configurations. It also leads to the idea of a search interface, where people negotiate the layout of a building and make choices in the light of the way the building configuration makes it more or less intelligible to its users - depth and rings. Observation is crucial to the understanding of how a building unfolds the various categories of users, and the way its layout restricts route choice or control access. This can have important theoretical implications in terms of building design for facilitating the beneficial outcomes of a building programme; interaction and co-presence among workers, and high-level social and economic outcomes, such as in the profit margins of businesses, innovation in laboratories and efficiency in hospitals.

1.3 INTERPRETING THE RESULTS

Observations are used to generate numerical data on space use and movement in urban areas. This data can then be correlated with the spatial variables. The most important variable is between integration and encounters (observed use and movement). The results of observation studies are used to research social variables: patterns of crime, the behaviour of adults and children. This is because integration (amongst other spatial variables) is an independent measure. The integration value of a space can produce the people (or the shops, or other functional variables), but the presence of more people, for example, cannot make space more integrated. An accurate way of describing space changes the nature of the questions that can be asked by controlling the architectural variable. We can use the results of the observations to more objectively represent our intuitions, or falsify those intuitions, and to begin to research and answer questions about space.

Does architecture affect human behaviour? We can say 'yes' to some things that we now know to be the case. First, the configuration of the grid gives rise to a stable structure of occupation and use, which can be dense or sparse, localised or global, predictable or unpredictable from the pattern of

spaces which mixes inhabitants and strangers together in different degrees. This, it seems, is what gives rise to cultural variation among towns. Cultural variation in spatial form is therefore a product of an underlying principle - that the pattern of movement and space use in a town is a function of its pattern of integration. The structure of the urban grid creates the encounter field. There is a natural background pattern of movement and space use which is created by the configuration of the urban grid and the disposition of the buildings within it. We know this from the sum total of applying research and observational methods in a way which provide us with an objective picture of the reality 'on the ground'. It is the theoretical/quantitative model of spatial analysis and observational representations, both graphical and statistical, which has lead to the fundamental findings published by researchers at the Space Syntax Laboratory at UCL.

1.4 QUALITY OF OBSERVATIONS

The size and type of the sample affects how accurately the data can represent reality. The accuracy and consistency are of paramount importance. As an observer make sure you understand what is required, and, if necessary, do a dry run of the study area or site, or a sample round, which will enable you to familiarise yourselves with its vagaries.

As an observer you are required to record data in as detailed a manner as possible; during the project brief you will be given an idea of what to do when the circumstances are different from those envisaged. If you still find that the circumstances do not allow you to record data properly (for instance footfall is too high and you are unable to count people correctly, or the study area is too large to be surveyed in the time you were given), contact the project manager and discuss the course of action. As an informed observer you will be expected to note down everything that may affect the normal patterns of movement, such as building works, street works, large tourist groups, etc.

2 Movement Observations

This section covers all methods of field work that record pedestrian movement in urban areas or buildings. The same methods can be applied, or adapted, to the recording of cyclists or vehicular movement patterns.

2.1 GATE COUNTS

Applicability

This method is suitable for recording moving people, bicycles or vehicles. It is not suitable for recording stationary people or parked vehicles. It is normally used in urban situations, but can equally be applied to the interior spaces of buildings. ‘Gates’ are the workhorse of spatial observing techniques. They generate a lot of data, which can then be represented graphically and statistically - provided they are applied with rigour, consistency and in many locations.

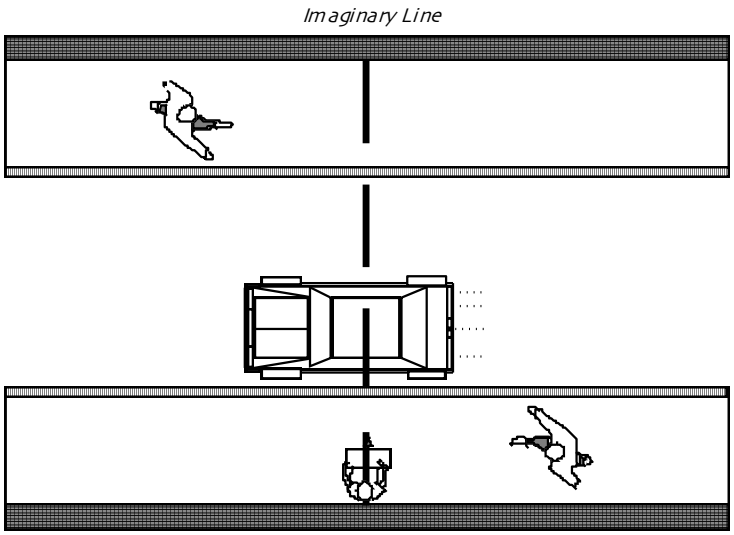
Method

Choose a number of street locations. These should cover a range of well-used, moderately-used and poorly-used spaces, in and around the area of study. There should be 25 ‘gate’ positions. The more gates, the more accurate the picture of movement patterns.

Procedure

Stand at each gate position and draw an imaginary line crossing the street space (the line should be at a right angle to the direction of the street). Count the people or vehicles that cross this line for a set period of time (see diagram overleaf). Count only the people or vehicles that have crossed the line.

The time periods vary from 2.5, 5 to 7.5 minutes depending on the busyness of the area: shorter times for busy areas and longer times for quieter areas. The time period should be as precise as possible down to the nearest second. Use a stop-watch, this will be given to you by the consultant, do not to rely on an ordinary watch. Always record the time period. This is so that when times are multiplied up to arrive at rates per hour no mistakes are made.



Observer position according to gate location

Record all observations on a prepared table. We recommend that you do a tally count (putting down one stroke for each person or vehicle) wherever possible, rather than keep a running total in your head. It will become impossible to keep the totals in your head especially when you are observing several different categories at once. There will be times when this is not possible, for example when people walk in groups, or come in 'waves' (for example exiting a bus). At such times keep a tally in your head and write down the number as soon as possible, and then go back to the tally count for individuals.

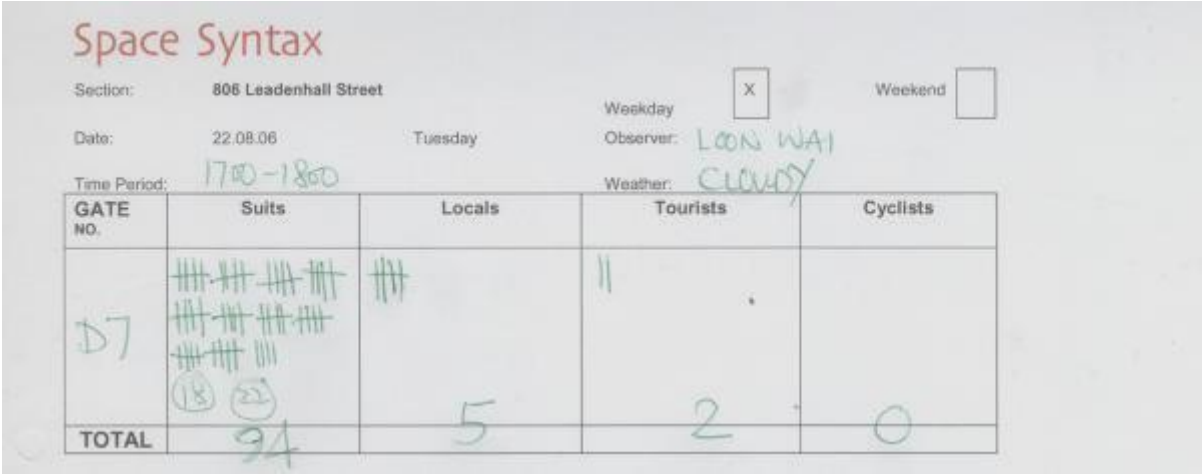
Different categories of pedestrians are often counted at the same time. Common categories are:

- moving adults, moving elderly, moving teenagers, moving children
- moving men, moving women
- moving 'suits' (working people), moving tourists, moving locals

Vehicles categories might include:

- cars, buses, light and heavy goods vehicles, motorbikes, pedal bicycles

This is not an exhaustive list. Categories will be tailored to the project you are working on. It may, however, be important to differentiate between walking people and people on bicycles in a study of Amsterdam. This would not be a useful breakdown in cities where there is little cycling and most people either walk or drive.



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Section: 806 Leadenhall Street Weekday X Weekend

Date: 22.08.06 Tuesday Observer: LOON WAI

Time Period: 1700-1800 Weather: CLOUDY

GATE NO.	Suits	Locals	Tourists	Cyclists
D7	94	5	2	0
TOTAL				

Observation sheet example

On quiet streets it may be possible to count people and vehicles simultaneously.

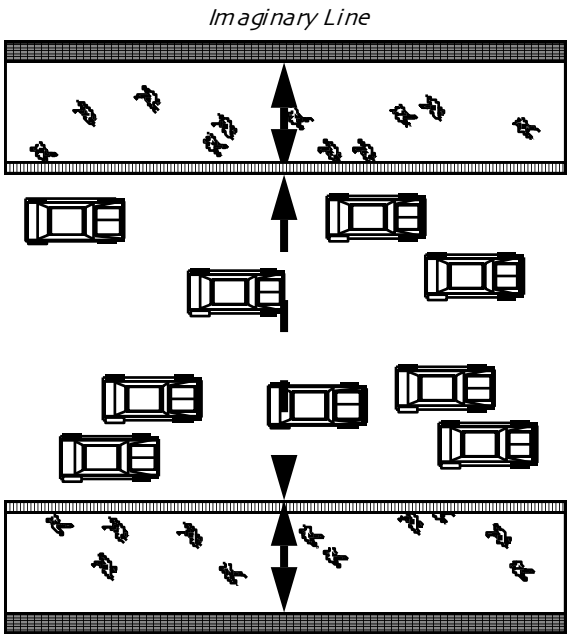
On busy streets it is better to count people and vehicles separately to avoid making errors. For example, do a 2.5 minute count of people, immediately followed by a 2.5 minute count of vehicles.

On exceptionally busy streets it may be necessary to do separate counts for each category. For example, men followed by women, followed by children, or cars followed by goods vehicles, followed by buses, etc. Alternatively, several categories may be observed simultaneously, but without differentiating between them. For example, moving adults would include both men and women, moving vehicles might include all vehicles.

In a business area, you may decide to ignore children altogether, or only count them if they are unaccompanied by adults.

As a general rule it is best to observe as many separate categories as possible. These can always be compressed into more general categories at the data analysis stage, but it is not possible to do the reverse!

Another strategy for gate counts on busy streets (such as those found in North American cities) is to observe the pavement on each side of the street separately, and then the roadway, as can be seen in the following diagram:



Gate location on busier streets

In contrast, on quiet streets it may be possible to observe several adjacent gates simultaneously - where, for example, they cover different streets intersecting at a corner. Here it may be helpful to draw the imaginary line through an object such as a lamp-post or post-box, to make it easier to identify who has or has not crossed the line on each street. Where there are two adjacent gates and a person walks through one gate and then the next, they should be counted in both.

All of the gates along an observation route should be counted subsequently, one after the other. Several rounds of observation should be undertaken for each gate at different times of the day. The normal observation periods are from:

8 am - 10 am	(morning rush-hour)
10 am - 12 noon	(mid-morning period)
12 noon - 2 pm	(lunch-time peak)
2 pm - 4 pm	(mid-afternoon period)
4 pm - 6 pm	(evening rush-hour)

Additionally, observations may be undertaken in the evening from:

6 pm - 8 pm	(early evening)
8 pm - 10 pm	(late evening)

Again, this is not an exhaustive list of time periods. They should be adjusted according to the problem being investigated, as well as the cultural characteristics of the study area (in many European countries lunch time peaks and rush hours are different from the UK). In some instances, in order to

gain a picture of the movement patterns it will be enough to count only the rush-hour and lunch-time periods, or only the evening period.

To cover the study area's allocated number of gates at least twice for each time period, it may be necessary to observe for more than one day. As a general rule, and for consistency, you should plan for observations to happen on the 'same type' of days, i.e. days with the same characteristic of use. This means observations should generally, but not always, fall on the following days:

- Monday, Tuesday, Wednesday and Thursday
- Friday (being the weekend 'eve', Fridays tend to have a different pattern of movement)
- Saturday and Sunday

It is normal for most observations to be carried out during working/week days. Some projects (for example an investigation of the South Bank cultural centre) would require Saturday and Sunday observations so as to get a true representation of movement patterns. This is entirely dependent on what is being studied, and where the study area is located. In other countries, for example Iran, the rest day is a Friday, whereas in a British shopping centre observations would be scheduled for days with the highest use – a Friday and/or Saturday. The observations will be designed to reflect the project specifications. If, however, your study area is one that has already been analysed, or is similar to a previous one, it may be worthwhile repeating the methods of the previous study so that you can compare the two. Remember to note the precise time, date and general time period each gate was observed.

The minimum number of observations for each time period is two rounds. Obviously, the count for each time period will be more reliable with each additional count that is undertaken. Within each time period, alternate rounds should be carried out in reverse order. For example, if the first round covered the gates in the sequence 1 to 25, the next round should go 25 to 1. This will even out the effects of time within a single period as different rates may be experienced in the earlier parts of the same time period than the later.

The gates will be arranged so that a single round can be completed within a single time period. As a general rule, a single person can cover 16-18 gates in a time period when observing for 2 1/2 minutes each, or 8-10 gates for five minutes observations (assuming the gates are not too far apart). Observers will be briefed on what to do if there are too many gates to comfortably fit into a single time period. If you find that you are unable to collect data accurately contact the consultant/project manager immediately and discuss an alternative course of action.

Ideally a group of people will be employed to carry out the observations. This will minimise the risks of errors being repeated by a single observer. Also, the data will be more accurate as we can check the observations of one person against the others. It will also be less boring for the observer as you will

not be stuck at the same locations all the time. Complex sites are an exception. Space Syntax Limited prefers to keep the same observer throughout the duration of the project to avoid inconsistencies.

Directional gate counts

At times it is useful to record the directionality of the movement. This will give a picture of the direction of movement flows, which can be related to other variables such as the location of transport. In the case of buildings, this method is used to assess the movement density in each room. The method is practically the same as the one outlined for gate counts. The only difference is that the observer will record people's movement for each direction in every location. For gate 1 you will record 'gate 1 – going north' and 'gate 1 – going south' as two separate items. Depending on the busyness of the area, and the number of categories, it may be possible to record both directions at the same time.

←			→		
GATE:		**Total**			**Total**
Adults			**Adults**		
Mobility impaired			**Mobility impaired**		

Example of split gates observation sheet

2.2 SNAPSHOTS

Applicability

The snapshot method is especially relevant when recording the use pattern of spaces within buildings. It can also be applied to the observation of public squares and spaces. The method is used for recording both stationary and moving activities. It is also useful when a direct comparison is being made between two different types of space use. In a high use area it may be enough to record a movement 'snapshot' for a crucial time period e.g. lunch-time, which will vary from case to case. This method is particularly useful because it represents the patterns of space use, in both an urban area or a room, in a way that is instantly apparent to the reader/client. This method is not suitable for observing moving vehicles, although it can be used to record parked vehicles.

Method

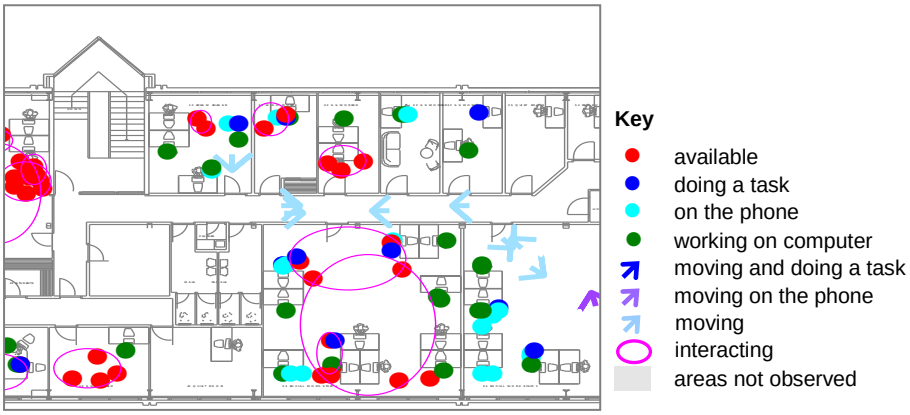
This method employs large-scale (1:50 minimum) plans of the area under observation. In some cases plans provided by building users may be out of date - especially in the case of the location of furniture - and it is always preferable to make a preliminary tour of buildings to be observed, to verify the accuracy of plans, and to correct them as necessary. In this method the precise location of people

and, if of interest, activity is recorded on the plan. The procedure involves working out a route that takes in all of the spaces which are to be observed. Spaces which cannot be observed as a whole, due to size or being broken up by tall furniture, should be divided up into smaller parts using the rules of convex break-up.

In a busy area, it is likely that the observer will walk through the space at a constant rate noting people on the plan as they are passed. In such situations it is not important, nor possible, to achieve 100% accuracy, but simply to note as many people as possible (perhaps 75%). The use in spaces like these will be so dense compared to less well-used spaces (where 100% accuracy is achieved) that the strength of the representation will not be compromised.

Procedure

The observer walks from space to space taking a mental snapshot of the activity occurring at that precise moment. It is important not to count people entering the space after you take your mental photograph, and when you walk through the space, not to count people behind you. The snapshot is recorded on the plan, with coding according to activity. Standard categories are: sitting, standing, walking. Talking is normally recorded as a circle drawn around the people in question. The coding convention for categories is indicated in the diagram overleaf; movement is shown as an arrow in the direction of movement, a sitting person is noted as a circle with a line underneath, and standing depicted as a plain circle. In office buildings, observers may also record 'recruitment', i.e. where a walking person is invited into conversation with a seated person. In cases of recruitment, the talking circle may be marked in a different colour.



Example of snapshot recording: Besides showing the location of people at a given time within the space, the recording also shows whether people where standing or sitting and whether they were interacting with others

Further categories may be of interest in specific instances, such as in laboratories, where writing-up and laboratory activities may be distinguished. In shops, appropriate categories might include male and female customers, and staff. When in a hospital, you may distinguish between doctors, nurses,

visitors, patients and so on. In all cases, each category (which could be coded by a letter) should also indicate the activity of the individual. For instance, a walking doctor would be noted as a capital D, attached to an arrow. The categories should be drawn so that they are easily recognisable, and not confused with each other.

Within buildings, as much of the interior space should be observed as possible. It is inappropriate to observe some spaces like plant rooms, storage cupboards and WC's, while permission may be denied to enter other spaces, such as personnel or financial departments holding sensitive records, or operating rooms in hospitals. It is usually possible to observe office room interiors from outside; people often leave doors open, and many offices have either glass doors, or adjacent windows. However in the case of large rooms, it is generally necessary to walk through them. Rooms which are locked or cannot be observed should be marked with a cross, and be removed from the statistical analysis. In some cases the route will pass through some spaces twice, such as walking in and out of a dead-end corridor, however it is important that such spaces are only observed once on each round.

A separate blank plan should be used for each observation round, and separate plans might have to be used for each floor of the building. It is a good idea to staple together complete set of plans for one round to avoid confusion. Observations within buildings should be undertaken throughout the whole of a working day, including breaks, although often it is not necessary to observe the lunch-time period. In general, 2 snapshots per time period will be made, over at least two different working days. The question of whether to switch snapshot observers around study areas or not is the same as for gate observations.

Similar procedures apply to the observation of urban spaces. A route should be devised that covers all of the spaces to be observed. This might include either the different parts of a public square, or a selection of different streets. The main advantage of using snapshots over the gate method, is that stationary people and vehicles are recorded. However, the main disadvantage is the inability to cope with high flows of many different categories simultaneously. Due to the high volume of static occupation in many public squares, this method is most useful for noting the pattern of density, rather than for precise recording of numbers. This is generally not a problem in buildings, where flow rates tend to be small. In general, if precise movement rates are imperative, then the gate method is preferred.

2.3 PEOPLE-FOLLOWING

Applicability

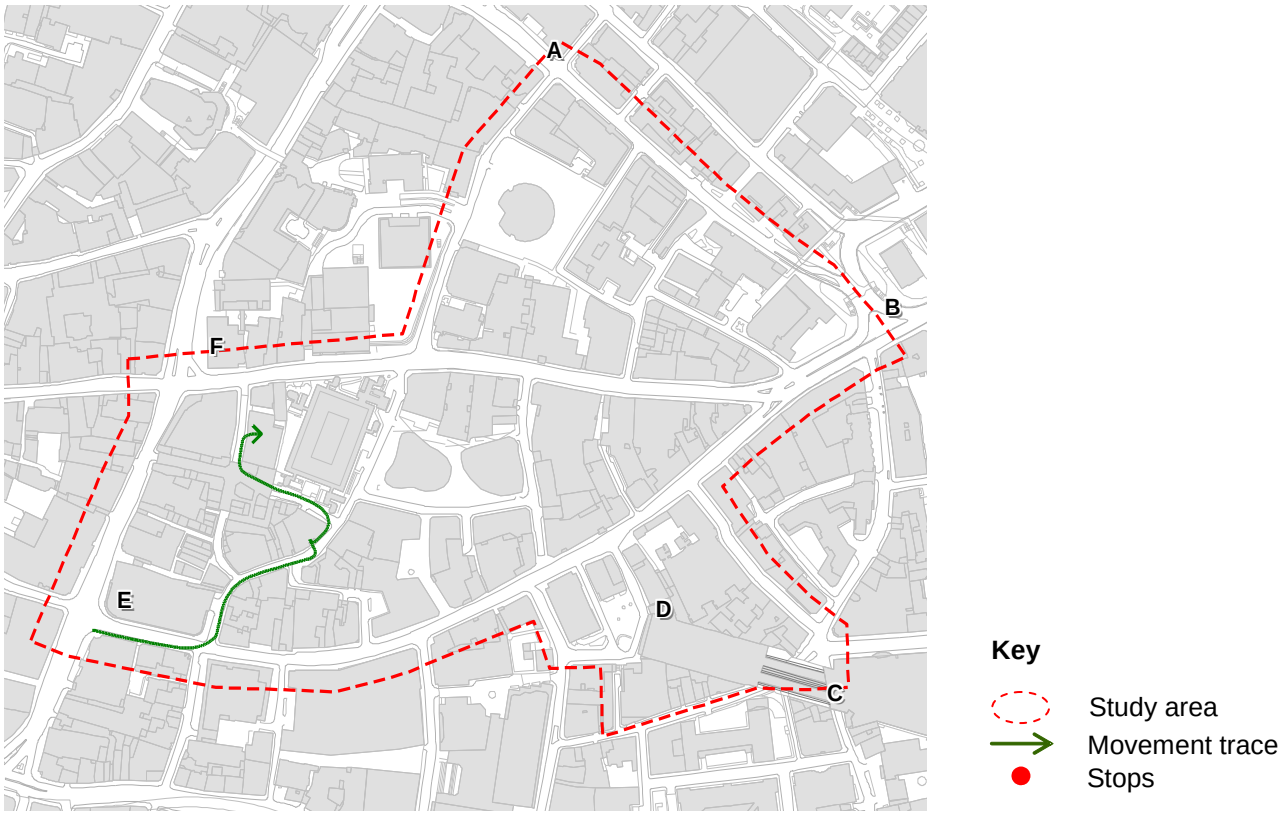
People-following is an important technique for observing movement that is dispersing from a specific 'movement distributor', for example a train station or shopping centre. It can be used to answer three specific questions: What is the pattern of movement from this specific location? What is its relationship to other surrounding routes? And what is the average distance people walk from the specific location? These data can be used to determine for example the pedestrian catchment area of retail facilities, or

public squares.

Method

The method is simply to have a plan of the area, with the specific location from which you 'pick up' people at the centre, and to trace the routes people take as you follow them. It is important to be discrete when doing this: do not follow so closely as to make people aware of your presence and hence uncomfortable. For each time period about 25 - 50 people should be followed, including a good mix of people types, i.e. young, old, male, female, etc.

People-following observations are useful for describing patterns of flux from a specific movement distributor in a building. For example, showing the first ten minutes of an individual's movement inside a museum, or understanding how people use a specific shop in a shopping complex. The methods of observation are the same for people following in urban space. The advantage of people following observations is that directional splits maps can be generated from them, provided the number of people followed is quite high.



Example recording from People-Following

2.4. TRACES

Applicability

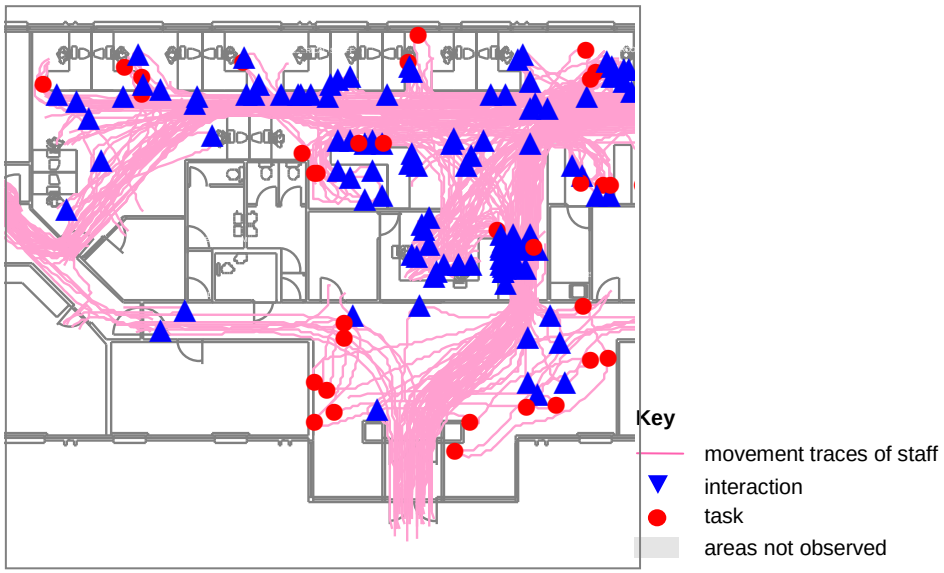
The traces method is used in conjunction with the snapshot method in order to record the precise route taken by people moving through a space, or in conjunction with traffic light observations to

assess the extent and mode of informal crossing. Traces can also be used where, due to the complexity of the architecture, the number of gates would be too high to be practicable. Instead, the number of people moving through gates can be counted later by drawing lines at key locations where gates would have been placed. Traces are frequently used to study public squares and are commonly used for building studies.

Method

A number of convex areas are selected in relation to snapshot or traffic light observations. The method is similar to that of snapshots: the observer stands for a set 3, 4 or 5 minute period and records all of the movement through the observed space. The precise route taken is traced with a pen and the last point at which each person was seen is indicated with an arrow. It is normally useful to define routes as: through, to, from and within. These can be noted with a four-colour pen, which allows easy switching from one to another.

The diagram overleaf shows an example of the recording of traces within an office space; in this case, recruitment was also noted (with a circle around the people in question).



Example of a single round of traces. This classifies types of movement at a given time and place

If this method is combined with snapshots, it is normally undertaken at least twice per time period for each individual room, both before and after a snapshot, for a minimum of 5-10 minutes. The observation time depends on the number of observers and how quickly the observations can be carried out.

There is one crucial drawback to this method concerning the size of the room or outdoor space. In a

building with different room sizes the observer will be able to trace more routes in a smaller room than a larger room because of the relative quickness of people moving through a smaller space and because of the limits on seeing them enter and leave. In larger rooms, this necessitates taking fewer observations or, if possible, breaking down spaces into smaller units, especially in a building such as a museum or gallery where movement is strongly related to viewing exhibits. This technique may be limited to the access routes and open spaces of a building.

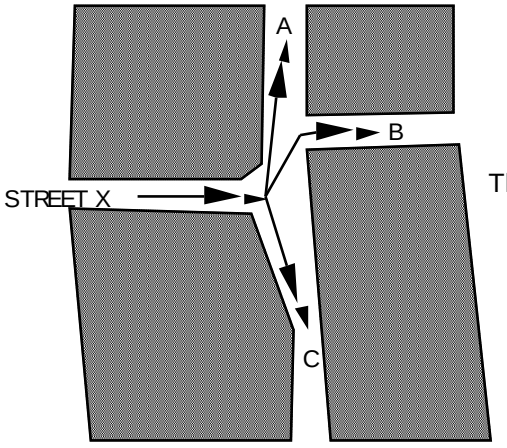
2.5 DIRECTIONAL SPLITS

Applicability

The directional splits method is suitable for recording observations of moving people or vehicles only. It is normally used in urban situations, but can equally be applied to interior spaces or buildings.

Method

This method aims to record the split, in absolute numbers and percentages, of movement flows at a junction. This might include the divergence of pedestrian or vehicular movement at a street junction, or the split of people coming out of a station. The method involves taking a plan of the junction and calculating all possible directions in which the movement may split. These possibilities are then labelled as A, B, C, etc. A person or vehicle is chosen at random from those approaching the junction, and followed until it is obvious which of the possible destinations they are headed for. The number of people or vehicles entering a destination space is marked on a tally sheet or preferably directly onto an enlarged plan, with a separate square for each split point.



The possible destinations from Street X are A, B and C

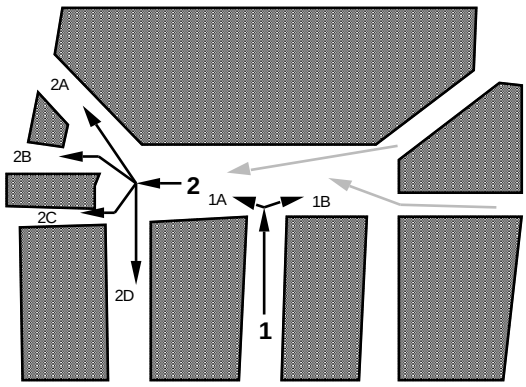
An example street layout where the directional splits method may be used

It is best to choose a person or vehicle some distance away from the junction, to avoid observational bias. For example, the majority of people coming out of the left hand side of station exits subsequently turn left. Therefore individuals should be chosen before it is obvious whether they are headed for the left or right hand side. Generally, 100 people or vehicles should be followed through the junction. If separate categories are being observed; men and women, or tourists and ‘suits’, then 100 people in each category should be followed. At the start and end of the observations, a normal count using the

gate method should be made of the numbers of people passing through the junction, with separate counts being made for people coming out of, and going in to the junction.

This procedure may be repeated at several junction points surrounding the site of interest to build up a picture of how the movement splits at each subsequent junction. This method requires a long time to cover a single junction, and so several observers may record data at different junctions in the same study area. This will enable the observations to be completed within a single time period, and is important when the behaviour of people is likely to change between different time periods. For example, direction splits might alter radically between mid-afternoon and evening rush-hour. One period would represent the background level of use, while the second shows strong tendencies for movement to priority spaces leading to stations or bus stops. If a single person must carry out the observations, make sure that they all occur within the same time period. If a time period is overrun, carry on the next day at the same time.

In some situations it may be possible to select a single observation point from which the approach to the junction, as well as all possible destination points, is visible. In such cases it is possible to carry out the observations while stationary. In other cases it will be necessary to follow a person on foot to ascertain their destination. For complex junctions where the possible destinations are some distance away from each other, it may be necessary to break down the procedure into several smaller junctions (see diagram below). However, the flow at each subsequent junction will be mixed with people or vehicles coming from other directions and, as such, this will not give a true picture of the distribution from the original starting street.



In a complex situation such as this entry point into a square, it might be necessary to have several split observation points. Two are shown here (1,2). However the problem at position 2 is that it receives movement from streets other than the starting street 1, so it is no longer possible to get a true picture of the eventual distribution from the starting street.

An example of a complex street layout where the directional splits method may be used by breaking the procedure into several smaller junctions.

Depending on the problem under investigation, this procedure might be carried out during a single time period (for example lunch time or at rush hours) or over all time periods. It is usually enough to observe a junction once during a single time period, however repeating the procedure will give a more reliable picture. As with the other kinds of observation, different observers may undertake subsequent rounds. This will enable cross checking to take place and reduce boredom.

2.6 TRAFFIC LIGHTS PERFORMANCE & INFORMAL CROSSINGS

Applicability

This method is normally used in conjunction with the traces method in order to analyse the performance of traffic light crossings. It can be used in cases where, due to the busyness of an urban area, the performance of signalled crossings influences informal crossings and, in turn, affects pedestrian safety. These observations aim to establish whether traffic light timings need to be recalculated or signalled crossings need to be redesigned.

Method

Ideally all signalled crossings in the study area are observed, however, depending on the extent of the area, often only busy crossings are observed.

Each crossing is observed for n cycles of green-red lights (between 4 and 5 cycles). The time during which the green light for pedestrians is on is recorded as well as the number of people crossing in the designated area. The same is recorded during the red light. People crossing when neither green nor red light is lit (black-out period) are recorded under the green light period.

This method is normally undertaken once for each time period. Observations are carried out at different time periods as both busyness and timing of traffic light crossings change during the day.

When the traffic lights procedure is used alongside the traces method, stretches of the streets near signalled crossings are observed for 5 minutes each and the movement of people crossing is traced on a map. This allows the extent of 'unsafe' crossings to be evaluated in relation to the location of signalled crossing, and establishes the quality of the signalled crossing design.

Project: _____

Date: _____ Observer: _____

Time Period: _____ Weather: _____

	Green Light for Pedestrians		Red Light for Pedestrians	
Round 1	**Elapsed time**		**Elapsed time**	
		Total:		**Total:**

Example of traffic lights survey sheet

3 Surveys

This section covers field work that records aspects of the physical make up of urban areas or buildings. This list of surveys is not extensive and covers only the surveys undertaken by Space Syntax Limited. While many of these procedures are commonly used across disciplines, the methodology and coding for recording different variables may vary. As with pedestrian movement observations, the methodology may change on a project basis; variables other than those described here may need recording, while other variables may be left out. The following descriptions show the theoretical background of the surveys, however work should always be carried out as directed by the project manager during the observation brief.

3.1 LAND USE

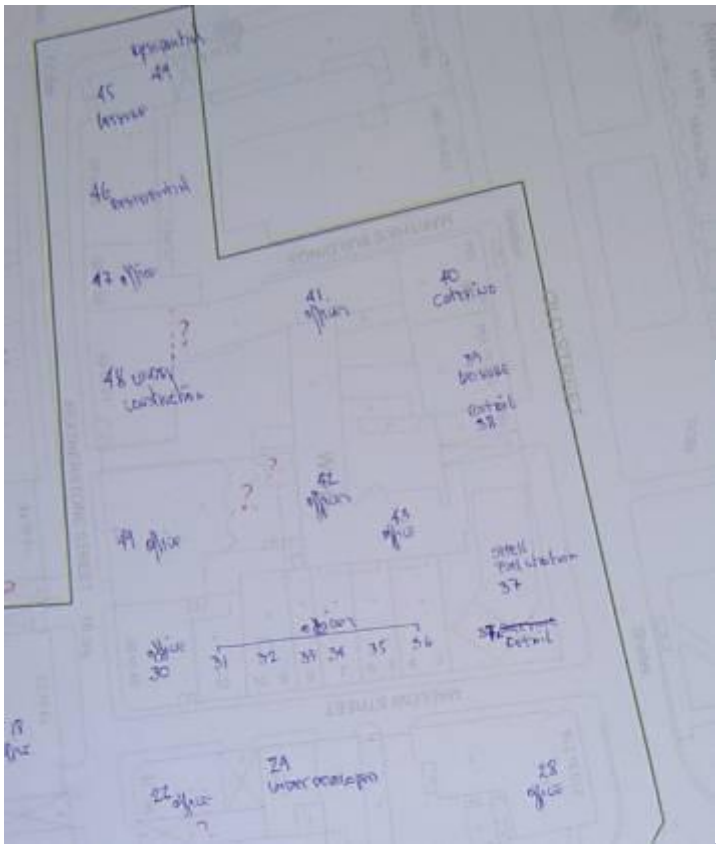
Applicability

This method is commonly used in urban areas but can also be applied to buildings, especially multi-purpose large buildings, such as retail and leisure complexes. Land uses – the facilities available to people within a certain urban area –are an influential characteristic that affect the character of an area as well as people movement. For example shops and services will attract certain numbers of people at certain times of the day while catering will attract other numbers at different times. Different land uses can create activity on the surrounding area: a large office building will feed many people onto the street at the end of the working day.

Method

There are different ways of recording and coding land uses. One effective method is to take a map and write on details of the land use or name if well known (i.e. fast-food restaurant or McDonalds). This allows land uses to be quickly recorded on site with as much detail as possible so as to subsequently help make informed decisions about coding. If uses were coded on site, for instance describing everything that sells food as ‘catering’, it is not possible to distinguish different catering activities at a later stage. Different agencies code land uses differently and different projects require different types of information to be analysed, so it is always an advantage to record land use with detail.

If the shape or size of a building is different from what your map depicts, it is good practice to redraw the building on site in as much detail as you can. Ground floor and upper floor uses should be recorded as instructed during the brief. An example of land use survey is shown overleaf.



In this situation you can see how building 48 was redrawn as it appeared different from the map and the detail of description (i.e. Shell petrol station). It is good practice to question mark those buildings which do exist, but for which you cannot recognise the use. It also important to record everything within the study area, but nothing outside.

3.2 FRONTAGES

Applicability

Frontage refers to the façade or side of buildings facing the public realm as well as fences defining different areas. These have different characteristics and influence peoples' movement as well as the character of an area. The frontages method is applicable to urban areas and large buildings, such as retail or leisure complexes. Frontages influence the feeling of safety in an area and can act as a deterrent to crime on the street. People feel safer walking by transparent frontages, through which the people working, living in or visiting the building are visible, because this provides access to help as well as surveillance onto the street. Even when it is not possible to determine from the outside whether people are inside a building, transparent frontages still deter crime as they provide a risk factor for the criminal to be seen.

Method

Normally, frontages are recorded for the ground floor only unless otherwise specified in the observation brief. They are recorded as lines along the façade or side of a building or open space, as either transparent, semi-transparent or blank in the case of buildings, and as high (above 1.5m) opaque, high see-through, low or very low in the case of fences and vegetation. The codes are tabulated below. Transparent is recorded when most of the façade offers visibility between the public realm and building interior, i.e. the façade consists mainly of transparent glass throughout its height and length. Semi-transparent is recorded when some transparent glass doors and windows are

present, and blank is recorded when there is no visibility between the inside of the building and the public realm. One single frontage is normally recorded for the whole façade or side of the building. However, if the length of the frontage is significant and its character changes dramatically, then it should be divided into appropriate segments, i.e. a transparent stretch and a blank stretch, rather than a single semi-transparent frontage. It is up to you as an informed observer to make decisions on whether to break a building into segments; you should do so when you believe that different characters of the same façade affect feeling or movement in the area. Similarly for land use surveys you should redraw a building if its shape or size differs from the map.

Transparent

Semi-Transparent

Blank

FRONTAGES	Symbol	Colour		FENCES	Symbol	Colour
Transparent	Continuous	Red		High Opaque	Continuous	Green
Semi-transparent	Continuous	Blue		High see through	Dashed	Green
Blank	Continuous	Black		Low	Zig Zag	Green
				(Very low)	Dotted	Green

Colour and symbol notation used for frontages surveys

3.3 ENTRANCES

Applicability

This method is applicable to urban areas as well as large building complexes. It is normally used in conjunction with land use and frontage surveys and is aimed at locating the places where people enter and exit buildings and the public realm. Entrances have an influence on movement as their distribution defines the locations where people are fed into the street, or attracted into a building.

Method

The locations of entrances in a façade are recorded upon a map with symbols. Entrances are recorded as controlled (wherever you need to ring, knock or have a code to enter), and uncontrolled (wherever you can just walk in, even if there is a security guard inside or a 'private' sign). The different codes are tabulated below. Sometimes secondary categories such as service entrances, fire exits and unused entrances may be recorded, according to the survey brief. An example of how entrances are recorded is given below.

Category	Description	Symbol	Colour
Uncontrolled	Anyone can enter the building, at least to reach the reception or security	Circle O	Any/Current
Controlled	One needs a key, security card or to ring a bell to enter the building	Cross ×	Any/Current
Secondary Category (only if required)			
Service	Used for loading/unloading goods or by staff	S	Any/Current
Fire Exit	Usually locked and only used in emergencies	F	Any/Current
Unused	Permanently locked	U	Any/Current

Summary of symbol notation used for entrances survey

Frontages and entrances example

3.4 INFRASTRUCTURE

Applicability

This method is suitable for large urban areas and involves recording in detail the transport and street facilities available to pedestrians and cyclists, including public transport facilities. This survey not only evaluates the availability of facilities but can also help evaluate safety, especially road safety, as well as accessibility for movement impaired people.

Method

This survey simply involves walking around the study area recording, in as much detail as possible, all the elements that are part of the infrastructure. Some elements may already be present on your map, such as railings, however you should record these anyway as such elements can be subject to frequent change, and may differ from those on the map. The main elements to be recorded are tabulated below, however, these may vary depending on the project brief.

For Pavement types, draw a line along the portion of pavement that is of the following categories.

Pavement types	Description	Symbol
Dropped pavement	Normally found at crossings or corners	
Dropped tactile pavement	Textured normally with raised solid dots	
Raised tactile crossing	Raised and tactile, found at pedestrian crossings	

Draw a polygon over and along the road differentiating between the following categories

Road Conditions	Description	Symbol
Pedestrianised area	Not accessible to vehicles. Pedestrians only	
Semi-pedestrianised area	Restricted vehicular access	
Cycle lanes		
Bus lanes		B

Draw a line across the street over the zebra crossings differentiating between the following categories

Pedestrian Crossings	Description	Symbol
Uncontrolled zebra crossing	No light	
Semi-controlled zebra crossing	Flashing yellow light	
Controlled zebra crossing	Light for vehicles only	
Controlled zebra crossing pedestrians	Light for vehicles and pedestrians, red and green man	

* Mark with a "C" next to the crossing if there is a light for bicycles

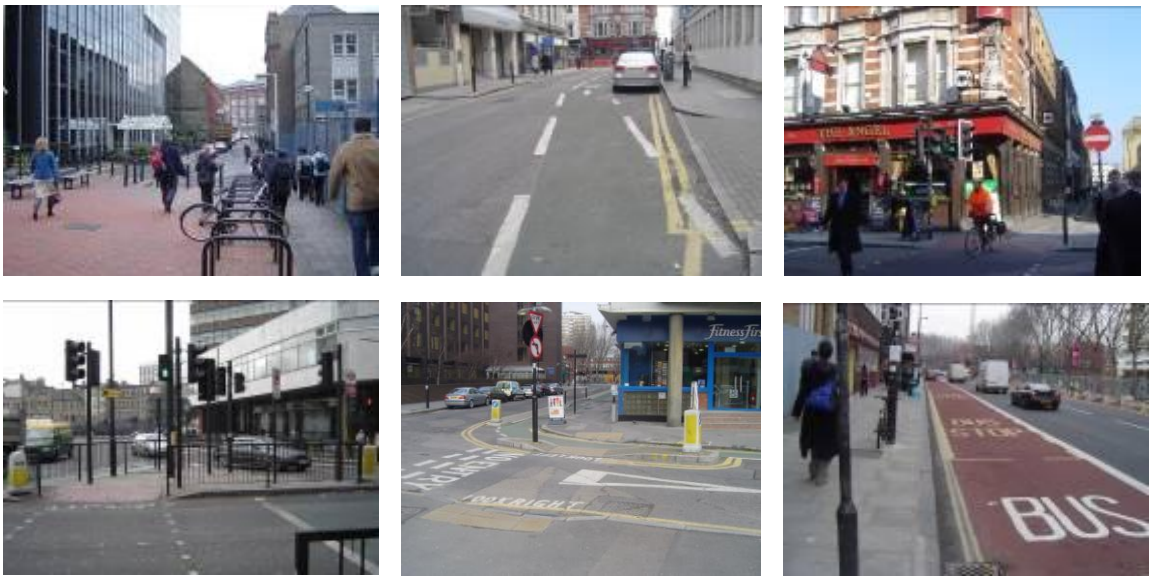
Transport node	Symbol
Tube stations	
Bus stops (note bus numbers)	
Entrance to subway	S

Surveillance	Symbol
CCTV cameras (note direction they are shooting)	
Street lamp	X
Pedestrian lamp	X
Mixed lamp	X

Street furniture	Symbol
Cycle racks	
Benches	
Pedestrian refuge	
Phone booths	
Trash bins	
Railings	
Vehicle Gate (closing street, not garage)	

Summary of symbols used for infrastructure surveys

Examples of the different elements of infrastructure are also shown in the pictures below. These examples reveal the complexity of the infrastructure and emphasise the need for attention to detail in recording the elements fully and accurately.



Images of infrastructural elements in the streetscape

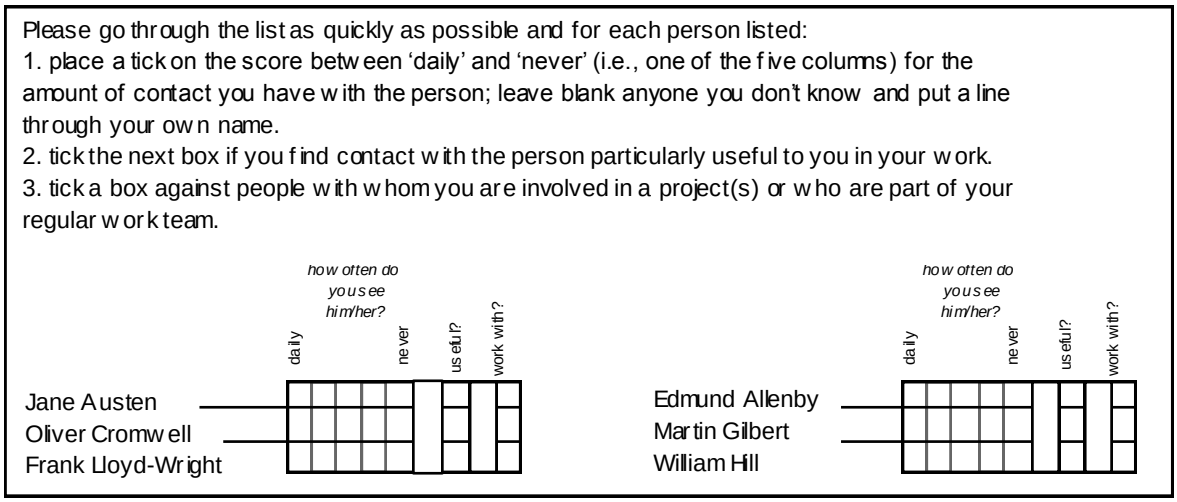
3.5 QUESTIONNAIRES

Applicability

Questionnaires and origin-destination studies involve asking a sample of people specific and defined questions on where they started their journey and where they are going. Such surveys provide information about the 'catchment' of spaces and the shape of peoples' journeys through them. For example, do local people dominate? or does the space feature on through-routes? This technique was used in a study of Camden Lock market, in order to investigate the proportion of locals, Londoners and tourists who used the market. As with all the above techniques, it is important to be aware of the general patterns of use beforehand: in Camden Lock, for example, the patterns of use during the week differ significantly compared to the weekend.

Method

Questionnaires can be used to explore many different aspects of the interactions of individuals with their surroundings and other people. Here is a sample survey questionnaire aimed at investigating the interactions of various people in a work context.



Questionnaire example

In such cases it is imperative that staff filling in the questionnaires are made aware and assured that responses are strictly confidential. It may help if an observer is made personally responsible for collecting questionnaires, rather than relying upon a member of staff to do so. In some workplaces, such as laboratories, staff may feel insecure about their name appearing on a published staff list. It is therefore important to reassure staff about the security measures being taken regarding the collection and protection of data. Finally, make sure that your staff list is up to date: the Facilities Management department is generally the best source for staff lists as well as maps.

3.6 OTHER METHODS

The use of photography and video recording, especially of public squares, can give an informative picture of the character of an area. It also can be used to generate a profile of 'psychological' type behaviours, defined in terms of 'rational' spatial behaviour. For example observing which spaces people tend to go to when they first arrive, and whether these are strategic in terms of the 'best' visual field of the area. Problems associated with video-recording and photography surveys include finding a strategic location that provides a full picture of the space under observation, and also 'irritation factors', such as trees and other people that obscure what occurs behind them. For a full explanation of time-lapse photography techniques see Whyte, William: 'The Social Life of the Street' from *City: Rediscovering the Centre*. When taking photographs, you should use as wide an angle as possible unless you need to photograph a detail. You will be given instructions on what and how to record at the observations brief.

4 Health & Safety

Your health and safety is of paramount importance to Space Syntax Limited. While collecting data on site be conscious of potential dangers, such as heavy vehicular traffic, construction sites or the presence of undesirable people. If you feel uncomfortable or are having difficulties in carrying out the work, stop collecting data and immediately contact the project manager, who will discuss the best way to proceed with your work. You should be aware that making observations and gathering data, may involve standing or walking for long periods of time. Therefore, you should wear comfortable clothes and shoes. When making observations in the open air you may require extra protection. On cold days you should have warm, protective clothes available, including gloves (fingerless gloves are especially useful). During summer you may find it helpful to have a light jacket with you and if the sun is shining, you may need a sun lotion to protect your skin. You should also carry some water and/or a snack with you, especially if you are working far away from shops.

You should make sure you have all relevant phone numbers, which will be provided at the briefing. Always be careful when working in urban areas: do not stand in the middle of the road to count people or take a picture, and always look both ways before crossing a road. Avoid confrontation: if you are questioned by strangers, always answer politely. If someone is aggressive towards you and you feel unsafe, leave the area and contact your project manager.

As an observer you will also spend time in the office during briefs and data entry, and will need to be aware of our health and safety policy. It is our duty to ensure that the office in which you work is safe and healthy. The implementation of new regulations has introduced some new obligations on the company and its employees.

The company is under a general duty, “so far as is reasonably practicable”:

- to ensure the health and safety at work of all its employees
- to conduct its business in such a way that people who are not employees, such as clients, visitors, consultants, maintenance engineers or delivery services are not exposed to risks to their health and safety.

The company has particular duties covering all aspects of your working environment including temperature, ventilation, lighting, room dimensions and space, safety requirements in respect of the use of corridors, doors, windows, floors, means of entry and egress and the provision of facilities such as toilets. It also has the duty to ensure that the office is properly cleaned and maintained and that rubbish and other waste materials are removed.

To discharge these duties the company is required to carry out a suitable and sufficient assessment of all risks to your health and safety, and to effectively manage them by putting in place appropriate protective and preventive measures. This means that all employees should receive proper instruction

and training on the use of any machinery or equipment which they use and should be advised of any risks to their health or safety and the steps which can be taken to guard against them.

Whilst at work all employees are required to:

- take reasonable care for the health and safety of themselves and anyone else who might be affected by what they do or what they fail to do
- co-operate with the company or any one else to enable them to comply with any health and safety requirements which they are under
- use any equipment they need to only in accordance with the instructions and training which they have received
- inform the company of any shortcomings in its arrangements for health and safety.

It may be tempting to think of an office environment as being free from risks, but this is not the case. Examples of specific risks and the steps which can be taken to guard against them are recorded in the following pages of this Office Manual. This list is not intended to be exhaustive.

If you know, or become aware of any aspect of your working environment, whether it be the equipment that you use or the way you carry out your duties, that is or might become a risk to your health, welfare or safety, or to that of others, it should be reported to the company without delay.

Repetitive work and poor posture

If you carry out repetitive work or adopt a poor posture whilst carrying out your duties it may lead to eye strain and other physical injuries. New regulations were implemented on the 1st January 1993 regarding the use of display screen equipment. If you use display screen equipment, such as VDUs as a significant part of your work you can guard against risks to your health in the following ways:

- change your work activity from time to time
- adjust the equipment that you use, including the chair so that you can comfortably carry out your duties
- if you suffer from eye strain and require eye sight tests and spectacles to carry out your duties the company will pay for these
- report any concerns that you have about the equipment you use or about your health (particularly if you experience pain in your wrist, back or neck) because there may be other steps which can be taken to guard against the risk of injury.

If you feel that you are at risk of any of the above, or if you feel your workspace is inadequate for your needs, please ask the Managing Director or the Office Manager to assess it and, if necessary, to purchase equipment to improve matters.

Passive smoking

The health and safety of non-smokers can be adversely affected by inhaling cigarette fumes of smoking employees. This is why the company operates a no smoking policy within the office. The building that we occupy is also a no smoking area.

Fires and suspicious packages

If you discover a fire or a suspicious package you must follow the procedures below.

On discovering a fire, sound the fire alarm (located at the end of the corridor by the stairwell), dial 999 and evacuate the building. Dial 999 once you have cleared the building if you are jeopardising yourself or others to do so beforehand.

Fire extinguishers are located along the corridors of the building. Only use these if it is safe to do so.

SAFETY: DO NOT USE WATER ON ELECTRICAL FIRES, OR FIRES INVOLVING FLAMMABLE LIQUIDS AND ALWAYS READ THE INSTRUCTIONS BEFORE USE.

CARBON DIOXIDE (CO2): USE ON ELECTRICAL FIRES - SAFETY: ON DISCHARGE IT PRODUCES DRY ICE WHICH CAN CAUSE COLD BURNS, SO ALWAYS HOLD THE EXTINGUISHER USING THE HANDLES PROVIDED. IT IS SAFE TO USE ON LIVE ELECTRICAL APPARATUS BUT ALWAYS ATTEMPT TO ISOLATE THE SUPPLY OF ELECTRICITY BEFORE USING AN EXTINGUISHER.

Lifting heavy loads

The incorrect lifting of heavy or cumbersome loads can cause back injuries and other physical problems. If you need to lift any load and there is not mechanical means of assistance, ensure that you adopt the correct posture before lifting. If the load is heavy, ask for assistance, and if none is available do not lift the load alone and seek to borrow a trolley.

Protective clothing

If you are carrying out particular duties which might involve a risk to your health or safety you should wear whatever protective clothing is required. Never underestimate the risks attached to seemingly routine jobs.

Alcohol and drugs

Intoxication from alcohol or drugs at work can result in an employee injuring themselves or others. If the behaviour of a fellow employee or anyone else in the office gives you cause for concern, this should be reported immediately.

Other risks

The work environment and knowledge of actual or potential risks is constantly changing. From time to time the company might learn of new risks or preventive measures, or precautions, which can be taken to reduce them. As and when it does you will be advised. However, if you acquire this knowledge first, pass it on to the company. It is only through mutual co-operation and sharing of knowledge and experience that your health and safety and that of your colleagues can be assured.

It is the duty of the company, to provide safe working conditions for all staff. To achieve this, the active co-operation of all staff is essential.

First Aid

There is a First Aid Kit for the office (approved by the HSE) located underneath the sink, which contains all the standard dressings, Band-Aids etc. likely to be needed. Please help yourself to whatever you need and inform the Office Manager if anything is missing or has run out. Painkillers and other medications cannot be supplied by ourselves, and if you choose to take them while at work this must be your own personal decision.

Accidents and emergencies are rare occurrences, and we aim to limit their prevalence as much as possible via our policies and procedures. However, in the event that an accident or emergency does occur, **all staff** are expected to adhere strictly to the following procedures:

During/Immediately following an incident:

- Remain calm
- Assist the victim/affected person where it is safe to do so
- Dial 999 if necessary

Shortly after the incident (within 3 working days):

- Report the incident to the individual(s) responsible for health and safety if this person was not available at the time of the incident
- Ensure that the incident is documented
- Suggest any foreseeable measures that could be taken to avoid a repeat incident
- Consult with the individual responsible for health and safety, and with other staff members for their input on the incident

One to two weeks after the incident, the individual responsible for health and safety must:

- Report any suggestions made during consultation to all staff members
- Report any amendments to the Health and Safety Policy to all staff members

If you contravene any health or safety requirements or obligations, the disciplinary procedure will be invoked. If the contravention is serious it could result in termination of employment.

You should contact the Managing Director or Office Manager in the first instance:

- If you have any cause for concern or enquiry on any health and safety issue which is not covered by existing policies
- If you have any criticisms or complaints, whether relating to your training or what you believe to be a shortcoming in the company's arrangements on health and safety
- If you have reason to believe that there is a "serious and immediate danger" to the health and safety of yourself or others
- If there is anything which, in your opinion, might constitute risk to the health, welfare or safety of yourself or others.

In cases of serious or imminent danger if neither the Managing Director nor the Office Manager are available you should contact any Associate.

Additionally, you should:

- Keep your workstation as tidy as possible and keep all corridors and access ways free from obstruction. Hang up coats, etc. in the cupboard provided.
- Report any defect in machinery, office equipment, furniture or carpet immediately. Minor problems such as loose carpet or faulty electrical equipment or wiring may result in serious injury and must be reported to the Managing Director, an Associate or the Office Manager so that they can be attended to immediately.
- Do not trail telephone cables, computer wires and so on across the open floor. If you need to do so for any period of time, secure the wire/cable with masking tape. If you need to do so on a regular basis, inform the Office Manager, who will seek a solution.
- Take care when negotiating doors leading to staircases or rounding corners.
- If you bring into the office any personal piece of electrical equipment you wish to connect into the office power supply, it must first be cleared by the Office Manager.

5 Bibliography

Below is a brief bibliography about space syntax. While you are not required to read all or any of the following papers, you may find them interesting and useful for your work. Most of the readings listed below can be found in UCL libraries or electronic publications as well as in the office. If you would like to find out more about space syntax or you are looking for more or different readings you are welcome to ask the consultants at Space Syntax Limited.

1. Hiller, B. & Hanson, J. (1984). *The Social Logic of Space*. Cambridge: Cambridge University Press.

2. THE COMMON LANGUAGE OF SPACE: a way of looking at the social, economic and environmental functioning of cities on a common basis
http://www.spacesyntax.org/publications/commonlang.html

3. Hillier, B. et al (1993) - Natural movement: or configuration and attraction in urban pedestrian movement. In *Environment & Planning B: Planning & Design, 19.*

4. Turner, A. Penn, A. & Hillier, B. (2005). An algorithmic definition of the axial map. In *Environment & Planning B: Planning & Design* 32 (3), pp. 425-444.

5. Hillier, B. & Iida, S. (2005). Network and psychological effects in urban movement
www.spacesyntax.tudelft.nl/media/Long%20papers%20I/hillieriida.pdf

6. Hillier, B. The hidden geometry of deformed grids: or, why space syntax works, when it looks as though it shouldn't. In *Environment and Planning B: Planning & Design 26(2)*, pp. 169-191.

7. Penn, A., Hillier, B., D. Banister & Xu, J. (1998). *Configurational modelling of urban movement networks.* In Environment and Planning B: Planning & Design 25(1), pp.59-84.

8. Hillier, B. (1996). Cities As Movement Economies. In *Urban Design International 1(1)*, pp 41-60.

9. Hillier, B., Penn, A., Hanson, J., Grajewski, T. & J Xu. (1993). Natural Movement: or, configuration and attraction in urban pedestrian movement. In *Environment and Planning B: Planning and Design 20*, pp. 29-66.

10. Hillier, B. (1999). Centrality as a Process: accounting for attraction inequalities in grids. In *Urban Design International 4 (3-4),* pp. 107-127.

11. Hiller, B. (1996). *Space is The Machine*. New York: Cambridge University Press.