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Designing a Research Centre

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12 Designing a Research Centre

Introduction

Thornton Research Centre (TRC) is a major research site for Shell, housed at the base of the Wirral Peninsula about 20 miles south west of Liverpool. During 1993 it was decided that the existing rather extensive mixture of buildings should be refurbished, some pulled down, with new more coherent buildings to replace them being needed. This was to be part of a general plan to rejuvenate research activities in preparation for the 21st Century and the many emerging technological developments. It was decided that the planning of the whole new site and the design of the new research laboratories should benefit from environmental psychology input. I was approached before any architects were appointed, but after preliminary planning had taken place, to carry out a series of studies that would provide the strategic basis for the planning and design.

   The projects had to be completed over a period of a few months in a context that I knew, from previous experience, would change during our involvement. In fact one set of architects came and went during the project and a research centre in the South of England, at Sittingbourne, was brought into the plan and had to be included in the study.

   I decided to turn the potential problems into strengths by inviting two long established colleagues and friends to join me. David Stea flew over from Mexico to oversee the design participation exercises and Arie Peled flew from Israel to supervise the location tasks. They both subsequently contributed to the preparation of the planning and design proposals. The remainder of the work was managed with my colleague Ian Donald. However, the day to day running of the project and the writing of the first drafts for the reports for Shell fell to a young student of mine who had just completed her MSc in Environmental Psychology, Margaret Scott. I like to think this was an appropriate reward for the fact that it was her personal contacts that had first brought Shell and me together.

   A great deal of information had to be analysed and collected in a short period of time. Once again a group of willing students studying on the MSc in Environmental Psychology provided the intelligent field workers to carry out many of the interviews and questionnaire surveys, including an architect on the course, Richard Blaise, who did the drawings for the picture questionnaire. Unfortunately the MSc course no longer had the flexibility of earlier years so this unique opportunity could not become a major focus for the students and instead had to be slotted into their very tight course structure. The lengthy reports that were produced and the discussions in many meetings were acted on by Shell and

I have since seen something I never expected, actual buildings rising from the ground, influenced in part but directly, by the results of our research.

The chapter that follows is an edited version of the final report that was produced. It has been edited to give a flavour of the ideas behind the work as well as the methods employed and the summary, strategic framework that was incorporated into the detailed design.

Objectives

The objectives of this report are to give an account of the research which has been carried out at Thornton Research Centre and Sittingbourne Research Centre with respect to the redevelopment and redesign of the Thornton Site. It aims to articulate the design aspects that are salient, and to identify the appropriate characteristics for the developments at Thornton Research Centre.

The recommendations made in this report are general trends rather than individual statements or requirements and it is not intended as a simple description of what people say they want.

The report has three sections. The first is a review of what is currently known about laboratory and research centre design.The second section outlines the methodological basis for the research which is reported, and the methods which were employed during this research. The third section reports the results of the research and how they relate to the design of the laboratory blocks and the site design.

Theoretical basis of the research

Theory of place

Canter (1977) presented a model for the issues which need to be addressed during design research. The basic assumption is that whatever is being designed, is a series of places, each with its own identity and experiences. Canter describes places not as collections of independent elements, but elements which combine to create places. The elements are integrated so that although they are definable as separate elements, to create a place, each must be present.

Canter's model identifies the major constituents which amalgamate to form places.

The constituents of place are:

- the behaviours associated with a given locus, or which are anticipated to be within a given locus
- the physical parameters of that setting
- the conceptions which people hold about that setting
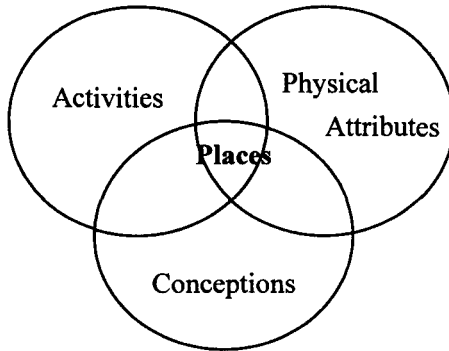
Canter's (1977) Visual metaphor for the nature of places (p.158)

These three elements are the constituents of places. Each is present in any setting defined as a place. Each can be considered separately, but each is entwined with the others. As a result, a place has not been fully identified until each of the elements for that setting are known. At the same time, exploration of one of the elements can be the starting point for research even if the other elements have not been fully developed. For example, the conceptions held about the activities at Thornton were explored even though the physical structure was not known at this time.

The research at Thornton was structured using this theoretical perspective.

- Behaviours - researched through design exercises in which teams produced simplified models of the building, location tasks in which the preferred spatial relationships between architects was explored and an importance questionnaire that asked how important it was for the design to acheive certain objectives and interviews
- Physical attributes - researched through design exercises, location tasks, pictures questionnaire in which people were asked to comment on line drawings of possible designs, importance questionnaire and interviews
- Conceptions - researched through design exercises, location tasks, pictures questionnaire, importance questionnaire and the sorting task.

Clearly, many of the research tools addressed several elements of place, but some were specific. For example, the sorting task explored the conceptions which the staff at Shell Research hold about the activities which occur at Thornton. It examined the conceptions held about the nature of the work involved in the activities and the place experience which each activity affords. The pictures questionnaire looked at the relationship between physical attributes of buildings and the images which they are interpreted as possessing.

In essence then, the research which was carried out at the Thornton and Sittingbourne Research Centres aimed to investigate the constituents of place. It sought to identify the behaviours which occurred and which were anticipated to occur, to look at the physical aspects of the current buildings and the new designs, and to examine the conceptions which the staff hold about the research centre and its activities. Each of these aspects will now be considered in a little more detail.

Activities. The design exercises included information about behaviours by asking participants to locate specific activities relative to one another and gave reasons for that. For example, in the design of the research centre as a whole, many groups included an area which would be landscaped. They explained that staff would like somewhere to go to at lunch times and to take breaks. They gave examples of the activities of walking, resting and relaxing.

The location tasks highlighted similar concerns, but also examined more closely the relationships between different activities and their associated objectives. For example, activities which were considered to involve similar features such as safety were located together.

The importance questionnaire clarified with a larger sample some of the issues which had been raised in previous sessions. With regard to activities, it clarified the design for the office by asking about the behaviours which staff would expect to be able to do there. For example, questions asking the importance of 'having a space around your desk to hold meetings with your colleagues to discuss work', and, 'there is peace and quiet at your desk for you to be able to work.'

The interviews explored in open ended questions some of the issues which had been identified as important to the new research centre and laboratory design. Examples of this included discussions about changes to car-parking arrangements, and encouraging interaction and communication between people.

Physical attributes. To explore the physical attributes of the buildings which would be appropriate, design exercises, location tasks, pictures questionnaire, importance questionnaire and interviews were used.

The design exercises provided the staff with opportunities to raise aspects about the physical design which they considered important. These included the architectural style of certain buildings currently on site which were considered to be inappropriate, the style and placement of windows and building height. The laboratory design exercises provided the participants with the opportunity to design and build their ideal laboratory building, including the internal and external design. This led to specific guidelines from the participants concerning the physical design of the laboratory block.

The location tasks allowed the participants to design, in an abstract form, the site and the laboratory blocks. For the laboratory blocks in particular, this meant

that participants could include specific physical features. These included the physical layout of the inside of the laboratory blocks, such as laboratories, offices and communal areas. On the site, landscaping and route layouts directives were also given.

The pictures questionnaire approached directly the issue of what the architectural style of the new buildings at Thornton should be. This provided clear themes which could be applied as guidelines to design and as criteria for evaluation. The research did not present the results as a style of architecture which should be adhered to, rather that whatever style(s) are chosen, that they should take into consideration the themes which were found to be salient by the staff.

The importance questionnaire again was used to explore with a larger sample some of the issues raised in earlier sessions. Questions included, 'the building you work in looks efficient', and 'the site looks as if it has been designed economically'.

The interviews explored in open ended questions the aspects of building design which should be included. This resulted in being aware of the overall effect being more 'frugal' than 'extravagant'.

Conceptions. Exploring the conceptions which are held by the staff of Shell Research used design exercises, location tasks, pictures questionnaire, importance questionnaire and the sorting task.

The design exercises highlighted the relationships which exist between various activities, and also the nature of activities which are considered appropriate. For example, there was a clear distinction between safe and hazardous activities which are performed within a laboratory block. This was supported by the location tasks, and linked to the sorting tasks. The dirty and more hazardous activities were located to the rear of the buildings and of the site, being separate from the clean, quiet and safe activities.

The sorting task researched the conceptions in the most direct way. It looked specifically at the conceptions which the staff held about the activities which are done at Thornton and at Sittingbourne. The data clearly revealed the distinction between the activities according to 1) the type of activity and 2) the nature of the place experience where that activity is done. This was useful in providing information on the relative location of activities and in the organisational structure of Shell Research at Thornton.

The pictures questionnaire explored the salient conceptions which are held in terms of 'appropriate to Thornton' and various architectural styles. The importance questionnaire clarified certain issues such as what is the purpose of an office by looking at what is important through questions like, 'a person's office or work space gives you some sense of their status' and 'you have a secure place around your desk to keep your work'. The answers to these questions

showed that office security is important but images of status are not important for staff of Shell Research.

These examples show how the research which had been carried out has been structured using the Theory of Place, and that the elements have been investigated as separate but integrated elements. The resulting work describes the place of Thornton and the places within Thornton.

Hierarchy of places

Within Canter's (1977) formulation of places there is not just one place which is called Thornton, but many places within the research centre as a whole and more within each of those. Places are not defined solely by size, and as a result, a centre like Thornton is composed of many places, each with their own identity, experience, physical features, behaviours and conceptions.

The places within Thornton can be identified in ways which are easy to understand and which constitute various 'modules' for the design. Within the Research Centre, there is the Laboratory Block. Within that are individual blocks. Within those are areas shared by large groups. Within those are smaller, group areas. Within those are offices. Each of these are places, and each have their own experience. However, because there is a hierarchy of places, many of the recommendations resulting from the research can be applied to more than one level. For example, the nested spatial hierarchy is applied to groups, buildings and the site as a whole. It suggests the grouping of people, groups and buildings around a central resource/relaxing area. The idea is applied to several levels of place hierarchy. Another example is the locating of hazardous activities at the rear. This can be of both the site as a whole, the laboratory block and individual laboratory blocks.

The Theory of Place provides for research to cover the whole of a design and not just small individual aspects of the design. By using the concept of a hierarchy of places, it is easier to identify the themes which develop during the course of the research, and to apply them in the creation of the design.

Methodology

The research on which the design recommendations are based was carried out at Thornton Research Centre between 27th October and 1st December 1993, and at Sittingbourne Research Centre on 16/17th December 1993. Additional material was collected on the landscaping on 3rd March 1994 at a workshop organised by Shell in collaboration with John Tierney of Wilson/Mason.

All the material collected was treated in confidence, with only general trends being reported to Shell management rather than individual comments. Participants were drawn from the whole of the staff at Thornton through

advertising for volunteers and by direct recruitment by supervisors. The participants from Sittingbourne were invited to attend by their supervisors.

The activities were carried out at Thornton over a period of six weeks. Some members of staff took part in one or more studies. In total, 196 different people took part in the process at Thornton. This included:

- 14 Focused Interviews
- 52 Questionnaires researching attitudes and opinions towards the site
- 54 Questionnaires researching conceptions about building styles
- 24 Design Exercises
- 30 Location Tasks
- 26 Individual sorting tasks
- 3 Group location tasks
- 11 Group discussions
- 15 Landscape Designs

The sorting task, importance questionnaire and pictures questionnaire were completed at Sittingbourne in two days. Fifty-one people took part at Sittingbourne. This included:

- 51 Questionnaires researching attitudes and opinions towards the site
- 51 Questionnaires researching conceptions about building styles
- 51 Individual sorting tasks
- 4 Group location tasks

This section of the report will list the type and range of data collection activities which were used during the research, and describe the nature of some of the analysis.

Initial interviews

Interviews were held with the Director of Thornton, four of the Department Heads at Thornton and seven Group leaders from Thornton plus two other senior people. These interviews explored broad issues concerning plans for the site and the laboratories, and were the first stage in understanding the salient aspects in the designs.

Design workshops

Two design workshops were held at Thornton, each lasting a day. The first day focused on the design for the laboratory, and two groups of four people took part. For this session, the participants were laboratory staff holding any position up to group leader. The second day focused on the site, and four groups of four

people took part. They were from the whole of Thornton, again, holding any position up to group leader.

Both days started by asking the individual groups to discuss aspects which they would wish to see included or avoided in the new designs. These were discussed with the whole group to clarify and assess the level of agreement. The individual groups were then asked to build a model of the new laboratory or site, so that it would be their ideal laboratory or site. No restrictions such as underground piping or cost were imposed on these designs. Finally, the designs were discussed by the whole group.

The design workshops were a particularly rich source of data. The sessions provided reasons and criteria for the designs, plus the models and many comments. The data was content analysed, and the major themes were identified.

Interviews

Further interviews were held with laboratory staff to gather more information about design issues in a laboratory.

Multiple sorting task

Twenty-seven people in four groups took part in the sorting task (Canter et al, 1985) at Thornton. Fifty people in four groups took part at Sittingbourne. A list of the activities which occur at Thornton had been compiled and the aim of the exercise was to explore the links which the staff perceived between parts of the organisation and the environmental experience in which each activity takes place.

The members of the groups were invited to look over the list of activities and add any which they felt were missing. At Sittingbourne, many of the activities which occur specifically at that centre were added. The activities were written on to pieces of card, which had a unique number printed on the back. Each person had an identical set of cards. The participants were asked to look at the cards, and then to sort them into groups in such a way that the cards in any group were similar to each other in some way and different from those in other groups. Each card could be in one group and one group only. There could be as many groups as they liked, and as many cards in each group as they liked. It was emphasised that there were no right or wrong answers, and that it was their opinions which counted. The common factors identified by each participant for the cards in each group were then written down by the participant, together with the numbers of the cards which were in each group.

The exercise was repeated two or three times, or until the participant could think of no more categories. The participants were then asked to think about the experience of being in the place where each activity occurs, and to sort according to this place experience.

The participants were also asked to work as a group and to sort the items into groups as they had done as individuals, but this time to arrive at a group consensus. It was emphasised that this did not relate to actual locations.

The data from the sorting task was analysed using Multidimensional Scalogram Analysis (MSA). In this type of analysis, the groupings imposed by the participant on the cards can be represented by a row of data or 'profile', which can be compared with the profiles for all the other cards. The more frequently cards have been grouped together, the more similar their profiles and, therefore, the closer the points are to each other in the computer generated space. The more distant points are from each other the less likely those activities were considered to be similar to each other in some way.

The plots can be divided into areas by reference to the original data supplied by the participants, and lines drawn to best represent the categorisations of the participants. A line drawn between two adjacent points indicates that although the points are physically close together, the overall structure of the participants' categorisations shows that they belong in separate sections of the plot. It is indicative of a factor which is pulling these items together, but which is not as strong as the factors which have created the divisions.

The titles of the areas in the plots come from the names given to the groups in the sorting. These are the aspects of the cards which those in a group have in common.

The data was analysed to show the basic conceptualisations which staff at Thornton and Sittingbourne hold about the various activities, and to show the types of place experience which they associate with each activity.

Importance questionnaire

Fifty-two people from across the Thornton site, and 51 people from Sittingbourne completed a questionnaire. None of the participants from Thornton had been involved with any previous data gathering. The questionnaire sought to clarify issues which had been raised through the research, and to assess the level of support which some possibilities had.

Members of staff at Thornton completed the questionnaire with a researcher. 67 questions covered a range of issues, and asked the participant to say how important the issue being addressed was to them. In addition to this, the researcher gained background information about the participant including job title and department, and asked for their reaction to the consultation process.

The participants at Sittingbourne were asked to complete the questionnaire themselves, and background information was obtained at another stage.

The data was analysed by calculating the means for each question, SSA and ANOVA. The results clarified which issues were important to the staff of Sittingbourne and Thornton, and whether there were any differences in the opinions of staff depending upon their department.

Pictures questionnaire

Twenty drawings of buildings covering a wide range of architectural styles, in two groups of ten, were shown to 54 staff at Thornton. They were asked to pick one as being their most preferred, and one as their least preferred, giving reasons for their decision.

Ten of the drawings were shown to 51 participants at Sittingbourne. The drawings were chosen to represent the range of preference expressed at Thornton previously. They were asked to chose their most preferred and to give reasons. Background information about the participants was gained at this point.

Location tasks

Three location task sessions were held. The first focused on the laboratory and the 10 participants were all laboratory staff. The second and third sessions focused on the site as a whole and the 20 participants were drawn from all of the site.

The Location Task (Peled 1976a, 1976b) is a technique through which a person can make explicit both the way in which they would like to position, partition and orientate the spatial regions of a place, and the meanings attached to this place. It was designed so that users would not be constricted by the complexities of actually designing a place, nor would it be too abstract to consider.

The participants are asked to think about the place as they would like it to be and to make a list of the places they would like to have in the immediate vicinity of, or be able to see from the place. They are then provided with a 'square-circle'[1] drawn on a piece of paper. The region surrounding this is the outside of the place, and marked on the paper are four major directions; Front/Back, Right/Left and Core/Periphery. They are asked to locate the items they have listed so that the best place as they would like it is created. The participant is asked to mark groups of places or regions of space on the paper and to describe the place they have tried to create.

The task enables the participants to relate simultaneously to inside and outside places, and to relate each place to another and to the system of places as a whole. It is this holistic approach that allows the participants to use all of the parameters in an attempt to create a spatial representation of the place's identity.

For the site location task, the participants were provided with the list of activities used in the sorting task. They were invited to add more activities if they wished, then to write down the activities onto stickers and locate the activities on the 'square-circle'. A discussion was held about each location task and the points it made.

The data was analysed using content analysis.

[1] This is a rounded square drawn on a piece of A3 paper.

Landscape workshop

Two landscape workshops were run with 14 volunteers from the Thornton site. They were asked to consider the experiences and activities they would like to include in the site design. The first exercise included a visit to the main area to be developed, and the volunteers gained an understanding of the size of the area which will be approximately the size of two football pitches. They were asked to list activities and experiences, and to make a rough drawing of locations. After a group discussion, they were asked to think about the ideas in more detail and to locate activities and features on a map of the proposed site plan. They were not restricted only to the central area, and could include the areas between buildings, the perimeter and the front entrance. There was a further group discussion and clarification of the landscaping ideas created in the workshop. Content analysis revealed themes for the preferred landscape design.

Design principles

The results of the research can be summarised in the following design principles.

International research centre

Thornton Research Centre should reflect in its design, the site as an International Research Centre and to support research of the highest standard.

Visitors. The design should facilitate contact with visitors, and provide quality accommodation for their visit.

Landscaping. Landscaping should be used to provide a variety of experiences on the site.

Building design. The building style should reflect Thornton as a World Class and International Research Centre.

Identity

A sense of identity should be provided to each building. Two design issues can promote this;

1. Building style - whilst maintaining a sense of uniformity across the site, each building should incorporate unique design features.
2. Landscaping - should promote distinct identities for each group of buildings.

Front stage and back stage. The design should incorporate 'public' and 'private' areas to enable people to be in control of what is 'presented' about their activities and what is 'backstage'.

Nested spatial hierarchy

The design should combine individual privacy with interaction and communication. This should occur on three levels; group level, building level and site level. This can be achieved by application of the idea of a nested spatial hierarchy.

Safety and security

The site design should improve the physical quality of the site and incorporate elements of security in the design.

Ring road and parking. The design should remove traffic from the centre of the site to improve the quality of the site. Security can be improved by the separation of vehicles from the site centre.

Clear demarcation of areas. This will ensure that visitors are readily recognised and facilitate security.

Comfort and efficiency

The site design should improve the efficiency within which the site operates. This includes raising the standards of comfort and convenience for visitors and staff.

Rationalised buildings. Fewer buildings will improve communication and interaction between staff, and provide a sense of identity to teams.

Activity layout. Logical location of activities relative to one another will improve communication and interaction between staff.

Orientation. Logical layout of the site will improve way finding for staff and visitors. This will add to the efficiency of the site.

Site layout recommendations

Central focus

The site has a central focus. It is surrounded by individual buildings, and is

accessed from all points of the site.

Ring road

The central focus creates a natural ring road which contains all main buildings and separates the site from the car parking.

The centre of the site can therefore be a pedestrian region.

Car parking and access. The car parking can be around the periphery of the site. This allows access from the back of the site, and reduces fears of personal safety.

Focused buildings

The buildings are arranged around the central area. Whilst keeping their individuality, each focuses on and shares this central area. This improves the interaction and communication between the buildings.

Visitors

The Visitor Centre is located at the front of the site, but within the central area. Visitors can thus be brought immediately into the centre of the site. This helps them to understand the structure and orientation of the site.

Landscaping

The site landscaping should be strong, with emphasis on a natural appearance rather than a 'park' approach. Native plants which encourage wildlife should be used.

The use of landscaping can improve the individuality of each building by providing unique views to each building.

Landscaping can provide a relaxing atmosphere of contemplation, and a change of environment from offices or laboratories.

Overall, variety is required to provide several different experiences around the site.

Security demarcation

The centrality of the Visitor Centre allows a demarcation of security so that grades of security can be applied. Visitors will be directed to the visitor centre in the first instance, and then suitable security measures applied depending upon which area of the site will be visited and the nature of the visit.

Front stage and back stage. The site and buildings can have areas which are open to all. These are 'front' regions, and contain public facilities and information. Hazardous and sensitive activities and information can be located in the 'back' regions. These are at the back of buildings and the site, and are not visited by either staff or visitors unless they need to go to that specific area.

In this way, a natural security demarcation is formed which can be reinforced by physical measures.

Progression through the site. The progression through the site with regard to the activities should be: Visitor Centre $\rightarrow$ Support Services and Site Facilities $\rightarrow$ Research and Development $\rightarrow$ Hazardous Activities.

Buildings

Focus. The buildings focus on the centre of the site, and within the buildings there are central points and areas.

Communal. There are communal areas within buildings where communal equipment is located and which serve as areas in which staff can meet informally, and therefore should not just be a storage area. These areas provide opportunities for communication and interaction.

Social. On a smaller scale, groups within the building have social areas in which to meet and talk. These are accessed directly from offices, so combining privacy and individual control with interaction and communication.

Connections. Connecting buildings preserves individual identity whilst maintaining links between groups. Covered connections can provide protection during inclement weather.

Building style

The style of the building designs should encompass a range of characteristics such as height, extent of uniformity and connections to other buildings in addition to the style of the external design

Building style dimensions. Buildings which are appropriate to Thornton would give an impression of a World Class Research Centre and which are impressive to visitors.

The designs should appear to be more frugal (but not cheap) than extravagant, and should incorporate the following features:

- Simple designs
- Many windows

- Some interesting design features
- Roofs which are not flat
- A design which is more 'classic' than futuristic.

Uniform/individuality.   Each building should be designed to be unique. This needs to be balanced with the sense of uniformity around the site.

Height.   The buildings should not exceed 2/3 storeys. To improve the experience of the buildings, plenty of external light should be allowed into all areas of the buildings. In laboratory blocks, the third storey should not be used for laboratory purposes.

   The height of the buildings can be used to create differences in the design of the individual buildings. Variation in height and third storey design will provide external and internal individuality.

Labelling.   Each building should be labelled with a number and/or a name which describes the activity which occurs within. A unique number and/or name will differentiate between buildings and improve a sense of individuality. The numbering system should be logical.

Activity groupings

The activities at Thornton need to be located on the site in ways which improve interaction and communication between related disciplines and which improve the working experience for the staff.

Place experience.   The activities have different place experiences such as noisy, dirty, clean and quiet. Where possible, noisy and dirty activities should not be placed close to clean and quiet ones. This is unlikely to occur since the noisy and dirty activities tend to be research and development, while clean and quiet activities are generally the support services and site facilities.

Risk reduction.   To reduce risks, hazardous activities should be located towards the rear of the site and at the rear of buildings.

Clustering.   Activities which are similar in nature should be clustered together. Research activities should be together, and development activities should be together, etc.

Laboratory layout recommendations

Components

The laboratory should be composed of the following:

- Offices
- Communal Area
- Laboratories
- Laboratories for specific activities
- Storage
- Visitor Reception

Linking laboratory blocks

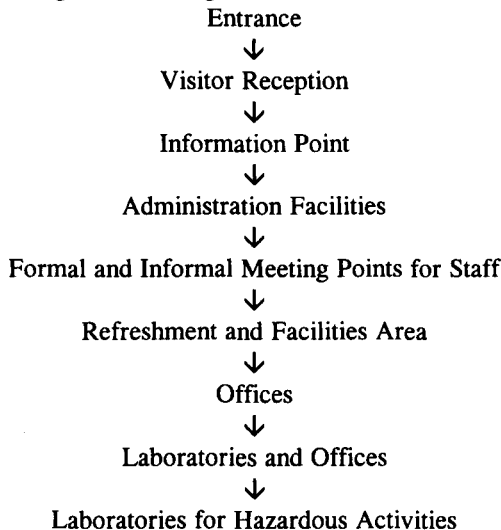The laboratory blocks should be linked by the communal activities

Hazards

Hazardous materials should be kept away from public areas, and preferably on the ground floor to reduce the problems of any leaks.

Hazardous activities should be located away from public areas, preferably at the rear of buildings

Progression through the building

The progression through the building should be:

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Entrance
↓
Visitor Reception
↓
Information Point
↓
Administration Facilities
↓
Formal and Informal Meeting Points for Staff
↓
Refreshment and Facilities Area
↓
Offices
↓
Laboratories and Offices
↓
Laboratories for Hazardous Activities

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