DESIGN PATTERNS IN ARCHITECTURE: TOWARDS A PROPOSED GRAPHIC INSTRUMENT TO ASSIST DESIGNERS

A DISSERTATION SUBMITTED TO THE FACULTY OF ENGINEERING, THE BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY
(DEPARTMENT OF ARCHITECTURE)
UNIVERSITY OF PRETORIA, SOUTH AFRICA

IN FULFILMENT OF PART OF THE REQUIREMENTS

FOR THE DEGREE OF
MASTER OF ARCHITECTURE

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October 2001

PREFACE

Firstly, my sincere gratitude is expressed to *Professor Hans Wegelin* who, as my mentor and leader helped me constantly to keep focus and stay true to the aim of this study. Thank you also for :

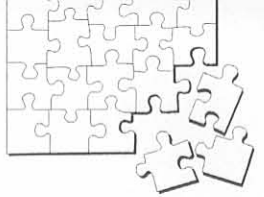
- *Professor Schalk le Roux* and *Gus Gernecke*; giving objective input at the right time.
- *Dr Pieter Fourie*, who encouraged me to 'specialise in something',
- My brother and architect-colleague, *Martin* for support, opinion and lots of encouragement,
- *Wim Swart* and the people at the practice for encouragement and accommodating me,
- *David Levey* for helping so much with the aspect of grammar and creating links.
- *Bentley (Microstation Triforma)* and *Informatix (Micro-GDS)* for providing academical software versions.

Working with computers has its advantages and disadvantages, and so is living in Africa. Great was the distress when the (previous) computer was stolen on the 1st of February 2000 with all the files on hard disk also gone and no back up files.

Sometimes setbacks can make one more determined and thankfully there is also clever software that can convert text from copies to word processing format!

Lastly I want to thank my dear wife, Esther and my children, Kirsten, Nadia and Gisela for their support, great encouragement, love and sacrifice and for really understanding.

This study is dedicated to God, my heavenly Father who guided me.



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12 ABSTRACT

Design Patterns in Architecture:

Towards A Proposed Graphic Instrument to Assist Designers

By

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In this study the following is examined:

- Firstly, *how* to develop an appropriate design tool for architects by graphically exploring, analysing and organising architectural design patterns.

And further how graphics can be used to illustrate design, how computer graphics and the computer can be utilized as an instrument for storing and retrieving design data in terms of software and web sites applications.

- Secondly, finding a *way* of including patterns as part of a user-friendly instrument, to be implemented in the design process in practice.

By also investigating the design process, specifically the creative process, and the possibility of implementing the following pattern-types in a web-site: design principles, social preferences and architectural language.

12 EKSERP

Patrone van Ontwerp in Argitektuur:

'n Voorgestelde Grafiese Instrument om Ontwerpers van hulp te wees

Deur

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In hierdie studie word die volgende ondersoek:

- Eerstens, *hoe* om 'n toepaslike ontwerp instrument te ontwikkel vir argitekte deur die grafiese ondersoek, ontleding en organisering van argitektoniese ontwerp patrone.

Om verder te ondersoek hoe ontwerp grafies voorgestel kan word, rekenaar grafika en die rekenaar gebruik kan word as 'n instrument om ontwerp-data te stoor en te bewerk in terme van sagteware en webbladsye.

- Tweedens, om *'n manier* te vind om patrone te implementeer in 'n maklik bruikbare instrument, in die ontwerp proses in die praktyk.

Om verder ook die proses van ontwerp, spesifiek die kreatiewe deel daarvan te ondersoek, en die moontlikheid om in webblaaie die volgende patroon-tipes te implementeer: ontwerp beginsels, sosiale voorkeure en argitektoniese taalgebruik.

INTRODUCTION AND MOTIVATION FOR RESEARCH

1.1 INTRODUCTION

The concept of *an ideal pattern* or typology in architecture dates back to the 18th century when Marc-Antoine Laugier (1711-1769), wrote *Essay sur l'Architecture* (1753), describing the prehistoric hut as an ideal model. He is quoted by Delavoy (1978):

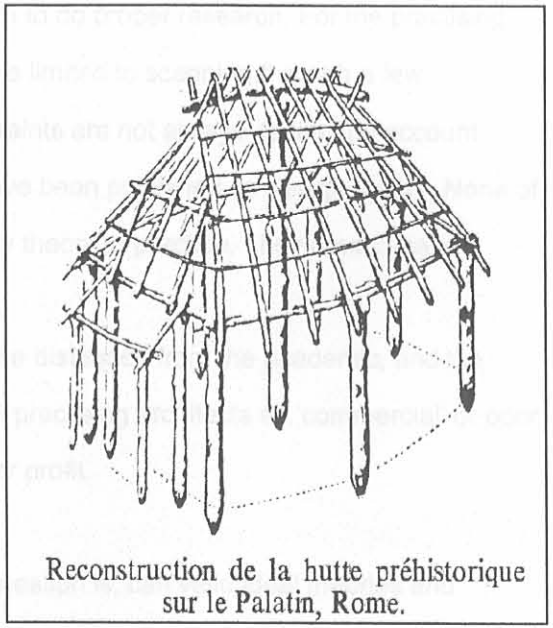


Fig 1A *Laugier's primitive hut as an idealistic model*

'The small rustic hut is the model upon which all the wonders of architecture have been conceived; in drawing nearer in practice to the simplicities of this first model essential faults are avoided and true perfection is attained. The pieces of wood raised vertically give the idea of columns. The horizontal pieces that surmount them give us the idea of entablature. Finally the inclined pieces that form the roof, give us the idea of pediments. This all the masters of the art have recognised.'

Laugier says that a simple model would bring perfection, avoid mistakes and could assist in designing, using elementary design principles.

When analysing design patterns in the wider field of architecture, each pattern should be *an excellent example* and should clearly portray that for which it is labelled. Patterns may portray design ideas from different ideologies, they may portray clear design principles, they could even portray different possibilities or alternatives. Studying the ideal model should assist the practising architect in designing projects.

Norms of perfection usually serve as a set standard to which all aspire, but there are always disparities between ideal and practice. Noble ideals (theories and principles) are taught in schools of architecture. Students are young and idealistic, ready to change the world forever. Their ideals are not always carried over to the practice of architecture. Practising architects are subject to other sets of influences and demands. They may stagnate, often compromising good design principles as a result of the realities of a demanding profession.

The following examples of these disparities may be cited:

- The issues of property development and of having to make projects successful as viable property income generating schemes, sometimes work

against valid design principles.

- When architects participate in architectural competitions, time limits often makes it impossible for them to do proper research. For the practising architect design inspiration is limited to scanning through a few periodicals. Relevant constraints are not always taken into account.
- Many books and studies have been published on design theory. None of these books can really apply theory to practice. They tend to have academic value only.
- Architects in practice become distanced from the academic, and the academics sometimes label practising architects as 'commercial' or poor designers, only practising for profit.

Arising from the above, the question is, can valid ideal theories and principles as taught at universities be reconciled with the practical realisation of design in practice? This dissertation will attempt to address the issue.

In analysing ideal patterns of design, the possibility is that architects as 'specialists' do not always have all the solutions. Modern architecture, such as Le Corbusiers' *Ville Radieuse*, (designed in 1924) had theories that were so idealistic, that they were not always beneficial to the common man. Many modern cities today resemble this early Modernists' vision, and they have failed to recognise people's needs (see Fig1B.)

On the other hand, spontaneous patterns of building are developed by ordinary people, and are sometimes in sharp contrast to the ideals of the 'specialist' or architect. These patterns are valid and valuable to society. As social preferences they are expressed in the way buildings are 'designed' by common

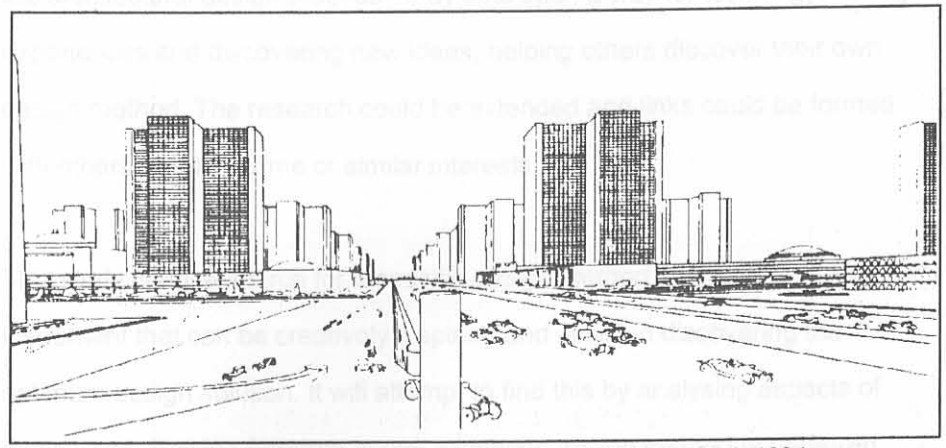


Fig 1B Le Corbusier (1887-1965): *Ville Radieuse (The Radiant City),* 1924

people, and thus are linked to a way of living. Modern lifestyles are subject to the influences of an industrialised and computerised world and some of the older patterns have become forgotten. Should these patterns be reintroduced into the design process? The question will be addressed by this study.

To analyse architectural design patterns, the use of graphic communication needs to be investigated because architects think graphically and design

graphically. Graphics serve to simplify life in many areas. In software packages, for example, simple graphic icons have become more easily recognizable than the alphabet.

A need has been identified by the author, for a soundly researched database to form a reference library for designers. This database, library or tool could well grow and expand and be linked to other information systems, but some questions arise:

- Is the computer the ideal instrument for storing and retrieving design data?
- Does the use of computers curb the creative flow in the design process?

This study will also attempt to answer these questions.

The opportunity for information technology to expand worldwide is now. We live in the age of the Internet and World Wide Web, and it has opened up endless possibilities of networking and sharing information on a global scale. The future academic and professional fields of architecture will be greatly influenced by the 'cyberspace' environment.

Current expansion in the development of information technology (the 'IT revolution') has been a substantial motivational factor for this research. It is felt by the researcher that architects should utilize the power and poten[illegible] computers more creatively.

The researcher has been in architectural practice since 1985 and was involved in the design of a wide range of different projects. Studying a field of interest - the architectural design process - may also open a way for teaching, sharing experiences and discovering new ideas, helping others discover their own design method. The research could be extended and links could be formed with others with the same or similar interests.

This study is not a search for a specific *design method* but rather for an instrument that can be creatively inspiring and assist in discovering the optimum design solution. It will attempt to find this by analysing aspects of design and allowing freedom to use *whatever* design method is preferred.

1.2 THE PROBLEM AND TWOFOLD AIM OF THE STUDY :

*To investigate **how** to develop an appropriate design tool for architects by graphically exploring, analysing and organising architectural design patterns,*

and

*To find a **way** of including patterns as part of a user-friendly instrument, to be implemented in the design process in practice.*

In order to develop an appropriate design tool, the following areas will be investigated:

- The methods of communicating patterns to the designer,
- The ways of assisting the user to select alternatives,
- The development of an appropriate delivery system or vehicle for such a tool.

So as to develop a way to implement the design patterns as part of a user-friendly instrument in the design process, the following issues will also be examined:

- How a database of patterns should assist the designer and what input it should provide to the designer,
- Design Principles as taught at schools of architecture (as ideal examples), and how the architect can use them in practice,
- Social Patterns as evolved by communities in contrast with the 'specialist' professional, and how they can be used as ideal pattern types,
- Ideologies of Architectural Movements: Should they be illustrated as patterns of Architectural Language, and if so, how?

1.3 PROPOSITIONS:

The following propositions are presented:

- *Graphics* could be an effective way of communicating with and illustrating patterns for designers. (Chapter3)
- *Computer graphics* should give the designer a wide choice of options and alternatives and allow for personal preference. (Chapter 4)
- *Software programmes or web-site type menus* may be suitable systems with which to compile a design tool. (Chapter 5)
- *The design process* analysed should indicate what type of input should be given and how design patterns can be implemented in the process. (Chapter 6)
- *Patterns of design principles* may be introduced into the typical process of design in practice, so as to assist designers and help them think through many possibilities. (Chapter 7)

- *Patterns of social preferences* focussing on the variables of human needs, could be introduced by menus to have the designer consider them. (Chapter 8)
- *Patterns of architectural language*, analysing the ideals of architectural movements, may also be expressed, organised and grouped in menus. (Chapter 9)

1.4 DELIMITATIONS:

This study is limited to:

- The typical architectural practice found in the modern global economy,
- The process of conceptual design, including deciding on and developing the design language,
- Aspects of social patterns in the western world.
- Some architectural ideologies of the twentieth century.

1.5 DEFINITIONS OF TERMS:

ARCHITECTURE:

The Concise Oxford Dictionary (1966): defines *architecture* as *'art or science of building'*. Both senses are appropriate in this study.

ASSIST:

The Concise Oxford Dictionary(1966) defines assist as: *help*. In this study it means *helping by way of providing inspiration and ideas, furnishing possibilities to investigate.*

DESIGN (AS A VERB):

'Making a preliminary sketch of a mental picture' is a way of defining design.

The term *design* as used in this study will mean*: the portrayal by any means of an idea or concept in a building or elements of it.*

DESIGN (AS A NOUN):

Design is a skill that can be taught, can be developed, can be learnt or unlearned.

The first three senses apply in this study.

DESIGNERS:

In this study *designers* means:

Anyone who studies, lectures on or practises architectural design.

GRAPHIC:

The Concise Oxford Dictionary (1966) defines graphic as:

'of drawing...vividly descriptive, lifelike...of diagrams or symbolic curves'.

The term *graphic* in the context of this study will mean *drawings, sketches and diagrams with annotations.*

INSTRUMENT:

The Concise Oxford Dictionary(1966) defines an *instrument* as '*Thing used in performing an action'*, which is the meaning used in this study.

MOVEMENTS:

Series of actions and endeavours of a school of architects towards a specific end.

PATTERNS:

- *The Concise Oxford Dictionary(1966)* defines *patterns* as *'an excellent example'*, a denotation which is also used in this study.
- Other words used for *patterns* in similar studies are: *an idealistic model, typology, archetypes, arche-patterns.*
- *A 'case-study'* can sometimes be regarded as a pattern in the sense of *being an excellent example of a successful design being studied.*
- The term *'form'* as used by authors with regards to architectural movements, can also mean patterns but all patterns are not necessarily related to *'form'*.

PRINCIPLES :

A fundamental truth as a basis of reasoning in terms of design theory.

PROCESS:

A course of action or method of operation, in this case *the design related actions and a method of producing a design.*

PROCESSES :

In this study *processes* means: *procedures or methods as a means of producing a design.*

SOCIAL:

Concern for the mutual relations of people and the social patterns which exist in building.

1.6 ABBREVIATIONS USED:

2D: means .....*two dimensionally*

3D: means .....*three dimensionally*

CAD: means.....*computer-aided draughting and computer-aided design*

Fig. : means.....*Figure*

IT: means.....*Information Technology*

M.I.T. : means.....*Massachusetts Institute of Technology*

RIBA: means.....*Royal Institute of British Architects*

UK: means.....*United Kingdom (Britain)*

USA: means.....*United States of America*

www: means.....*World Wide Web*

1.7 THE ASSUMPTIONS:

It is assumed that:

- Only some architectural design patterns can be illustrated for the purposes of this study.

- The method of organising, grouping and analysing patterns and case studies is subjective and may have been done differently by another researcher.

- The type of design patterns to be analysed will be chosen subjectively. The correct practical route may be to do research and analyse what type of design pattern is needed.

1.8 NEED FOR THE STUDY:

This study could be of both practical and academic value. Academically it addresses the design, theory and history of architecture. For architectural practice it addresses planning, design conceptualisation and design development.

The contents could benefit academics in architecture, students of architecture, architectural practices, property developers, developers of information systems and of software.

A secondary goal is to eventually publish the data of the study as a user-friendly tool. Such a manual could be subdivided into smaller components as separate volumes. The database could well grow and expand. Other research and databases could be linked. The use of web-sites with links to other relevant information to aid designers could be investigated.

The information can be updated regularly, and revised editions could be published quarterly or yearly . The instrument could be fine-tuned by users and user-group interaction.

A user-friendly design tool should fill a void in practice and build bridges between the academic and professional fields. More interaction between practices and universities or colleges can improve design quality in both fields.

To be useful, the design tool should be open-ended and able to accommodate any design method. Architects who are not familiar with computers should also benefit. The patterns could also be illustrated in book-form with appropriate grouping/classification and indexes.

This study should contribute new ideas to the subject of design methodology and will show further avenues that can be pursued in using the computer in design.

CHAPTER 2

REVIEW OF RELATED LITERATURE

In the search for relevant literature, the approach was that the study concerns mostly graphics, design principles and idealistic patterns and thus studies in these fields were mainly searched for. The following sections of this chapter discuss some of the important issues found in the literature.

2.1 GRAPHIC COMMUNICATION

The following studies on graphics are reviewed:

- *Architecture: Form, Space and Order* (Ching 1979)
- *Graphic Thinking for Architects and Designers* (Laseau:1980)
- *The Digital Architect* (Sanders:1996)

The above three books were chosen because of their contribution to the subject in terms of graphic drawings portraying design principles, graphics as a communication tool and computer graphics in the architectural practice respectively.

Graphic studies are widely used by students and architects in the design process. The books of Ching and Laseau were also successful commercially - each book has been published in several editions over a period of twenty years. The books are also both in the 'reserved collection' at the local university library, students can only work on the books in library hours or make copies of pages relevant to their study.

2.1.1 Architecture, Form Space & order

The use of graphics is well described by Ching (1979:11): *'On the following pages is an overview of the basic elements, systems and orders that constitute a physical work of architecture. These constituents can all be perceived and experienced. Some may be readily apparent while others may be more obscure to our senses. Some may dominate while others play a secondary role in a building's organization.*

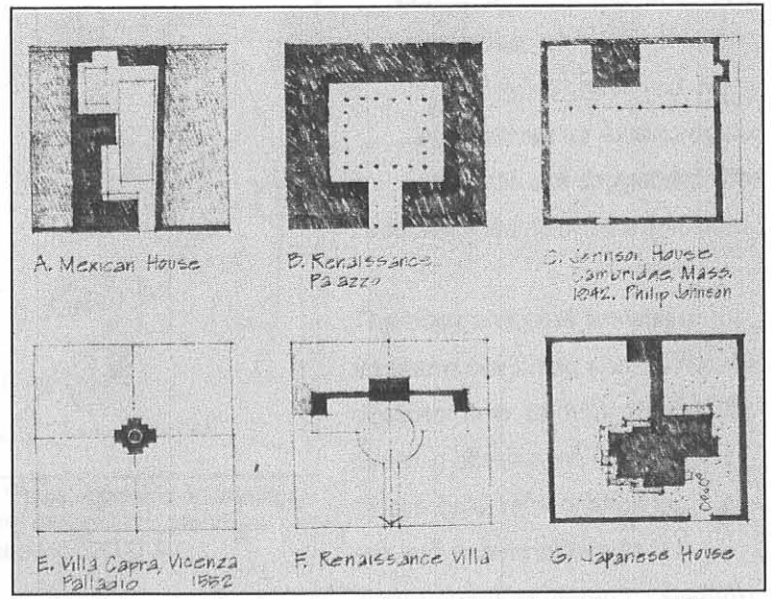


Fig 2A Ching: *Architecture: Form, Space, Order*; hatching used for elements to explain principles

Some may convey images and meaning while others serve as qualifiers or modifiers of these images and meanings.'

The book is mostly graphic, with well-executed sketches done in pencil, illustrating design principles *(see fig 2A).* Not all the examples or patterns are analysed in the way that the design concept was discovered, or in terms of how the design developed. Where this is done however, the illustration of the specific principle is a lot more effective. The variety in rendering technique obscures clear communication, as there is not always a standard way of presenting the graphics to the reader.

Hatching is used, sometimes to great effect to highlight elements, for example for structures that create space, or in other examples the space that it creates (such as a courtyard or square). There is no use of colour in the entire book, which could have enhanced effective communication.

Annotation is always in separate columns. Integrating it with the graphics could have been more effective. The reader has to look at the graphics and then read the text column.

The book is probably popular because of the large number of drawings of noteworthy architectural designs and the way they are categorised and elaborated upon. The graphics communicate the principles in such a way that architects and students can use it as a 'design manual' for inspiration. (It is also reviewed under design principles.)

2.1.2 Graphic Thinking for Architects and Designers

Laseau's (1980:1) remark regarding the drawings of Leonardo da Vinci, indicates his own purpose in writing his book:

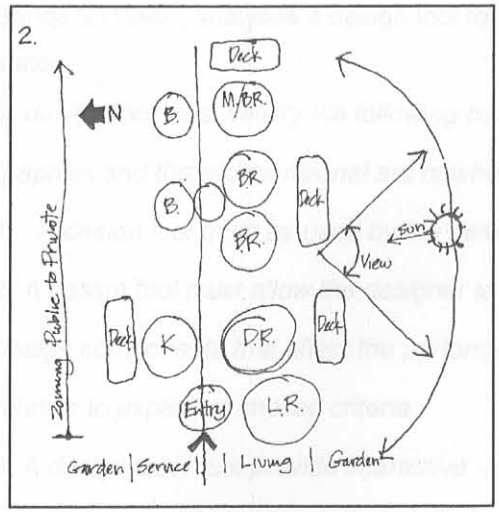


Fig 2B Laseau: *'Positioning and orientation'* illustrated utilising relationship, modifiers and identities- see Figs 2C,D & E

'The thinking is exploratory, open-ended; the sketches are loose, fragmented, while showing how they were derived. Many alternatives for extending the ideas are suggested. The spectator is invited to participate.'

The book analyses the use of freehand sketching and shows the designer how to think graphically. Graphic abstraction is portrayed by symbols, relationship(such as arrows) and modifiers (a diagrammatical hierarchy system) to create what Laseau calls *'a Graphic Language'.* It is never shown in combination with a design project however, but rather as separate graphic diagrams.

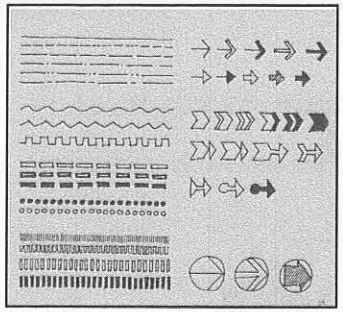


Fig 2C Laseau: *'Relationship'*

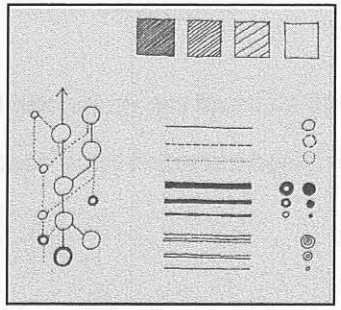


Fig 2 D *'Modifiers'*

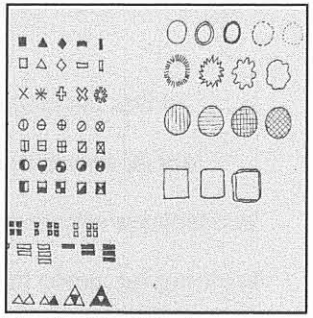


Fig 2E *'Identities'*

The author seems to think in two different graphics spheres: design diagrams and design sketches. Combining the two would have been more effective in communication.

The graphic analysis of the following aspects of a project are shown:

- Context
- Site
- Form
- Scale and proportion
- Mass and balance
- Unity and diversity

The book also analyses the design processes graphically. It is successful in showing architects the possibilities of how graphics may be utilised. The popularity of the book is probably because it shows the *different ways* of illustrating designs graphically. It also assists the graphic thinking of the designer.

(See also Graphics as Communication, Chapter 3)

2.1.3 The Digital Architect

Sanders (1996), analyses a design tool for the architectural practice. He states:

'A design tool must satisfy the following basic criteria (Note that the terms graphics and three-dimensional are nowhere to be seen):

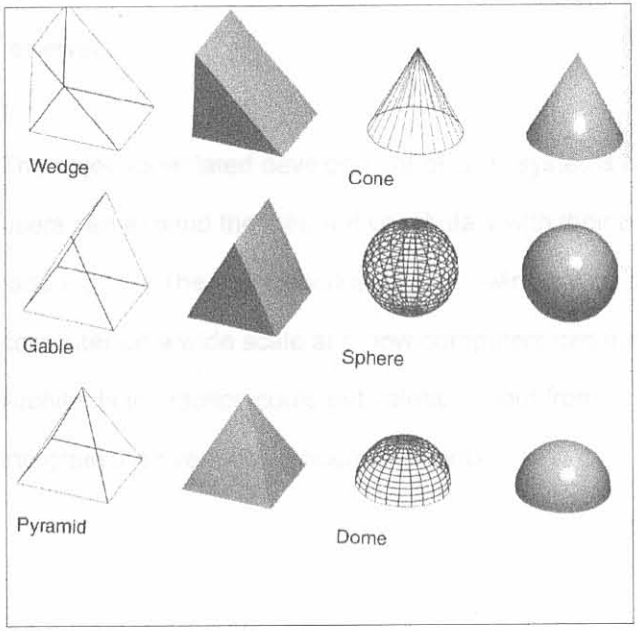
1. A design tool must be used by the designer, not the surrogate.

2. A design tool must allow the designer to define the relationships between design components that affect the performance or appearance of the design, relative to explicit or implied criteria.

3. A design tool must provide interactive -(preferably dynamic) feedback concerning the performance or appearance of a design as the designer modifies its geometry.'

The book is a study of computer graphics in the architectural practice and examines how computers can be harnessed to design projects. Not many books are published on this subject, and with computer technology growing rapidly and continuously, some aspects of the book will already be out of date.

Most publications on digital technology are found on the Internet and in magazines. However, the book is still important because it shows all the possible applications of computer graphics in the practice situation.



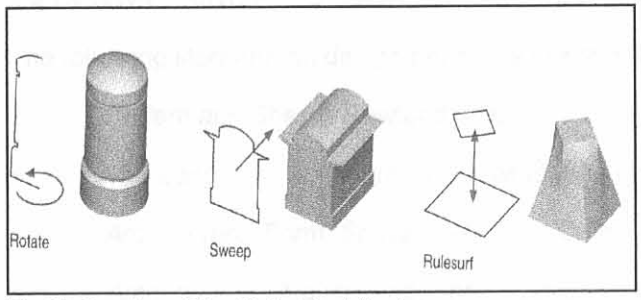


Fig 2F Sanders, *The Digital Architect*:
3D modelling, standard forms and special forms created on CAD

The book shows three-dimensional (3D) modelling and indicates how different designs can be illustrated on the same site by creating block models of mass and scale. It shows the terminology and techniques used in computer graphic renderings, also how hand drawn sketches can be scanned into graphic programmes and coloured in on computers. He also says the following on the advantages of the computer in process of design:

'The design process at it's core is an iterative one. Schemes are identified, explored, measured, revised, enhanced - and the loop repeats. As digital tools compress the loop and make it easier to iterate design alternatives and evaluate their effectiveness, they in theory can improve the quality of design. Some architects equate digital design tools with three-dimensional CAD, but powerful design tools can emerge from other desktop programmes as well...'

The impact of technology on the architectural practice is clearly defined, planning and implementing technology in the firm is addressed, training, tools and the language of the digital media, operating systems, hardware and on-line resources are shown. Even the future trends in the computerised practice are forecast. The appendix indicates world-wide-web sites containing architectural resources.

The illustration of bitmap images - hand drawn images scanned into computer programmes with colour added with the digital tool, are shown as well as

several CAD - images in all it's formats, from wire-frame renderings to fully rendered animations and digital video presentations. The CAD software versions of Autodesk (AutoCAD) and Bentley (Microstation) are mostly reviewed.

The object-orientated development of CAD systems is shown, where CAD users can expand the element vocabulary with their own custom drawn objects (see Fig 2F.) The book is valuable in showing how a practice can utilize the computer on a wide scale and how computers can integrate various functions. Architects in practice could get valuable input from this book, on how to integrate their various computer-systems.

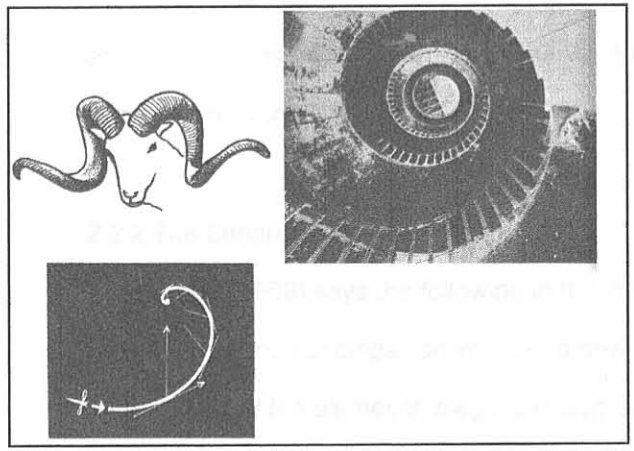


Figure 2H Rowland : *Patterns and Shape: spiral* shapes in nature and spiral staircase

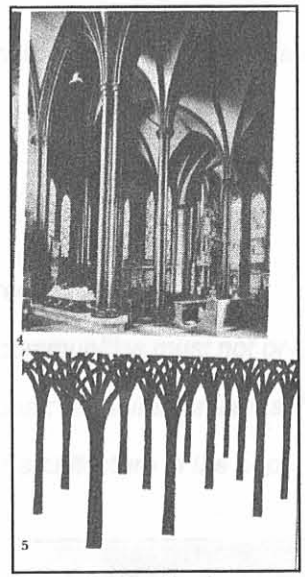


Figure 2J Rowland: *Patterns and Shape :* Forms in architecture derived from nature

2.2 DESIGN PRINCIPLES

The following literature on design principles are reviewed:

- *Pattern and Shape,* Rowland (1964)
- *The Language of Architecture,* Hesselgren (1969)
- *Architecture: Form, Space and* Order, Ching (1979)
- *Archetypes in Architecture*, Thiis-Evensen: (1987)

2.2.1 Pattern and Shape

Rowland (1964) analyses shapes(forms) and patterns in everyday life. He says the following in the foreword (p2):

'*The object of the book is to encourage the rising generation to examine the shapes and patterns which form the background of human life. The author believes that such an experience will provide them with standards of value which may be applied to everything they see.'*

This study will also attempt to transmit values (design patterns) by visual, graphic illustrations, that should give the designer application possibilities. Rowland analyses patterns and shapes in the following chapters:

- Thinking about patterns,
- Patterns caused by materials,
- Patterns from our surroundings,
- Town and Country patterns,
- The same and yet different,
- Nature's patterns,
- Solid patterns and light,
- Seeing all around: looking at forms from all angles.

This book, written for school children, addresses some very important issues: How a pattern changes appearance because of the position of the person viewing it; how new materials have brought about new shapes; what relationships exists between materials and patterns; how nature influences patterns and shapes. Viewing forms from all angles to gain an idea of the flow of the form is also discussed.

Although the book is simplistic, it shows some important aspects of visualisation and ways of looking at patterns and shapes. Photographs are mostly used, with some line drawing illustrations.

2.2.2 The Language of Architecture

Hesselgren (1969) says the following in the introduction:

'*The houses and buildings constructed in new communities must not only provide shelter against the elements, they must also 'speak' to their inhabitants. It is the purpose of this book to analyse the language of architecture in the hope that such*

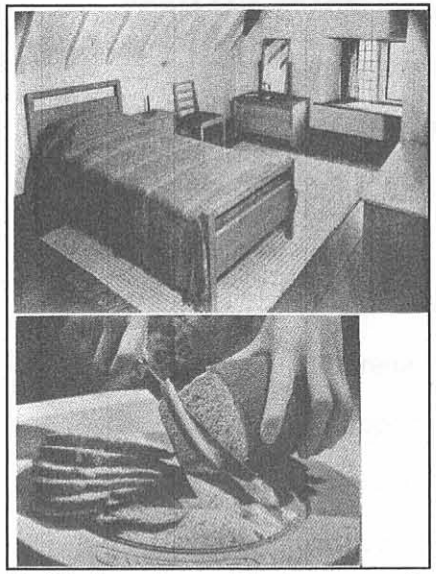


Fig 2K Hesselgren : *The Language of Architecture* : Interior of room creating feeling of 'cut Rye-bread'

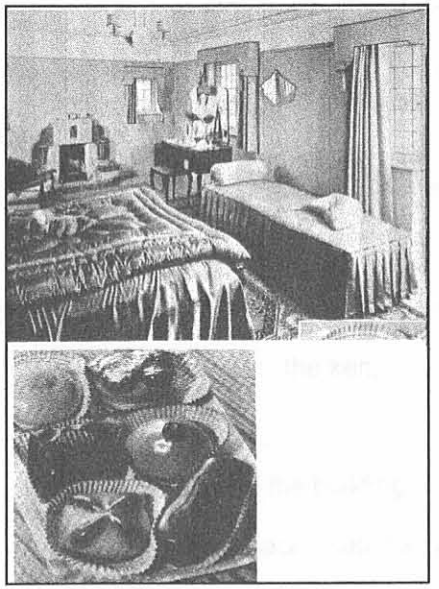


Fig 2L Hesselgren: Interior of room creating feeling of 'sweet pastries'

an analysis makes a contribution to a more effective approach to architectural problems, an approach which will not only incorporate experience and intuition, but which will replace superstition by conscious knowledge based on scientific research.'

He describes the language of architecture (in terms of visualisation) with:

- Facts about perception, (see Fig 2K and 2L),
- Formal aesthetics in visual form, colour, texture, rhythm etc.
- Architectural expression,
- Perception, expression and emotion, architectural form and townscapes.

The book is based on his doctoral thesis and the subject is approached exactly as he describes it above: *a scientific research*. The problem is probably that some of the topics are examined too scientifically. He proposes fundamental rules for the aspect of aesthetics, which is regarded generally as an art form (not a science.) The graphics do however show some interesting visual material which show the way all people, not only architects, perceive graphics and forms and symbols.

2.2.3 Architecture: Form, Space and Order

Ching(1979:8-9), portraying design principles by graphics, provides the following analysis:

- PRIMARY ELEMENTS: point, line, line to plane, volume.
- FORM: visual proportions, shape, primary shapes, platonic solids, regular and irregular forms, transformation of form, dimensional transformation, subtractive forms, additive forms, formal collision of geometry articulation of form etc.
- FORM AND SPACE: the unity of opposites, form defining space, defining space with horizontal elements, ditto with vertical elements, qualities of architectural space, elements defining space.
- ORGANIZATIONS: organizations of form and space, spatial relationships, spatial organizations .
- PROPORTIONS AND SCALE: proportion, proportioning systems: golden section, the orders, renaissance theories, the modulor , the ken, anthropomorphic proportions, scale.
- CIRCULATION :circulation elements, the approach to the building, building entrances, configurations of the path, path/space relationships, form of the circulation space.

- PRINCIPLES: ordering principles, axes, symmetry, hierarchy, datum, rhythm and repetition, transformation.

Ching uses graphics to illustrate patterns according to a specific principle. Many sketches, some with different views of the same design, are used to explain a principle (see fig 2M Four Planes Closure.) The book is a graphic study of patterns and case-studies in design and is illustrated mostly with freehand sketches. Architects and students can use it as a design manual. It is a helpful design tool, a thorough basic training for students of architectural design which addresses both modern- and historic architecture. This book has made a valuable contribution to the subject of *design principles*, illustrated by graphics, but at times lacks clarity and order, which can be confusing. A possible reason is the size of the images and the type of rendering utilised, which varies considerably.

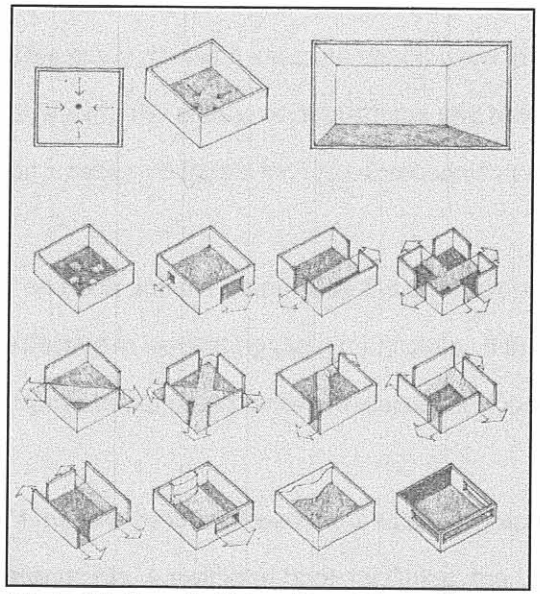


Figure 2M Francis Ching : 'Four Planes Closure' from the book *Architecture: form, space, order*

2.2.4 Archetypes in Architecture

Thiis-Evensen (1987) analyses architectural patterns in three categories:

- the floor,
- the wall,
- the roof.

He says the following in his introduction:

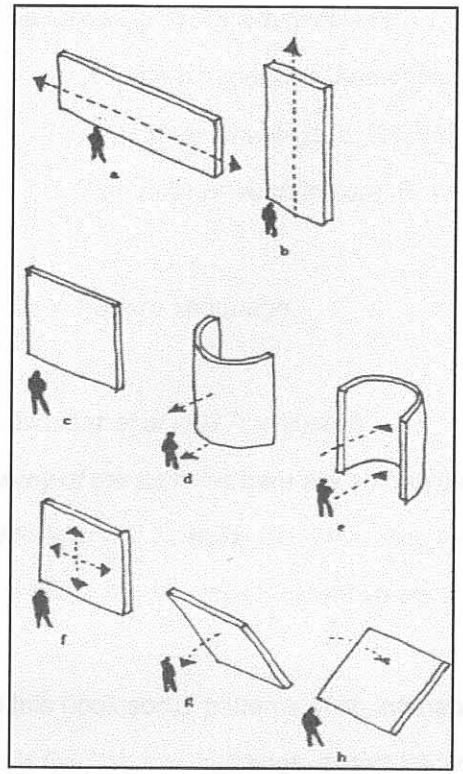


Figure 2N Thomas Thiis-Evensen: *Archetypes in Architecture : 'wall experiences'*

'The book has a design-orientated goal. With a more precise knowledge of archetypes and their variations, it is possible to replace the schematic architecture of recent years without necessarily falling back on and copying motifs from the past... Moreover its intent is to point out the possibilities which lie at the roots of architecture, and which in the hands

of a creative practitioner can give the art of building a more humane countenance.'

The principle analysis is probably clearer when the stylistic rendering of the final design is omitted. However, it is inspirational, inviting and open-ended. It analyses the patterns in elements of architecture in a wide variety of archetypal themes which Thiis-Evensen calls 'the grammar of architecture'.

This study makes a valuable contribution to the subject of *design principles* in analysing the elements of buildings and how they are experienced. It is also based on a research thesis for Thiis-Evensen's doctorate at the University of Oslo.

The book doesn't emphasise the style of the design pattern. It is probably more effective in illustrating design principles than those illustrated by Ching. However, many elemental patterns are discussed (floor, wall or roof elements.)

Many sketches are freehand and photographs are also used to convey the idea of a principle. As with the book by Ching, the principles illustrated by design development sketches are more effective in illustrating a principle. Photographs always show the final design and style, which sometimes obscures the analysis of the principle.*(See also Appendix A: Examples of Design Principle Graphics)*

2.3 IDEALISTIC PATTERNS:

Idealistic patterns and case-studies have been the subject of much teaching and research, especially in terms of social and historical values.

The following books are reviewed:

- *A Pattern Language*, Alexander *et al* (1977)
- *Leon Krier Drawings*, L. Krier (1981)
- *Rob Krier on Architecture*, R. Krier (1982)

2.3.1 A Pattern Language

Alexander *et al* (1977: xviii)says:

'Many of the patterns here are archetypal- so deep, so deeply rooted in the nature of things, that it seems likely that they will be a part of human nature, and human action, as much in five hundred years, as they are today.'

In this book social patterns of spontaneous design in building are explored over a wide field (towns, buildings, construction). It is perhaps somewhat rigid in defining

social patterns and in how it relates to buildings, towns and cities. It is a thoroughly empirical, perhaps even pragmatic approach. It does, however, look at the 'forgotten' patterns that people seem to want in today's industrialised, motorised and organised society. It can be argued that Modernism and the industrialisation of building methods have developed many inhumane environments and that people long for the familiar things in social patterns of a bygone era.

Alexander implies that architects have often been guilty of creating buildings that are not friendly towards users. He believes they should exercise a social responsibility; they should not miss the opportunity to create buildings that accommodate people's needs.

Pattern Language summarises and indexes patterns according to a sequence: from the larger patterns to the smaller. From patterns that create structures to ones which *'embellish'* them, to the patterns that '*embellish the embellishments'*. This network of sequences forms the basis of the pattern language. The graphics illustrating the patterns consist mostly of photographs but also use diagrams *(see Fig 2O).*

Broadbent (1990:) critiques Alexander as follows:

'In practice, many of the patterns ring true and they have been applied quite widely. Others must be taken with a pinch of salt nor can these or any other Patterns, be applied in all cultures, all climates, all social conditions.'

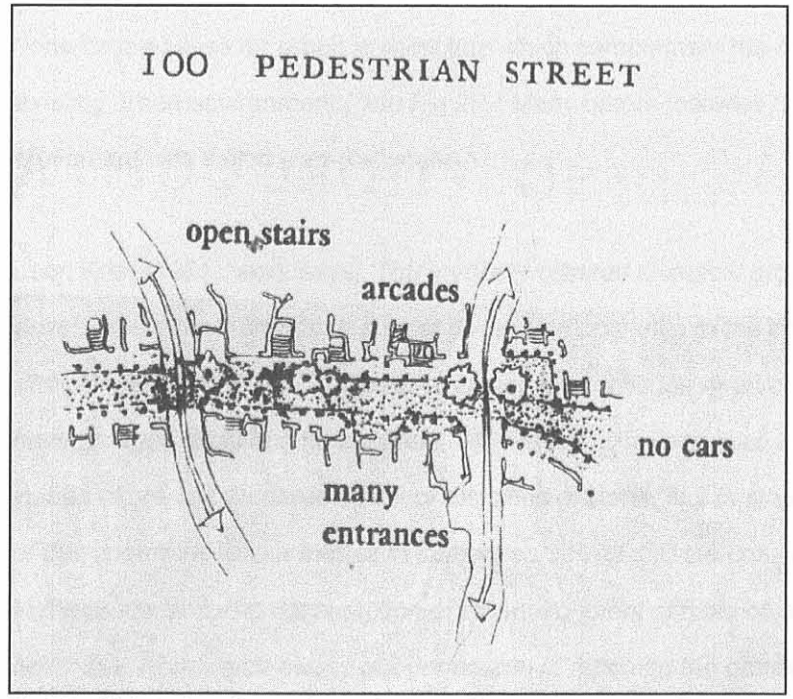


Fig 2O Christopher Alexander and others: *Pattern Language* - Pattern of *'pedestrian street'*

The patterns strive towards a specific social order, from the way cities and suburbs are planned, to the way houses and other buildings are

designed, to the very elements used in designing these buildings. Broadbent is therefore correct to say that the book can't be applied to all cultures and social structures.

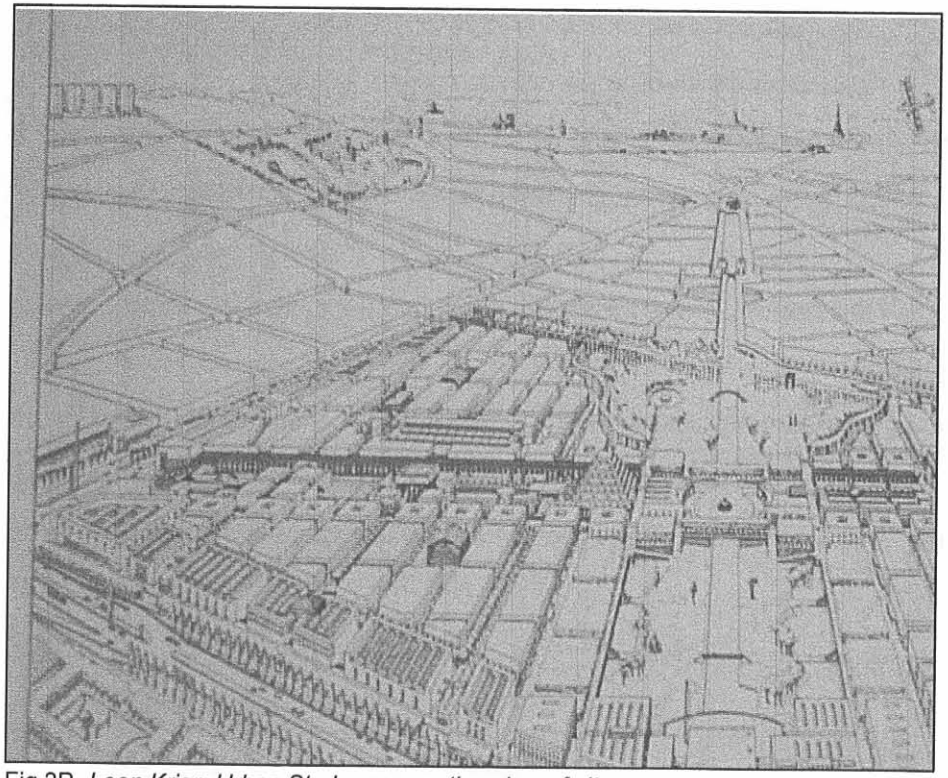


Fig 2P *Leon Krier Urban Study :perspective view of city*

2.3.2 Leon Krier: Drawings

While Alexander and colleagues attempt to be the custodians of social space, brothers Leon and Rob Krier are the idealistic custodians of urban space and order. Both groups protest against the detrimental effects of an industrialised society, the first upon social behaviour, the latter upon old cities. Leon Krier has done case-studies for urban architecture which complement the context of the existing urban environment (see Fig 2P.) Many others followed his thinking; the movement was called Neo-Rationalism..

Leon Krier (1981 : xxv), says*: 'The myth of unlimited technical progress and development have brought the most developed countries to the brink of physical and cultural exhaustion. The fever of immediate profit, the empires of money, have ravaged cities and countryside. We have now to recognize the absolute values of pre-industrialized cities, of the cities of* stone. *Not to stop the destruction of this enormous labour means to subject ourselves and the coming generations to the production and consumption of an environment of futile objects. The enormous work which awaits our generation in repairing the damages and destructions of the last thirty years, must be undertaken in a perspective of material permanence.'*

Alexander wrote about archetypal, deeply rooted patterns, while Krier speaks of the absolute values of pre-industrialised cities, especially in Europe.

2.3.3 Rob Krier: On Architecture

Rob Krier (1982:10) states the following:

'The 1960's revealed the need for a more coherent theoretical approach in the social sector. It is now time for architecture to consolidate the theoretical foundation of its long-established craft, the art of building, to re-discover the basic elements of architecture and the art of composing with them.'

The book shows design projects done by the author, many typologies of variation of themes for urban space, on plan ,elevations and three-dimensional drawings (see Fig 2Q). As with Leon Krier the sketches are well executed works of art and sometimes rendered beautifully. Some of the sketches have poetry alongside, some sketches are abstract showing elements that Krier wants to revive in the European city, such as:

- The wall
- The column
- The bridge

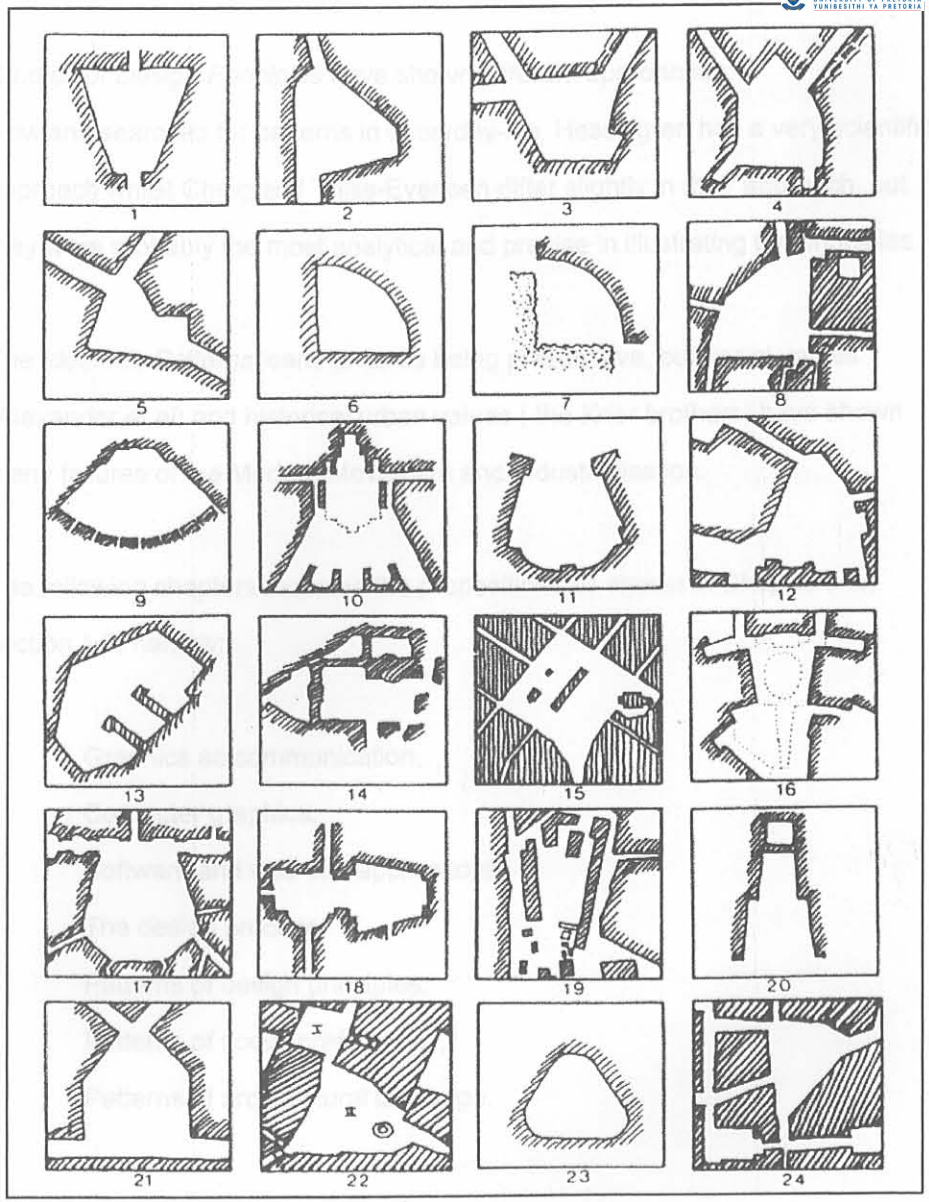


Figure 2Q , *Rob Krier: Squares as urban spaces*

Urban design in Europe has been widely influenced by the Krier brothers' projects and writings. Their work should also be seen in the context of the old cities of Europe and the tremendous historical and social values their urban building patterns have. Modernism and industrialisation have ignored many of these values and it can be argued that they may even have destroyed them.

The Krier brothers and Alexander, all practising architects, analyse the 'absolute values' of peoples' preferences over the centuries. According to them, the patterns in these 'absolute values' should appeal to the designer and it should be reintroduced in the practice of design. It may be argued that people will never move back to these values, that they have adopted new values because of modern lifestyles, but it could also be argued that people will always move back to the familiar things of the past. (*See also Appendix B : Graphics of Social Preferences.*)

2.4 CONCLUSION : REVIEW OF RELATED LITERATURE

Graphics and *Computer Graphics* were examined, and valuable contributions to the subject of graphics were found in the books of Ching, Laseau and Sanders. They all showed some imperfections, though.

Studies of *Design Principles* have shown different approaches: Rowland searches for patterns in everyday-life, Hesselgren has a very scientific approach whilst Ching and Thiss-Evensen differ slightly in their approach, but they were probably the most analytical and precise in illustrating the principles.

The *Idealistic Patterns* leans towards being prescriptive, but social values (Alexander *et al*) and historical urban values (the Krier brothers) have shown many failures of the Modern Movement and Industrialisation.

The following chapters examine the propositions as shown in Chapter one, section 1.3, namely:

- Graphics as communication,
- Computer graphics,
- Software and web-site applications,
- The design process,
- Patterns of design principles,
- Patterns of social preferences,
- Patterns of architectural language.

GRAPHICS AS COMMUNICATION

3.1 INTRODUCTION

The proposition in this chapter is that *Graphics* could be an effective way of communicating with and illustrating patterns for designers.

This chapter analyses the requirements of graphic thinking, and attempts to show the way architects visualise designs. As shown in the review of Ching (1979), graphics should explain and communicate, should bring out that which is perceived as obscure, should enhance the apparent features of design ideas.

The design patterns must be inspirational, but to assist a designer effectively, they should be open-ended (Lasseau,1980) - inviting and fostering participation.

The aim of this chapter is to find a way to expose the designer to elements and ideas in a systematic, graphic way which will clarify certain images that have been obscure and will communicate the interrelatedness of others. Images and ideas familiar to designers are analysed from different perspectives. The purpose of an appropriate design tool should be to inspire, to familiarise, and to scan across ideas in a systematic way.

Graphic symbols communicate ideas more effectively than most other ways of communication. Children are exposed to flash-cards at school in order to learn elementary reading and writing. Graphics are used in public buildings to communicate the functions of and directions to facilities. It is also used to communicate computer operations through user-friendly icons. The more simple they are, the more user-friendly. A person without much computer training can learn to use a computer extensively through 'icons'- graphic symbols and by pressing a button that will perform an operation.

Architects and designers are graphic thinkers. They are taught to think on two-dimensional and three-dimensional planes. They look at forms, buildings and space differently, as an artist looks at colours and light and composition. These perspectives have to be widened and analysed to bring out the best in the designer's potential.

Exploratory thinking is what is required from a designer. He or she should explore many possibilities, hopefully discovering new ideas to put together a good end product. To explore, to discover one must realise that one cannot see everything yet, that the vision has to expand, be developed, be thought through, and be allowed to grow and be fertilized by more ideas. Design in architecture does not consist only of the first idea. Many promising initial concepts have been spoilt by not thinking them through.

Exploring ideas and possibilities is a process: the designer has to start walking, has to start to look and see:

- the site,
- the restrictions,
- the brief from the client,
- possibilities of form,
- the context.

This chapter attempts to show how open-endedness (in Laseau's terms) can invite participation, can fertilize ideas while keeping the designer aware of the possible restrictions. The design process is about alternatives. The design-assisting tool should meet the challenge to help designers choose correct alternatives at the right time during the design process. The grouping of design patterns has to be systematic and logical, but allow the user flexibility of personal preference.

3.2 BASIC GRAPHIC ELEMENTS FOR ARCHITECTURAL DESIGN

The basic elements in graphic communication of design in architecture are listed and illustrated by Francis Ching in Fig 3A on the right: *point, line, plane and volume*. Dimensions come into focus: one-dimensional, two-dimensional (2D) or three-dimensional (3D). Patterns can be illustrated by means of 2D or 3D graphics.

The vocabulary of architects in 2D drawing consist of: plan, elevations and sections, and diagrams thereof. For some aspects of design, for example proportions, it may be more relevant to use 2D than 3D. The design of elevations can best be illustrated through 2D planes, whereas site aspects could have 2D and 3D input. 3D views include isometric and perspective views.

The aerial perspective view may have some value in expressing form , for instance where a pedestrian perspective view could have value in relation to scale and context. These elements of graphics are the basic means to communicate design patterns. The way that architects seem to visualise and think about design is analysed in the further sections of this chapter.

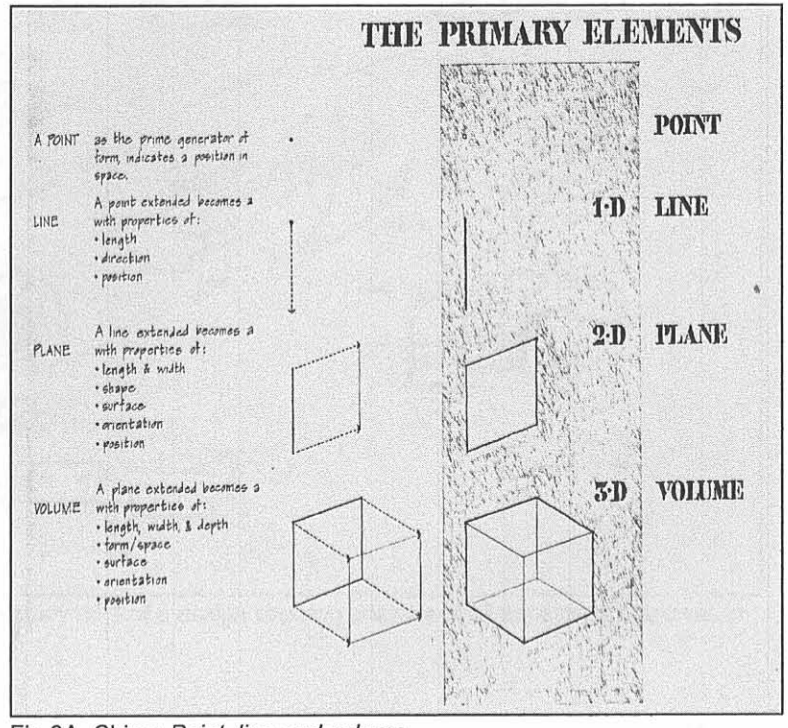


Fig 3A Ching: *Point, line and volume.*

3.3.1 PARTICIPATION AND EXPLORATORY THINKING IN THE DESIGN PROCESS:

Exploratory thinking by means of graphics is usually illustrated through case-studies. The following page shows graphic case-studies by Laseau (1980 : 85-87) which illustrate the aspect of participation in and exploration by the designer (Fig 3B, 3C, 3D). Basic choices in three different design approaches are analysed. The graphics vary between site plan, plan, diagram and sections and between 2D and 3D illustrations, and form a total picture of design-problem analyses. The graphics are inviting and show exploratory thinking. The designer is boldly sketching the different possibilities and their implications.

The three case studies are good examples of how a specific design can follow different approaches and how each has its implicit or explicit constraints and principles that shape the outcome of the design.

The design options are analytical and will have to be merged to form a design solution. This process illustrates the importance of decision making in design Influenced by priorities.

However, the diagrams are not always very clear. The graphics could have been better annotated or some keys provided to explain the various graphic elements. The user should understand the graphic language or keys clearly; there should be no room for misinterpretation.

The sketch-type analysis gives the drawings a sense of being preliminary and assists the thinking related to the development of a design.

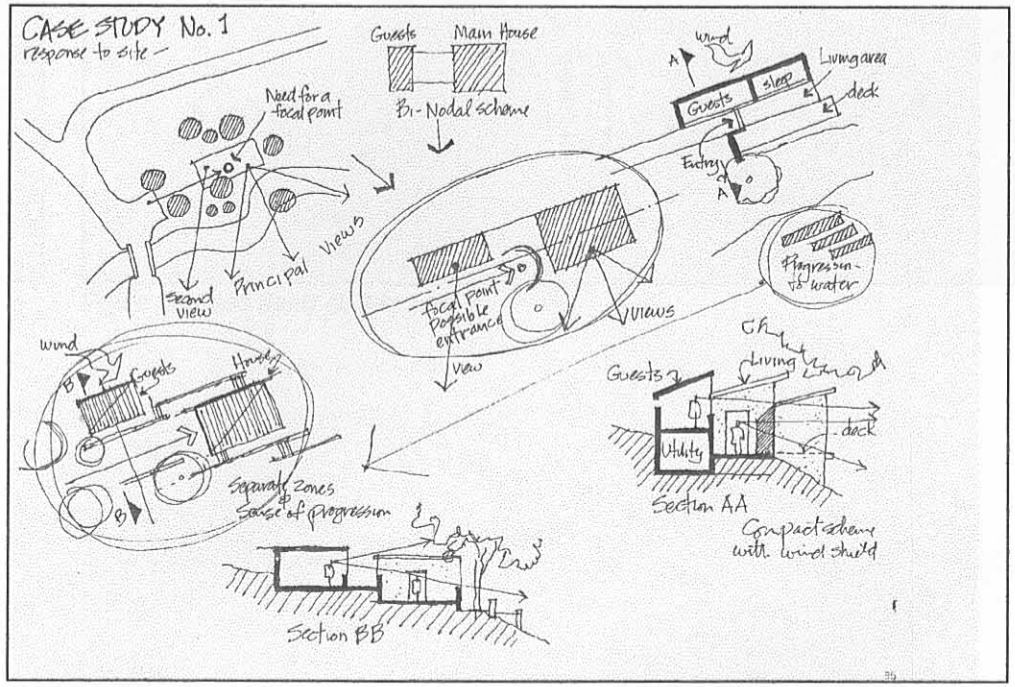


Fig 3 B *Laseau* : Case study no 1 of a design showing analysis of all aspects of response to the site

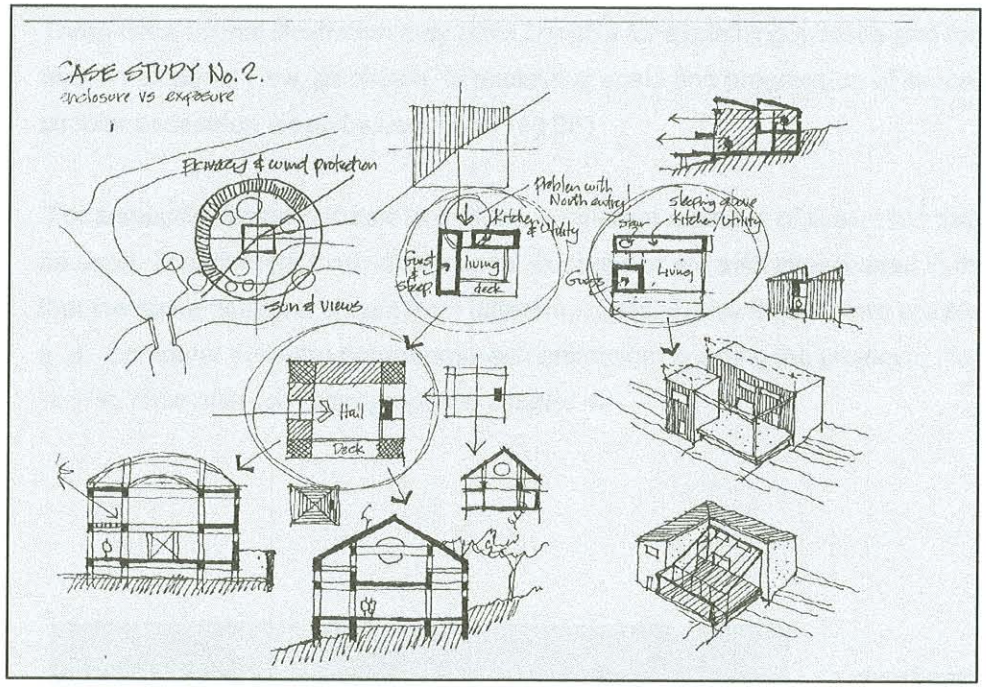


Figure 3C *Case Study no 2 by Laseau*

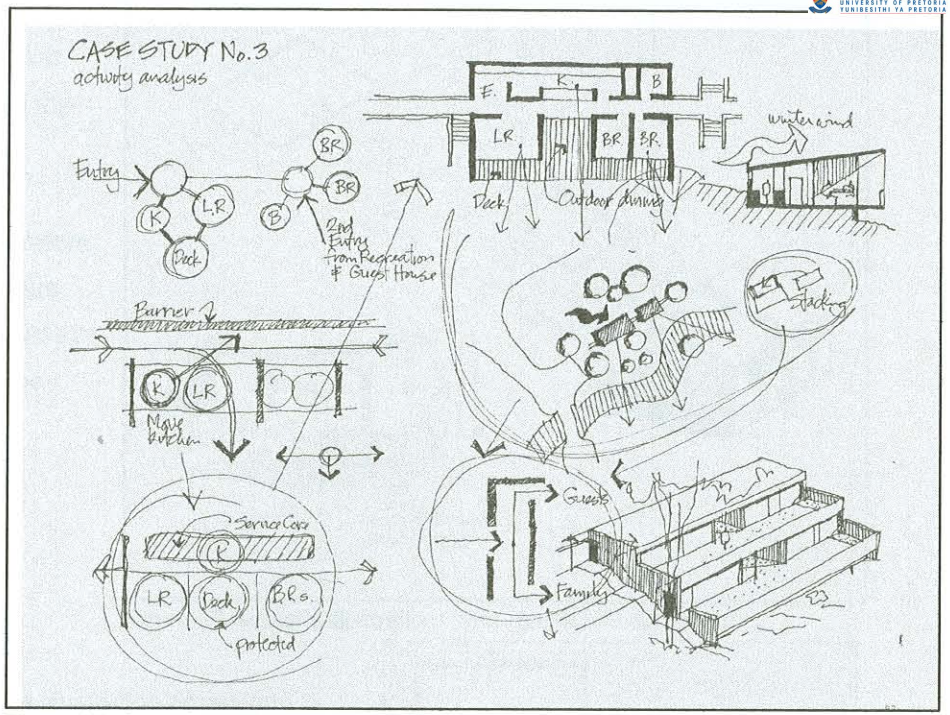


Figure 3D *Case Study no 3 by Laseau*

Three-dimensional illustration may have benefits for explaining masses and form when used in an aerial view, as shown, or explaining scale and progression of space as in the circular pedestrian views by Leon Krier (fig 3F)

For a specific design principle any of these different methods of illustration may therefore be used. The different three-dimensional illustrations are also inter-related in the sense that the same design is shown from different angles. Today these views are all possible in a 3D-Computer software programme with animation, bringing the project to life for the viewer. *(See also computer graphics, chapter 4.)*

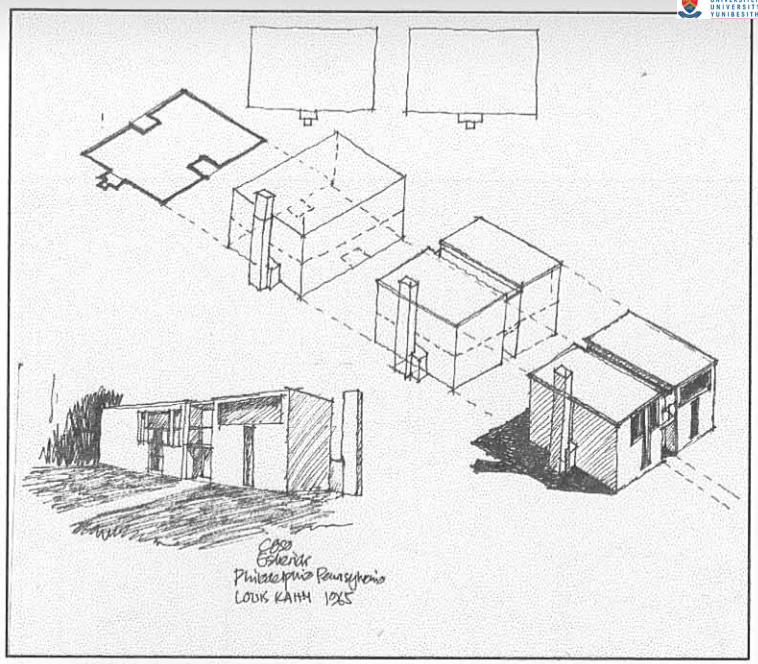


Figure 3E Author's illustration: from *House by Louis Kahn*

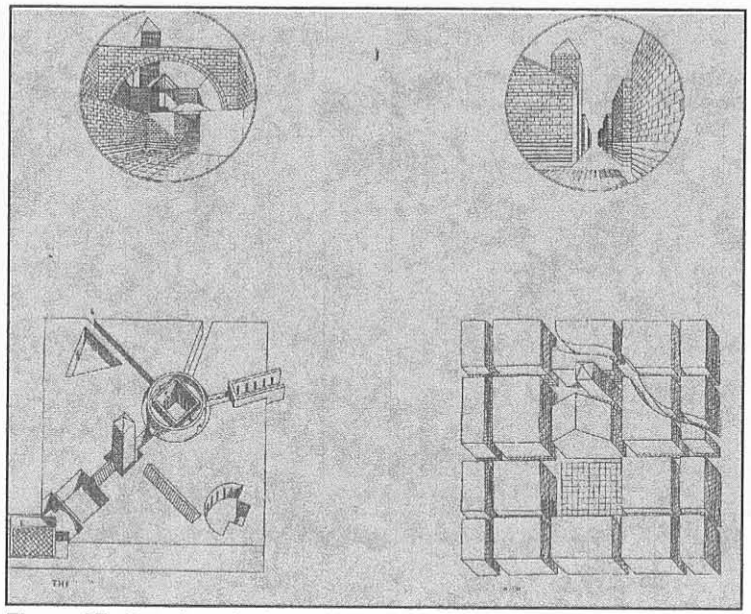


Figure 3F *Drawings by Leon Krier*: Pedestrian and aerial views

In investigating the illustration of design patterns graphically, the sketches to the right (figs 3E & 3G) were done to provide a better understanding of how pedestrian or aerial views can be used to effect.

The sketch of a simple house on the right shows the plans of two floors and the two views illustrate patterns of:

- *form (additive)* for the isometric view,
- *approach to the entrance* for the pedestrian view.

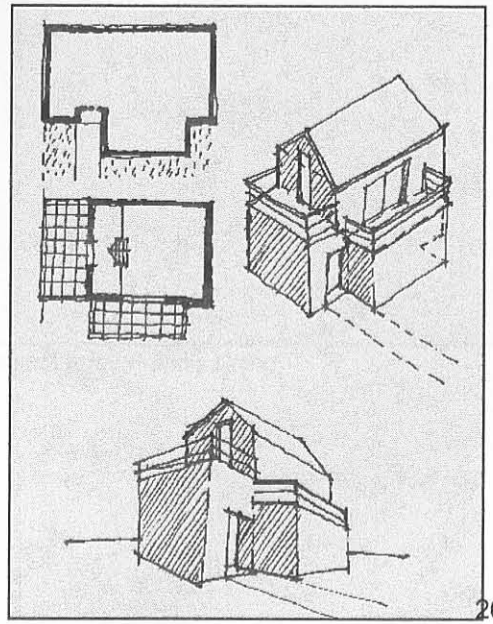


Figure 3G Author's Illustration: *pedestrian*

A progressive graphic development such as illustrated in fig 3J by Ching is needed to show how the design is developed and a form is transformed. The method of giving a progressive 3D-view of the cube and how the new form is derived and developed is very successful.

The elevation studies by Leon Krier in Fig 3H again show progression and development in design, a study to show how the urban street can be transformed. They illustrate scale, proportion and style and show a process of transformation. The graphics need only some explanation and very little annotation. They show how a large scale street-block can be transformed into several buildings with arcades and avenues. The different stages in the development of the design are portrayed.

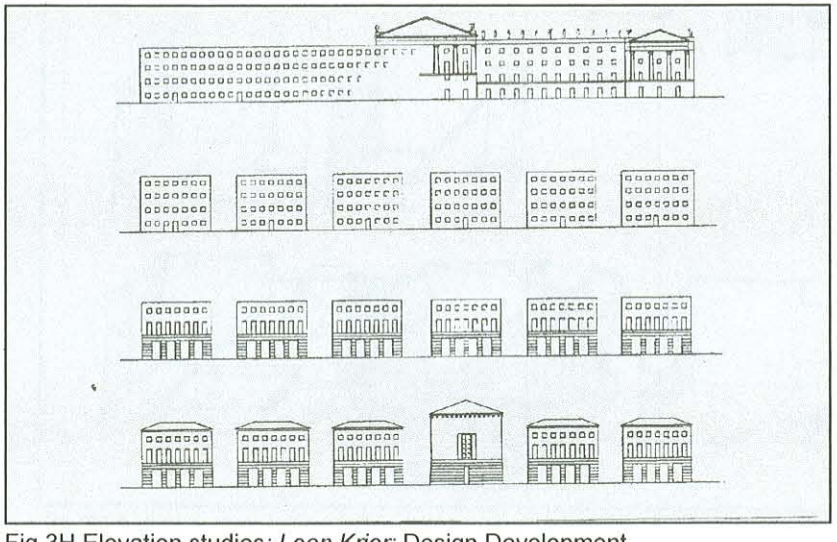


Fig 3H Elevation studies*: Leon Krier:* Design Development

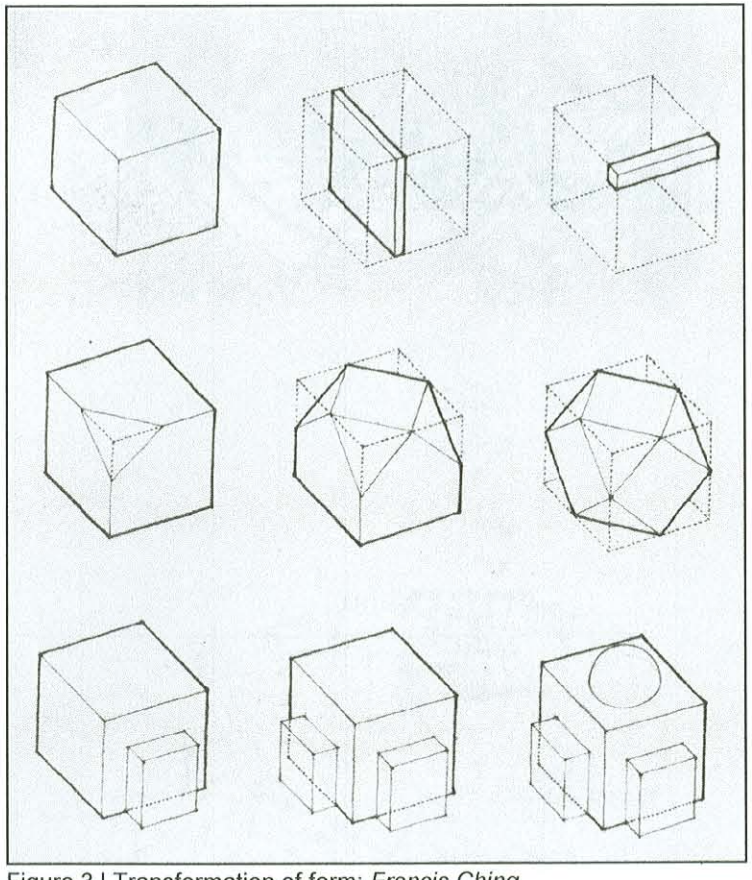


Figure 3J Transformation of form: *Francis Ching*

The following sketches were done to investigate the manner of illustrating the development or transformation of design forms:

The figure below, 3K, shows aerial views of two forms from cube, cut-out and add-on to the final design concept.

Fig 3L to the right shows isometric views developed from plan-form, elevations and site layout. (See also fig 3M, where this same design concept was analysed further.)

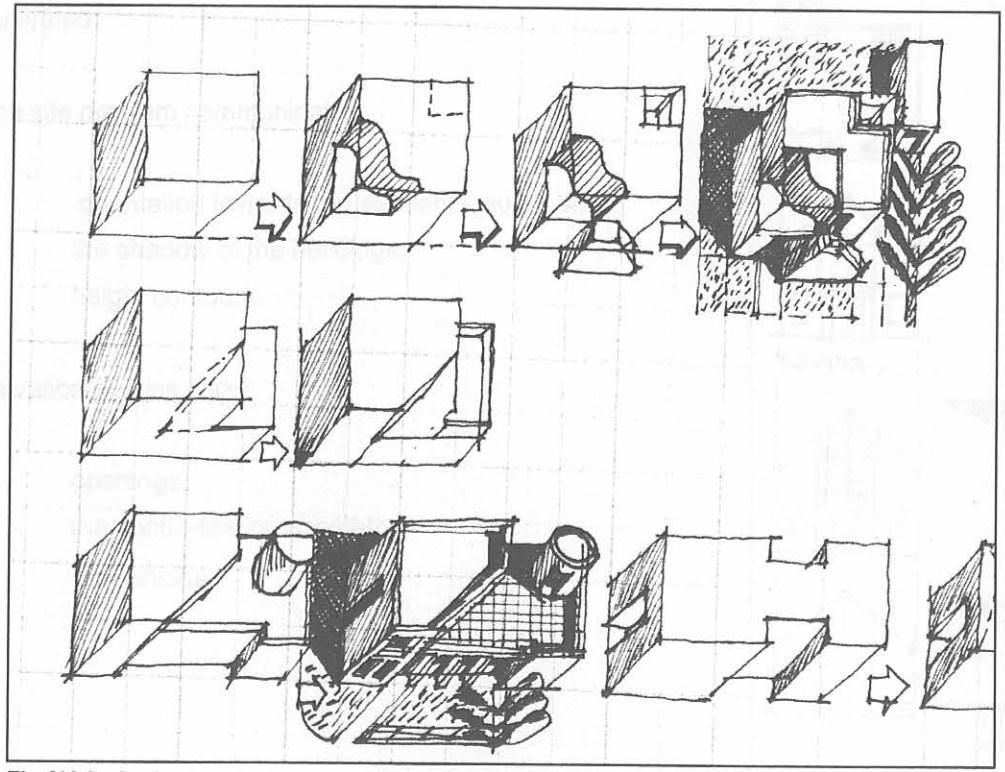


Fig 3K Author's sketch illustrating the development of form to a final design.

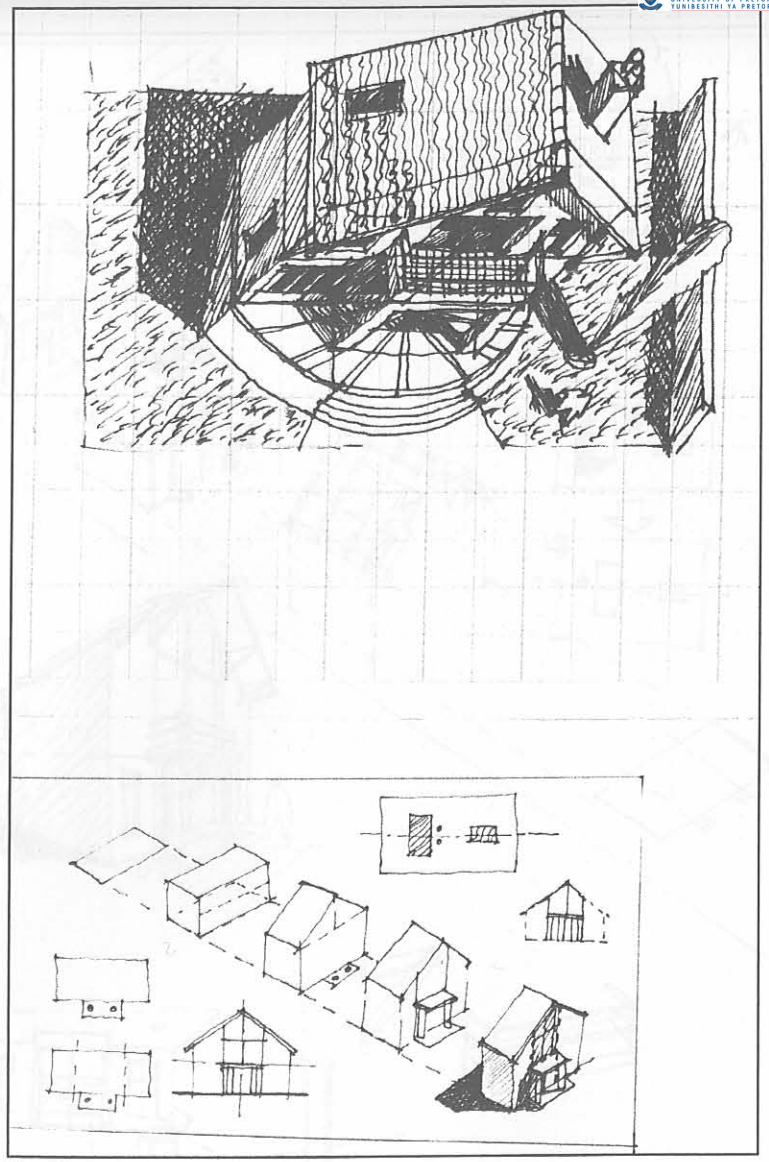


Fig 3L Author's sketch
above: final design,
below: development of the design

The sketch to the right illustrates how a pattern can be shown in all 3D-views, in 2D-views and in exploring the development of form and structure.

The diagonal axis is an isometric projection showing elements of the forms used. The development of the design is thus illustrated.

The site diagram communicates :

- orientation towards the elements: sun & wind,
- the shadow of the buildings,
- height contours.

Elevation studies show:

- openings,
- the centre-line of symmetry,
- proportions.

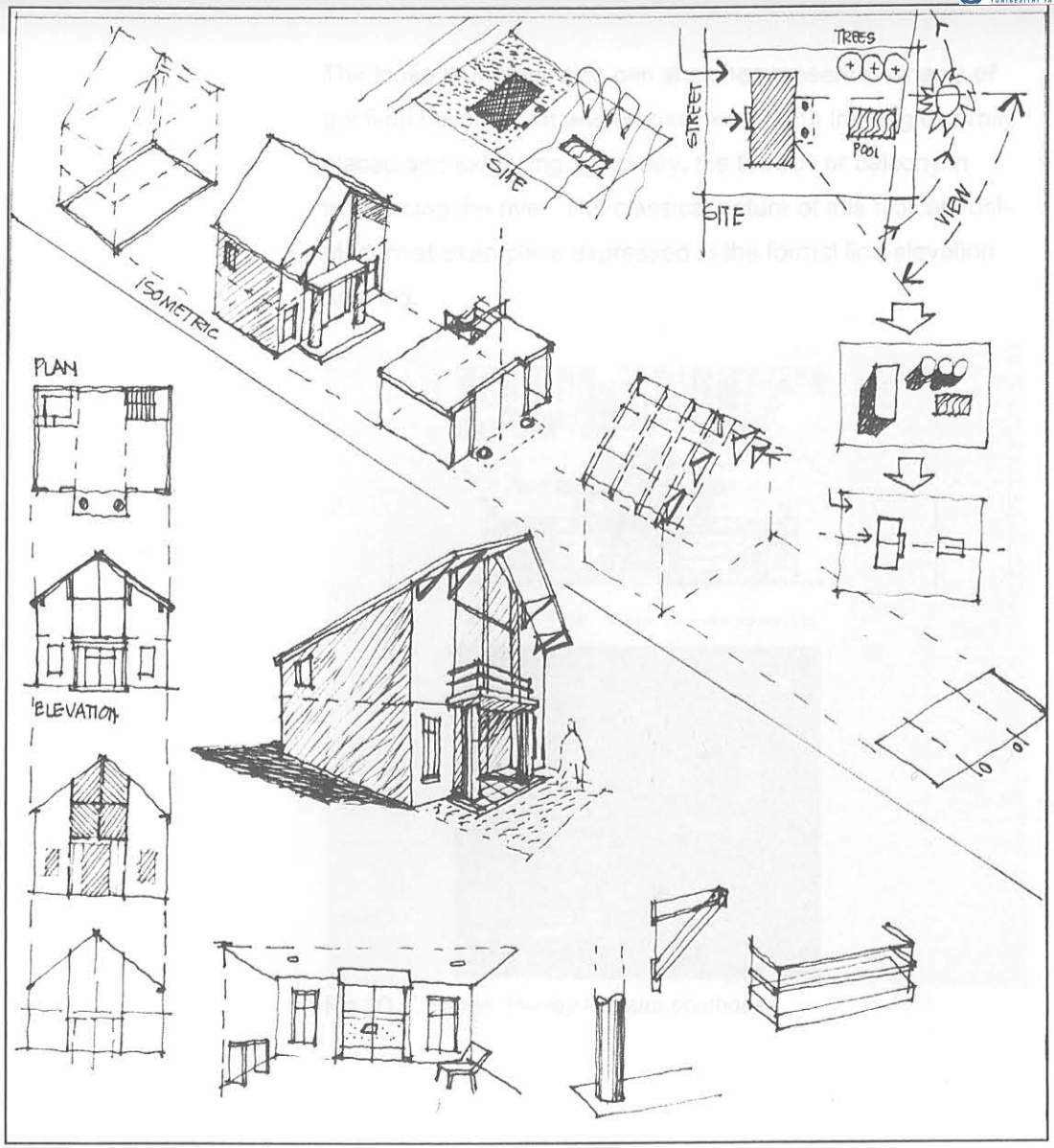


Fig 3M : A possible typical pattern/case study illustration (author's sketch)

The following example of design development (Fig 3N) shows the design conceptual sketches of the Henley Regatta Headquarters by Terry Farrell. The preliminary line sketches illustrate the development of the concept and proportions. The final line drawing (Fig 3O; top-right) is a sketch plan indicating the final elevation as viewed from the river. The photograph (Fig 3O; below) shows the project as built. In illustrating design patterns or case-studies the chronological phases of presentation and realisation can be presented as shown.

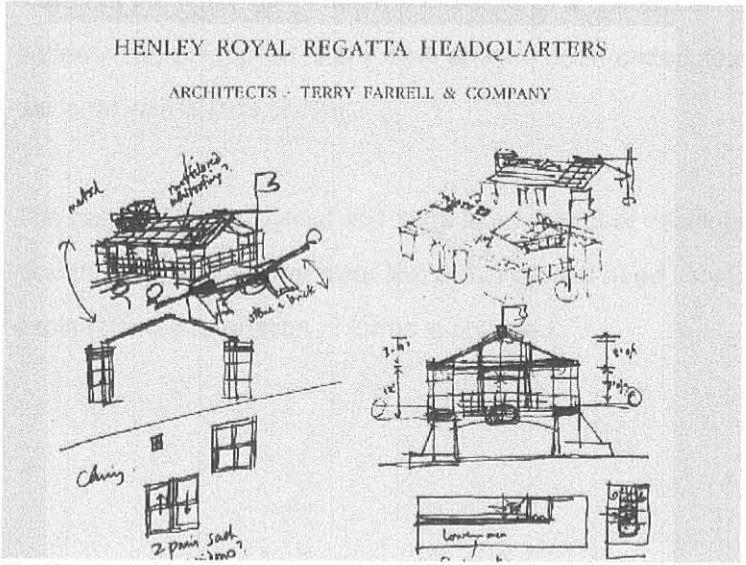


Fig 3N *T. Farrell*: Sketches of Henley Regatta Boathouse

The loose thumbnail size pen sketches present elements of the final building: the angled base-walls with the flag centrally placed and exhibiting symmetry, the terrace or balcony in front facing the river. The classical nature of this typical Post-Modernist example is expressed in the formal line elevation drawing.

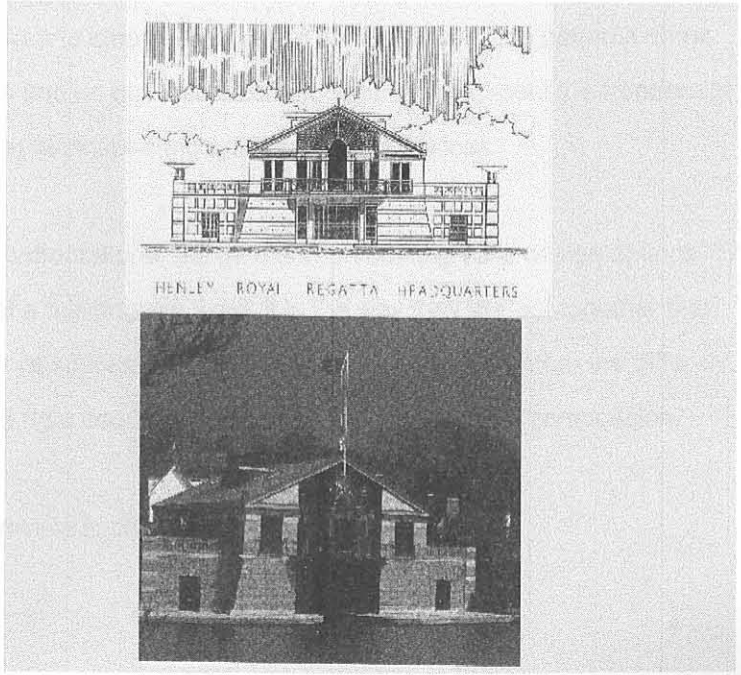


Fig 3O *T. Farrell: Henley Regatta boathouse*

3.3.5 *OPEN-ENDEDNESS IN DESIGN (ILLUSTRATED)* :

Thomas Thiis-Evensen uses *the floor, roof and wall* in architecture to investigate archetypes that provide open-ended patterns to architects. This is shown in fig 3P on the following page.

The patterns are not shown in relation to the rest of the building and therefore the figure gives no style or sense of architectural language. The patterns can be applied to any style and are open-ended, leaving the designer with a wide choice.

The patterns are analytical and there is an aspect of development of the design. The graphics are clear line drawings and need very little explanation. Interrelation of forms is provided.

The freedom from style and language suggests many alternatives. There is an exposure to ideas - exploration should follow. The patterns show possibilities and do not prescribe solutions. They respect the freedom of the designer but inspire thoughts and throw in ideas.

They are confrontational but gentle in presenting valid design options. The elements of a building are fixed: it is the way they are put together that determines its success, as good musicians will put together the different notes in the right sequence and rhythm to form a great composition.

(See also review in chapter 2, section 2.2.4)

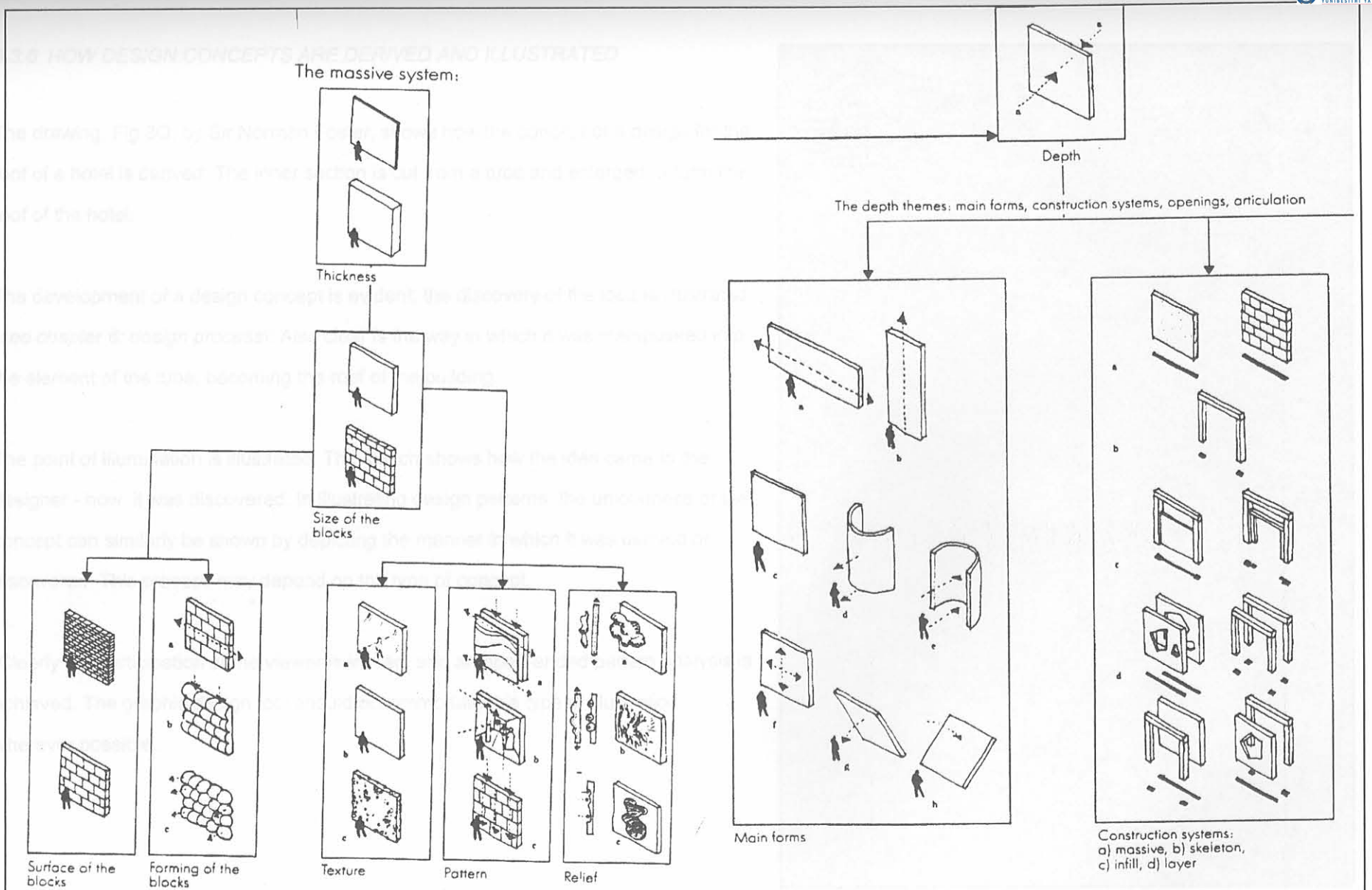


Figure 3P *'Wall experiences'* from *Archetypes in Architecture*: *T .Thiis-.Evensen*

3.3.6 HOW DESIGN CONCEPTS ARE DERIVED AND ILLUSTRATED

The drawing, Fig 3Q, by Sir Norman Foster, shows how the concept of a design for the roof of a hotel is derived. The inner section is cut from a tube and enlarged to form the roof of the hotel.

The development of a design concept is evident: the discovery of the idea is illustrated (*see chapter 6: design process*): Also clear is the way in which it was manipulated into the element of the tube, becoming the roof of the building.

The point of illumination is illustrated: The sketch shows how the idea came to the designer - how it was discovered. In illustrating design patterns the uniqueness of the concept can similarly be shown by depicting the manner in which it was derived or discovered. This process may depend on the type of concept.

Clearly the participation of the viewer is invited, and an open-ended pattern analysis is achieved. The graphic design tool should accommodate this type of illustration wherever possible.

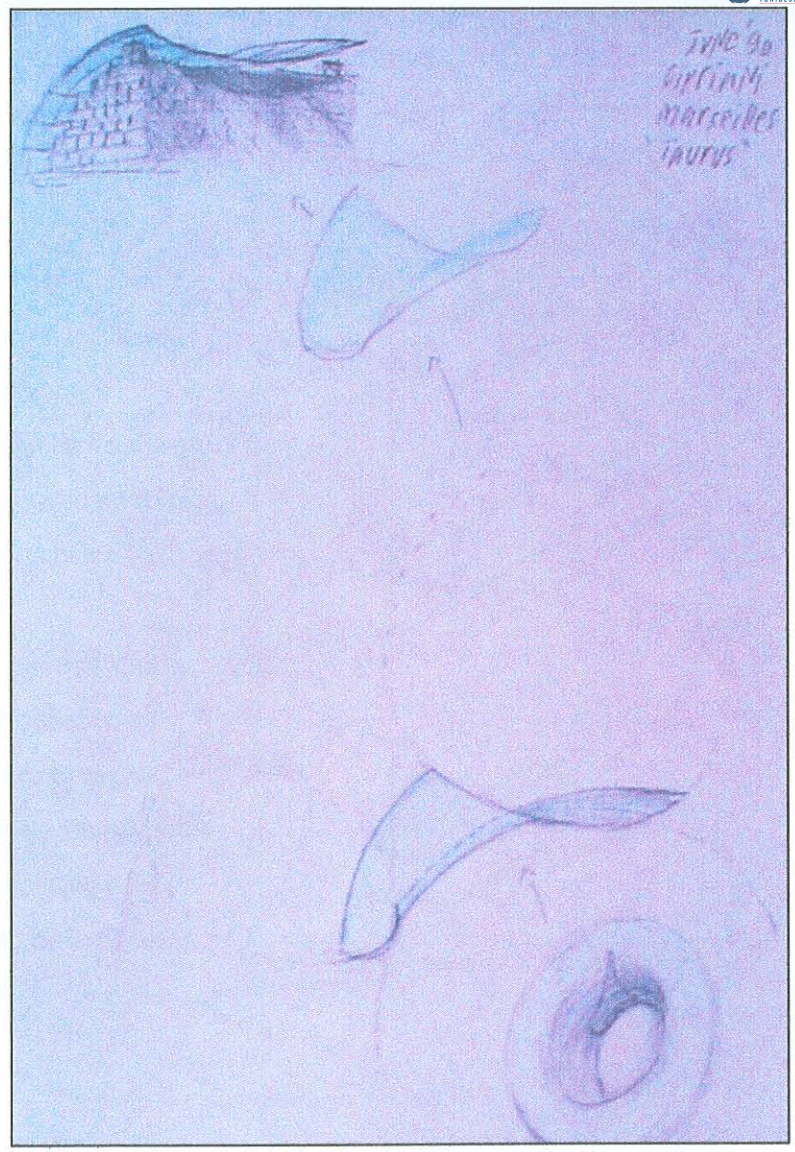


Fig 3Q Design sketch for roof of hotel: Marseilles *Sir Norman Foster*

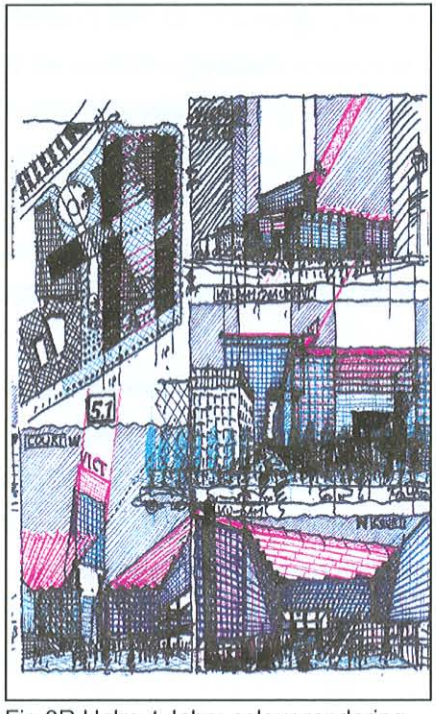


Fig 3R Helmut Jahn: colour rendering of *Victoria, Berlin*

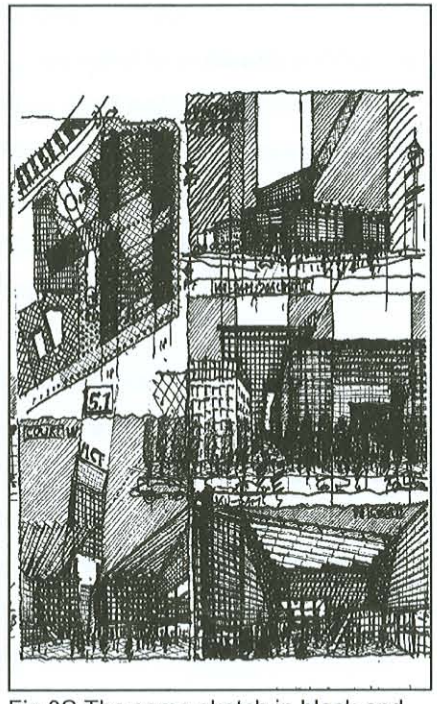


Fig 3S The same sketch in black and white

Two illustrations of a conceptual sketch by Helmut Jahn are shown in Fig 3R and 3S. The impact of colour in communicating a design idea is clearly illustrated. The colour sketch shows what difference colour can make in illustrating a design.

In Fig 3T colour is used in a illustration to highlight important elements in patterns. The grid or modules are here shown in thin red lines; shading is expressed by hatching and the paved areas by the grid (in blue).

Colour communicates more information - it expresses elements separately, thereby more clearly defining what is meant to be expressed.

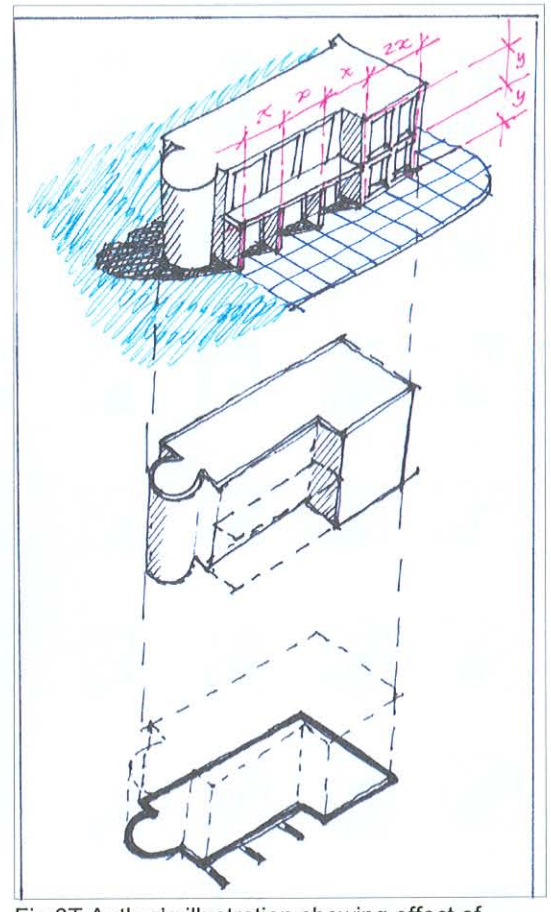


Fig 3T Author's illustration showing effect of colours.

Porter (1979:72 - 73) wrote about *'concepts in motion '*:
'If we want to appreciate a concept fully we need to experience it from all sides and at all angles, turning the object in our mind before its transfer and subsequent articulation in graphics. For the purpose of an animated perception, varieties of isometrics and indeed, perspectives are employed - their frames of reference or vanishing points being mobilised through sequential drawings which assess the implications of an idea in the round.'

This book was written well before 3D-CAD software programmes were developed. As shown in section 4.6 of the next chapter, all the views are possible in CAD programs to visualise them 'in the round'. In a documentary film on his life, the sculptor Henry Moore, acknowledged the range of drawings required to account adequately for more intricate forms. He described his need to create for a single sculpture up to forty, fifty or even hundreds of drawings to convey its complexity (Porter:1979:75)

On the right is an example of creating multiple views of an artifact to have the viewer appreciate it's total three dimensionality. In a 3D - CAD programme even further interaction is possible; the viewer can choose whatever view he or she wants and print out a series of representations of it.

(See also 4.6 in the next chapter, indicating possible views created in a CAD programme for architectural form.)

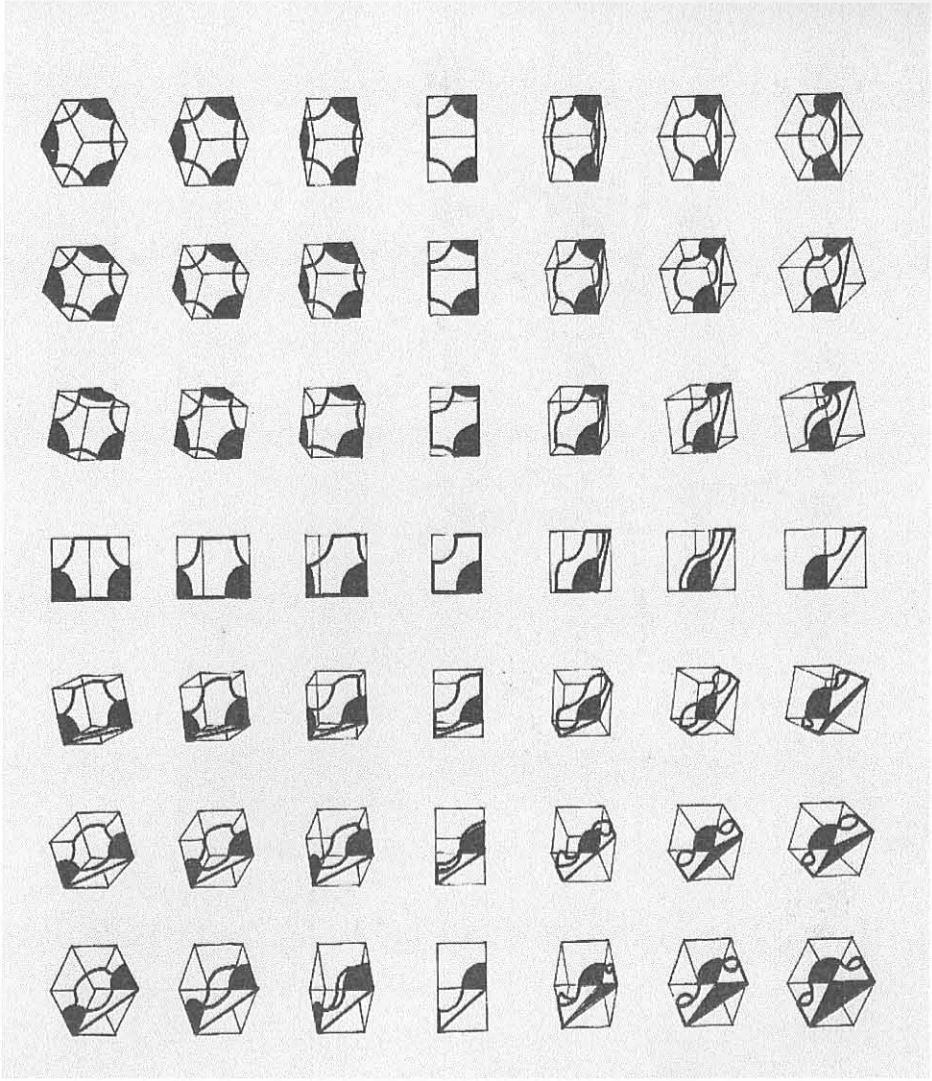


Figure 3U *Dynamic Graphics:* student sculpture project.

This chapter has shown that graphics can be used to communicate design patterns effectively and can be illustrated in several manners:

- Participation and exploration,
- Three-dimensional: aerial or pedestrian views,
- Indicating design development,
- Open-endedness,
- How concepts are derived and illustrated,
- By colours for different elements,
- By dynamic graphics.

The following chapter will analyse graphics further in the form of computer graphics.

COMPUTER GRAPHICS

4.1 INTRODUCTION AND BACKGROUND:

The previous chapter analysed normal graphic communication possibilities. This chapter investigates the proposition that graphics created by computer should give the designer a wide range of options and alternatives, and allow for personal preference.

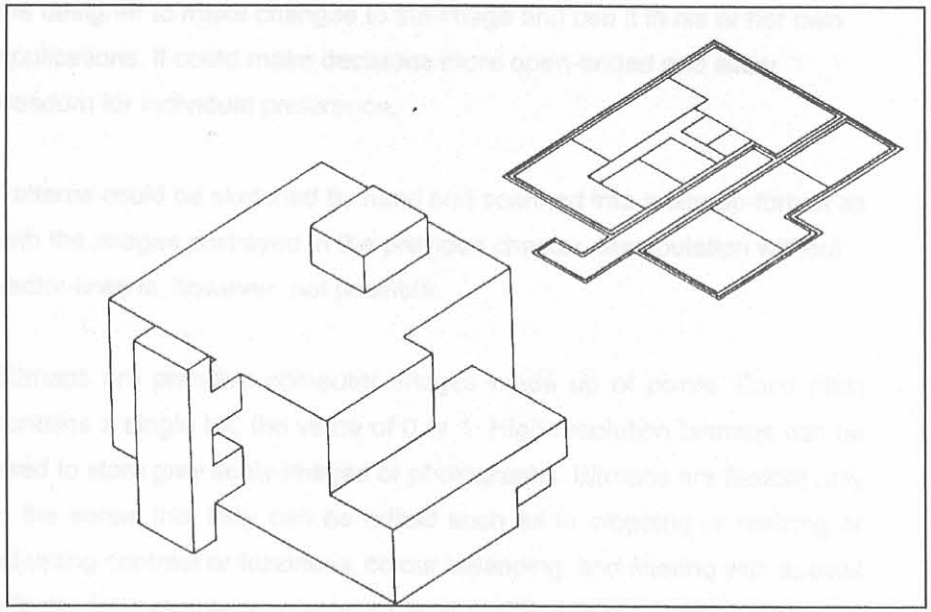


Fig 4A Early Computer Systems: *3D CAD image*

Computer graphics have developed rapidly over the past fifteen years as more powerful computer systems have become a common commodity in the architectural profession. In architectural practice the early computer applications were based mainly on the technical aspects of documentation. Few applications saw the need for a design-tool. The software could produce only basic 3D images (see Fig 4A.) Recently however, much development has gone into software programmes that give architects mostly 3D images in which to develop their designs.

Computer-aided draughting and computer-aided design (CAD) have also focussed recently on the interaction between the 2D and 3D planes. Architectural software companies, like *Autodesk (Autocad)* and *Bentley (Microstation)* in the USA and *Informatix (Micro-GDS*) in the UK, have developed programmes through which designers can create 3D elements or objects and allow the programme to create 2D technical documentation from these.

The *Bentley Microstation Triforma* CAD software programme was developed initially by mechanical engineers, designing the working parts of mechanical machines and plants. These are created in 3D and 2D shop drawings are 'automatically' created from them, the object is then manufactured from the drawings. The researcher was able to use

academic versions of *Microstation Triforma* and *Micro-GDS* for the purpose of this study. They were utilised for most of the examples of patterns created in computer graphics.

4.2 SOPHISTICATED OR PRIMITIVE COMPUTER IMAGES:

When using a computer with a user-friendly software programme as an instrument to assist designers, the computer's potential should be optimised by using sophisticated images and CAD-type programs to give the designer more interaction and dynamic feedback (Sanders,1996 *see Review of Literature*). This will also allow views from any angle, and allow the designer to make changes to the image and use it in his or her own applications. It could make decisions more open-ended and allow freedom for individual preference.

Patterns could be sketched by hand and scanned into a bitmap-format as with the images portrayed in the previous chapter. Manipulation without vector-lines is, however, not possible.

Bitmaps are primitive computer images made up of pixels. Each pixel contains a single bit, the value of 0 or 1. High resolution bitmaps can be used to store grey scale images or photographs. Bitmaps are flexible only in the sense that they can be edited such as in cropping or resizing or adjusting contrast or fuzziness, colour balancing, and filtering with special effects, for example to create an 'embossing effect'. Bitmaps are used extensively by Graphic Designers.

Vector lines in a CAD environment, which are mathematical lines in a mathematical 2D or 3D model, are more sophisticated, can be manipulated and therefore can be much more flexible and powerful in portraying patterns. In *Microstation Triforma* the images can be rotated in 3D from any angle, and 2D/3D inter-action is evident as a quarter view-window. See fig 4B (a screen dump of the software program).

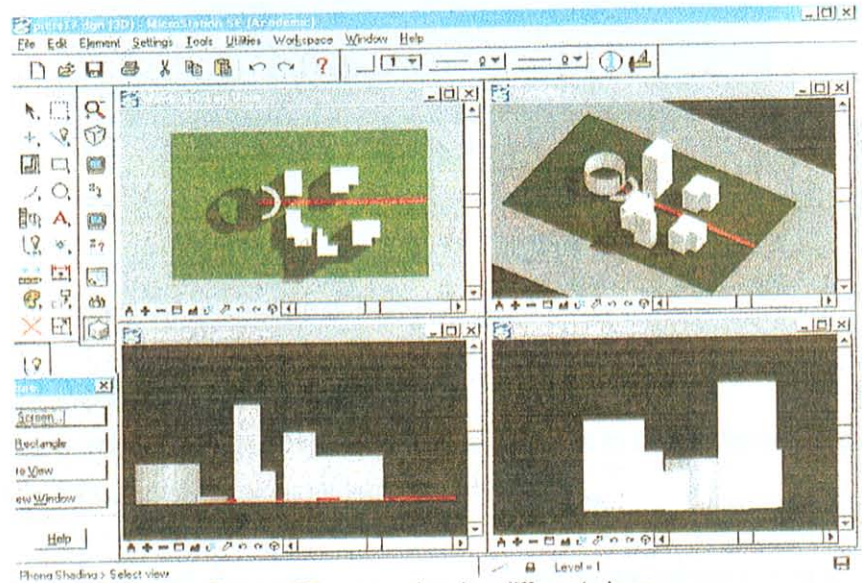


Figure 4B *Screen Dump* of Program showing different views

A user-friendly viewing tool can be made available (by software companies) to explore patterns, to give designers not only better views of design patterns but also to allow the user the freedom of exploring other possibilities. This tool can be a simple, but innovative software programme with the same viewing windows as in the *MicroStation* CAD-programme, for example.

If the patterns are imported into a CAD programme, the user can add or transform the image. Pattern files may also be exported via dxf-format files (data-exchange-format), to make it possible for any CAD-programme to read the information. A designer may well be able to build up his or her own library of patterns, incorporating or merging his own ideas or previous designs with the patterns of the design tool. The tool could well grow and be developed to suit the designer's style or expand his/her creation of a personal design pattern-library.

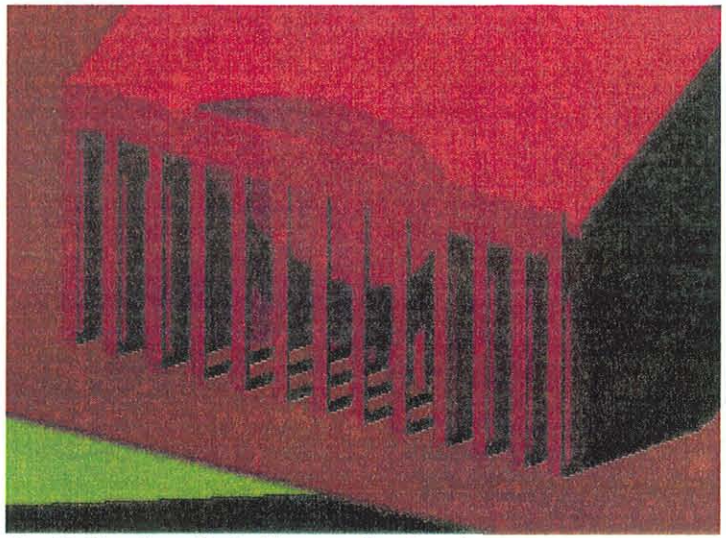


Fig 4C *Shading effect* with preceding facade

4.3 SHADING:

It is possible to create real 3D images consisting of mathematical vector lines as in any CAD program and to manipulate these images to compose a 'reality'. A reality can be composed by shading and adding light and shadows to the image. This aspect of illustration could have greater effect if the design patterns had elements which allowed light to filter through to a facade behind, for example where a screen or colonnade precedes the building facade (see fig 4C). Indicating the shading will also have value for the designer in relation to the micro-climate of the building and in determining the orientation of elements of the building.

4.4 COLOURS

Colour lines can define aspects of design patterns to be highlighted. Fig 4D is illustrated in colour to demonstrate this:

- The use of green for the base colour gives the impression of a landscaped area, thus allowing the image to convey the feeling of buildings in landscape environment.

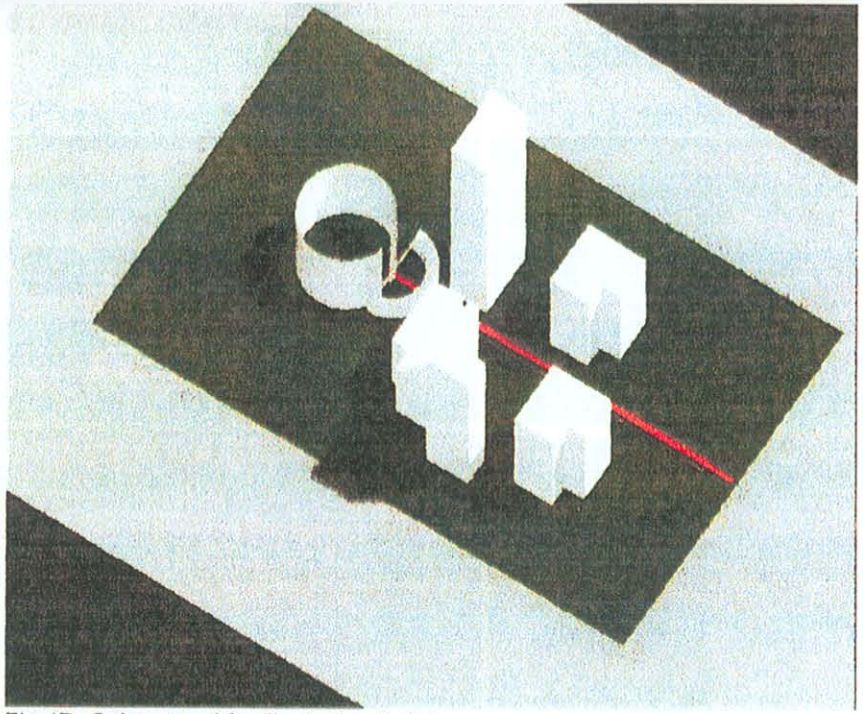


Fig 4D Colour used for illustrating *'axis'*

- The use of red to highlight the axis brings out the pattern of 'axis' and gives the other elements a sense of presence around the axis.

These aspects of colour in presenting patterns may well be further developed.

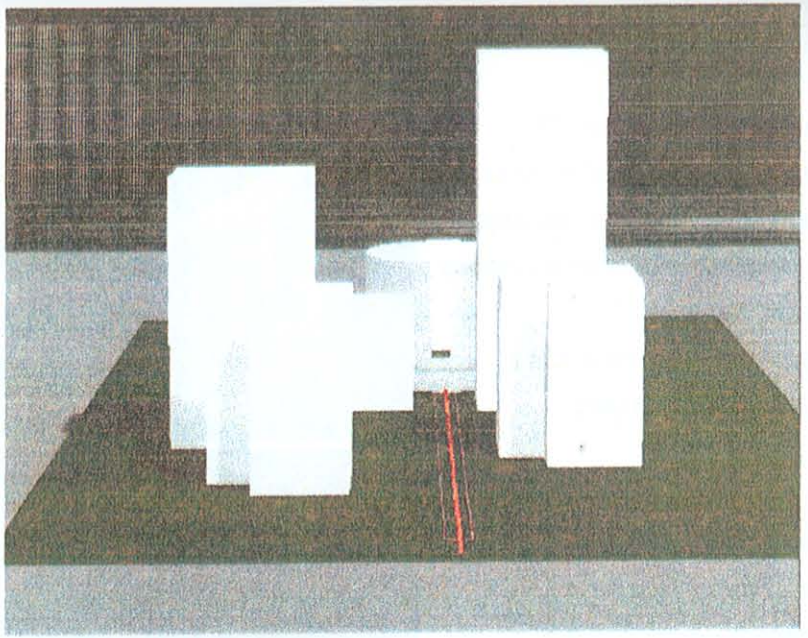


Fig 4E 3D pedestrian view : *'axis'*

4.5 3D INTER-ACTION AND FREEDOM OF VIEW SELECTION

Patterns created in 3D CAD programmes can help designers by allowing all angle views and all dimensions to be investigated. Fig 4E shows the 3D pedestrian view, emphasising the aspects of *scale, focus and axis* in the design.

The aerial view in Fig 4E shows the aspects of *form and composition of form* more clearly. This aspect of the interaction and dynamic feedback from a design tool was also analysed by Sanders (1996). *(See 2.1.3)*

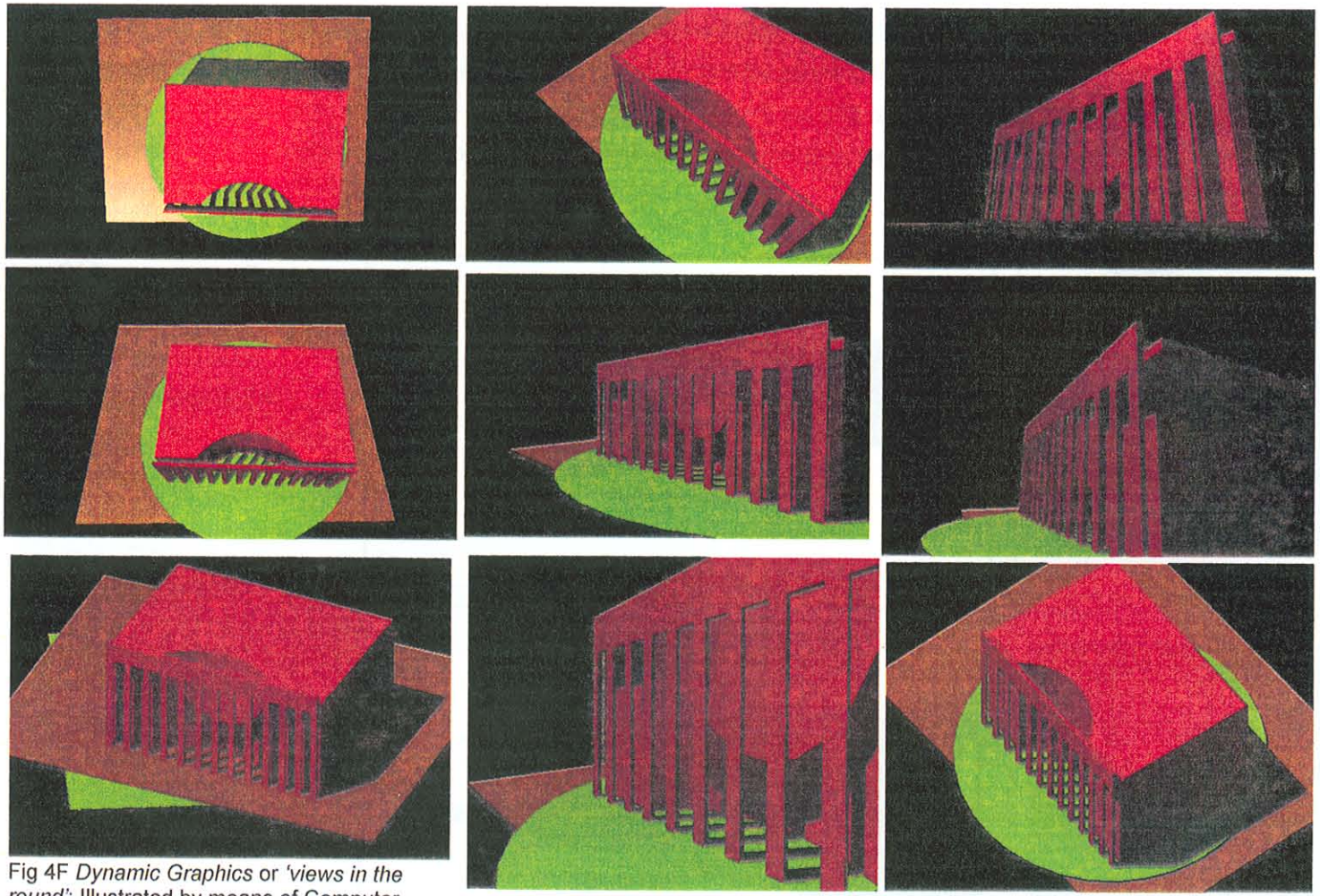


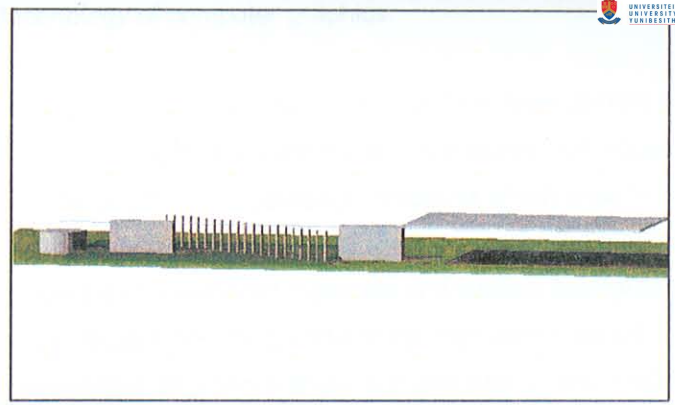
Fig 4F *Dynamic Graphics* or *'views in the round'*: Illustrated by means of Computer Graphics (Author)

Porter (1979),illustrates *'Concepts in Motion'* and creates multiple views in the round. This conveys a better understanding of form.

(It is shown in the previous chapter, section 3.4)

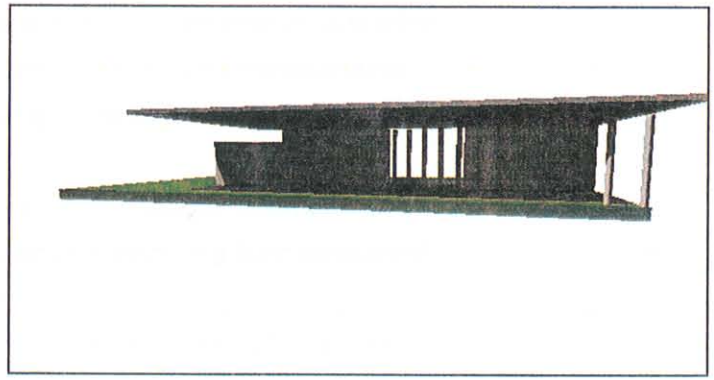
The views on the left(fig 4F) were created by the author on CAD, to explain form to the viewer, showing many different angles. Designers that have similar software could view their images from patterns according to their own preference if the patterns created are in a vector (CAD) format. The design tool should endeavour to provide this, as dynamic, interactive feedback will assist in the process of exploration and discovery.

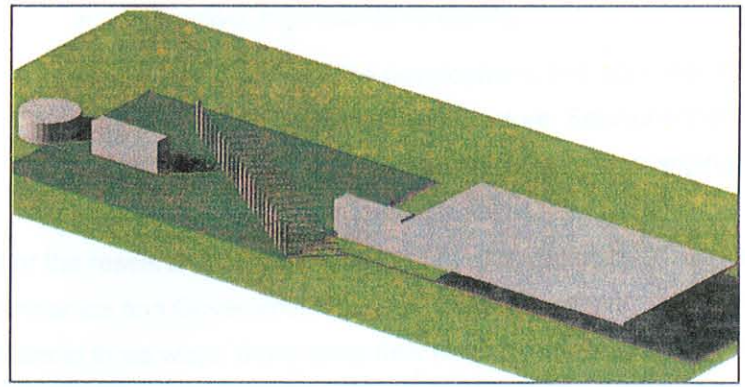
The following graphics created by the author from computer images indicate the possibilities of illustrating the design development and exploding elements of the building. The 3D-computer animation capabilities can allow the illustration of this type of images by allowing the different object-elements of a design to move away from each other. The user of the software programme may only press a button and a scene will be created by animation to show the different exploded elements.

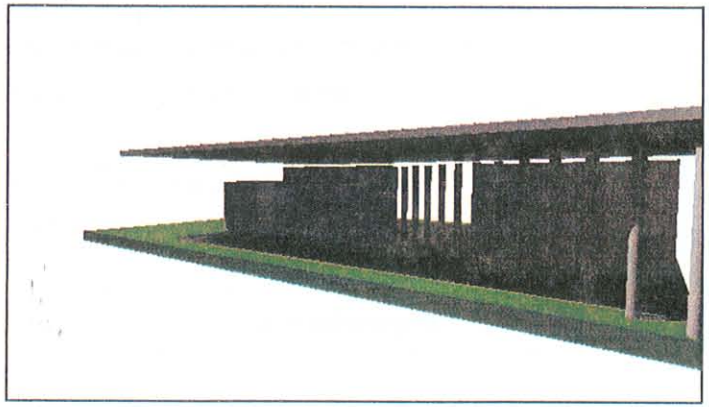


In a CAD-programme the utilising of layers to contain different elements of the design would simplify this animation process. The layers in this design concept could be:

- columns
- roof element
- box elements
- cylindrical element
- base







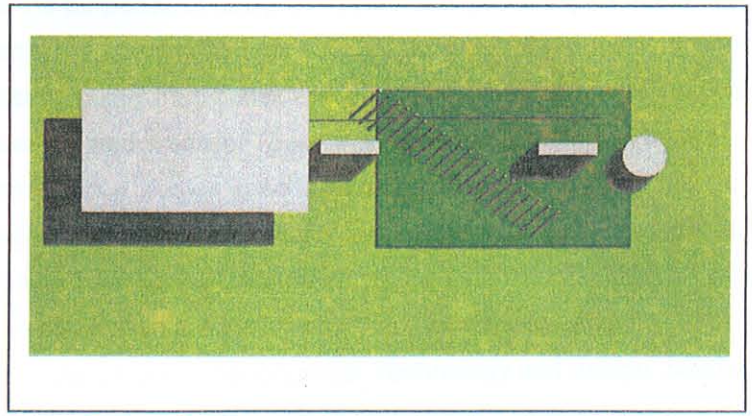


Fig 4G *Design Development* illustrated by the author with computer graphics: (This can be done by animation: exploding elements)

4.8 RECENT DEVELOPMENTS IN ARCHITECTURAL COMPUTER APPLICATIONS: CURRENT RESEARCH.

The *Massachusetts Institute of Technology (M.I.T.*) in Boston is known to be in the forefront of computer and World-Wide-Web technological developments. It has recently (1997) founded a department of *Design Technology* which is part of a post-graduate school and a research institute under the Faculty of Architecture. Faculty and students associated with this group combine education in architecture and urban design with education in computer graphics, art, mathematics, and other fields. The following research fields are active (all are centred around the application of computer technologies in design) :

- Architecture Representation and Computation: Innovative use of computation for solving problems stemming from contexts of architectural design practice.
- Design Studio of the Future: An interdisciplinary effort between the Schools of Planning, Engineering, the Lab of Computer Science and the Rapid Prototyping Laboratory which focusses on geographically distributed electronic design and work collaboration issues.
- Sustainable Form Group: Focussing on how a broader concern for the environment and related issues can translate into a set of viable design strategies.
- Computation of Shape Grammars: Finding formal machinery to calculate three dimensional solids in solid modelling in the technology of computer graphics.
- Computer Graphics in Visualisation: The development of computer graphics algorithms and interactive techniques in the service of difficult visualisation problems which arise in architecture and related design settings. including modelling and rendering of weathered materials and surface appearance, image based modelling and editing, high-performance visualization of urban scenes, acoustic design and modelling, and interactive, high-fidelity rendering.
- Kinetic design group: The development and application of intelligent kinetic systems in architecture: Solutions that are not merely flexible and adaptive but responsive to changing individual, social and environmental needs.

All of the research institutes receive sponsorships from Corporate Companies and Government funding. Research related to design inquiry occurs in three ways: developing new ways of harnessing the computer for the purposes of design; observations and analysis of the activity of design in various settings; and development of propositions about design arising mainly from consideration of important influences on design teaching and practice. These three areas of study, design and computation, design in settings, and influences on design, are often necessary components of a single research project. Students at the Design Technology Department, in the PhD and the MArchS program take subjects in the theory and practice of design and computation,*computer graphics*, Technology and design, *building*

typologies, and the *design process*. (The topics in italics are also to be found in this study.)

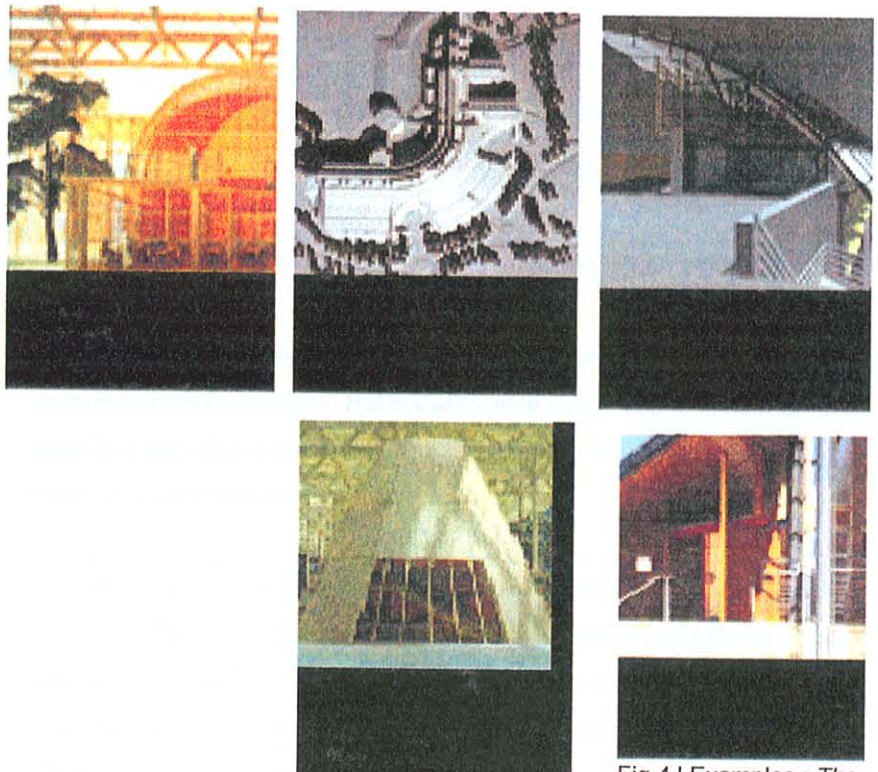
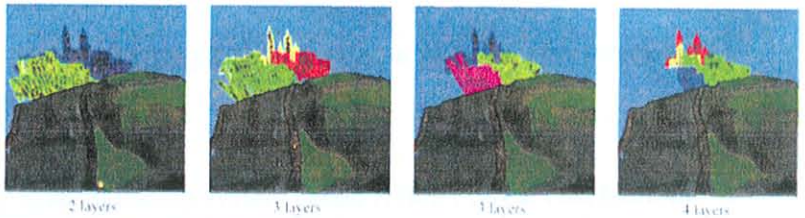


Fig 4J Examples : *The Sustainable Form Group* - work at M.I.T.



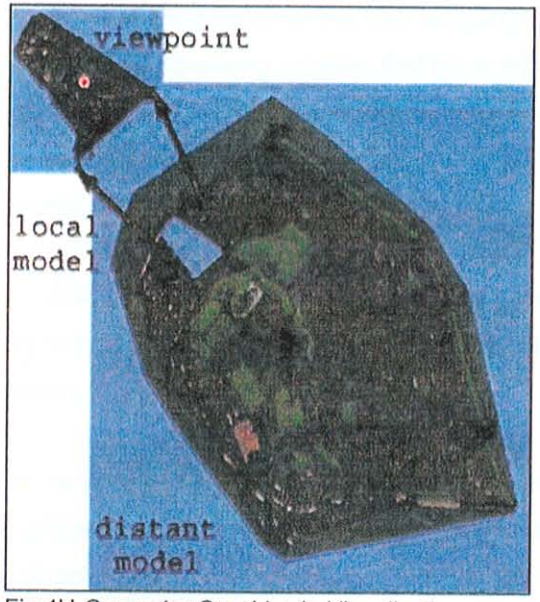


Fig 4H *Computer Graphics in Visualization* created at M.I.T in visualizing 3D modelling in Urban Space on large scale

Computer graphics has shown many new capabilities to graphics as communication. The following Chapter will analyse *the vehicle* to deliver the design patterns to the designer in the form of a user friendly tool.

CHAPTER 5

SOFTWARE AND WEB-SITE APPLICATIONS

This chapter will investigate the possibility of *Software programmes or web-site type menus* as computer-based applications to become a suitable delivery system with which to compile a design tool.

5.1 BACKGROUND; THE INTERNET AND WORLD- WIDE-WEB :

In the late 1970's the Internet as we now know it was already a powerful communications system, but only the elite could use it. One man changed this in a way that is probably equal to the way Gutenberg's press revolutionised the world centuries ago.

Berners-Lee, a British software engineer, developed a user friendly system (1980) that made the Internet open-ended and infinite by allowing personal computers to communicate with one another on a global network. According to *Time Magazine*[1] he should have received the Nobel Prize for Science for his discovery.

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[1] *Time Magazine March 29,1999 : 113 'The Century's Greatest Minds'* (see Bibliography: Quitter, J. 1999.

The following innovations brought about by Berners-Lee revolutionised the Internet (and the world):

- An easy to learn coding system called HTML (HyperText Mark-up Language) that has become the web language,
- Designing an addressing scheme that gave each web-page a unique location or URL (Universal Resource Locator) and setting up rules and protocols by which the documents can be linked together on computers across the Internet,
- The rules are called HTTP (HyperText Transfer Protocol),
- The HTML software programming became used worldwide by everybody using the Internet, being the language of all web browsers.

The World Wide Web (www) as we know it today debuted in 1991; within 5 years users jumped from 600 000 to 40 million. At one point the number of users were doubling every 53 days. Today the Internet and World Wide Web is used by the mass media and numerous Internet companies have been created that trade in various fields on the Web. Internet companies, known as 'dotcom' companies, have seen rapid growth but recently also some decline on the world markets and stock exchanges. The Internet has globalized the world financing systems and information systems, it has changed the way business is done and the way professionals operate. It has given the world an infinite information and trading system and is growing

and developing daily. It is possible for any person or organisation to form its own web-site that has pages on the World Wide Web and it is accessible to anyone with a computer, a modem and a telephone line.

Berners-Lee (2001), author of a recent book, *The Web Weaver*[2], noted the following in an interview about his book:

'He meant to create an electronic information system that worked like a brain where one neuron can link to any other neuron without any central point of control to hamper the system. He is first to admit that the web doesn't live up to his dream in its present incarnation. He didn't want to create a new form of mass media, but a 'social engine' in which lots of people communicate with each other. The World Wide Web though, is still a work in progress, and its inventor intends to fix shortcomings with new technology. He is currently involved in the W3C (World Wide Web consortium) at the Massachusetts Institute of Technology (MIT), which decide on protocols and policy for the Web. His aim was not to profit from the www, but to revolutionise society. The revolution he initiated has already caused upheavals, for instance by creating a free market, one which has no central control. Anyone can trade anywhere without having to apply to an authority for permission.'

The World Wide Web is constantly developing and new technology is developed weekly to extend and simplify its use. There are those who exploit it for profit and those who make it a life task to establish it as a communication, information and social system.

5.2 MENUS AND WEB-PAGE LINKS

In the previous chapter it was shown how computer graphics provide the possibilities of graphic illustration as well as interaction and flexibility to the user of design patterns, especially with regard to dynamic graphics and animations.

A computer software programme has the following additional advantages for the purpose of developing a data base of design patterns:

- Intelligent retrieval and links capabilities,
- Capacity for large data-base storage,
- Memory of tasks done and history of search process,
- Internet and web-page possibilities and networking on a large scale,
- The information collected in a data-base can be sorted, indexed, grouped and printed to hard-copy 'manuals' for designers not familiar with computers.

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2 Recorded in a *M Web Information Technology* web-site-(see Bibliography)

DESIGN PATTERNS contained in a WEB SITE/SOFTWARE PROGRAMME

WEB-SITE OR SOFTWARE PROGRAMME WITH MENUS

THE MAIN MENU PROPOSEDWILL GIVE LINKS TO THE FOLLOWING PATTERNS SUB-MENUS:

DESIGN PRINCIPLES

SOCIAL PREFERENCES

AND

ARCHITECTURAL LANGUAGE

The chapters that describe these proposed menus or web-pages are chapters 7,8 & 9. The constraints-section could be checklists that may assist the designer to accurately access the limits of the design requirements.

The advantages of a web-siteare described on the next page.

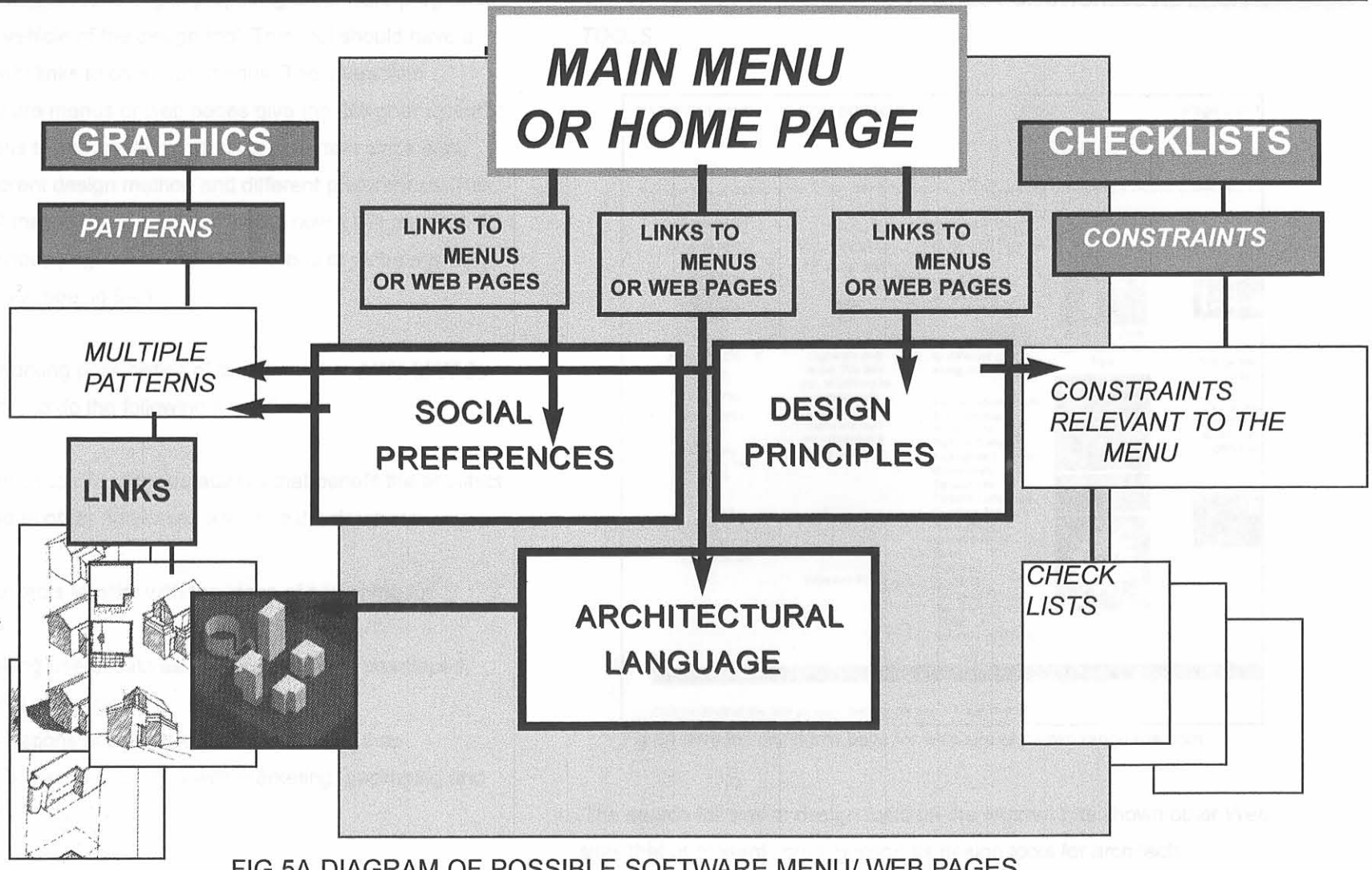


FIG 5A DIAGRAM OF POSSIBLE SOFTWARE MENU/ WEB PAGES

The above augments the reasoning in proposing a software programme or web-site as the vehicle of the design tool. This tool should have a variety of menus with links to other sub-menus. The interactive possibilities of software menus or web pages give the designer dynamic feedback and options to choose from, which is important since each designer has a different design method and different preferences. The open-endedness of the assisting tool is crucial to how it will be used. The diagram on the previous page indicates how a menu or web page can impart form to the tool (see fig 5A.)

The additional networking possibilities of the Internet and World Wide Web make it possible to do the following as well:

- Link the design tool to other databases that benefit the architect, Being linked to other databases also give the database exposure,
- Getting architects familiar with the ideas of searching for patterns,
- Easily updating users' data as more patterns are developed, analysed and categorised,
- Starting operations at a relatively low cost rather than developing software packages with marketing, packaging and shipping costs.

5.3 EXAMPLES OF OTHER WEB-PAGES FUNCTIONING AS DESIGN TOOLS

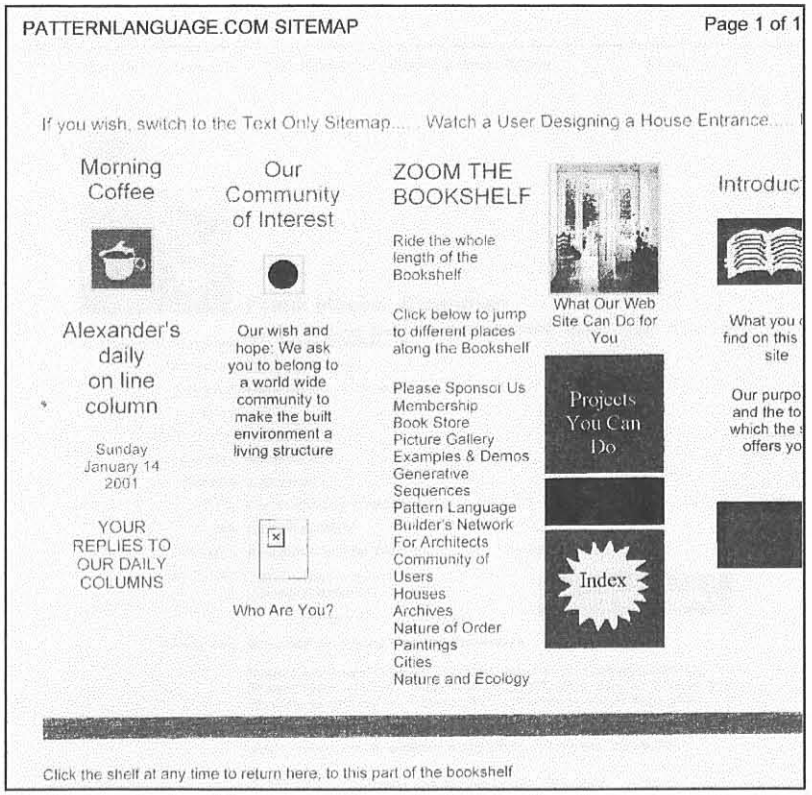


Fig 5B Introductory Home page for web-site of *patternlanguage.com*

The search for similar design tools on the Internet has shown other Web-sites that at present could function as design tools for architects.
The site *PatternLanguage.com*,(fig 5B), was developed by Christopher Alexander as recently as the year 2000, and has several features to assist

designers. Membership is required to access the patterns and the book *A Pattern Language* is also available online to members for viewing. Christopher Alexander has a daily on-line column that expresses concepts of his philosophy on patterns and sequences. The web site is designed as a bookshelf with different 'books' giving links to specific sections with pages on the web-site.

The other web-based design tool which lists buildings and architects is

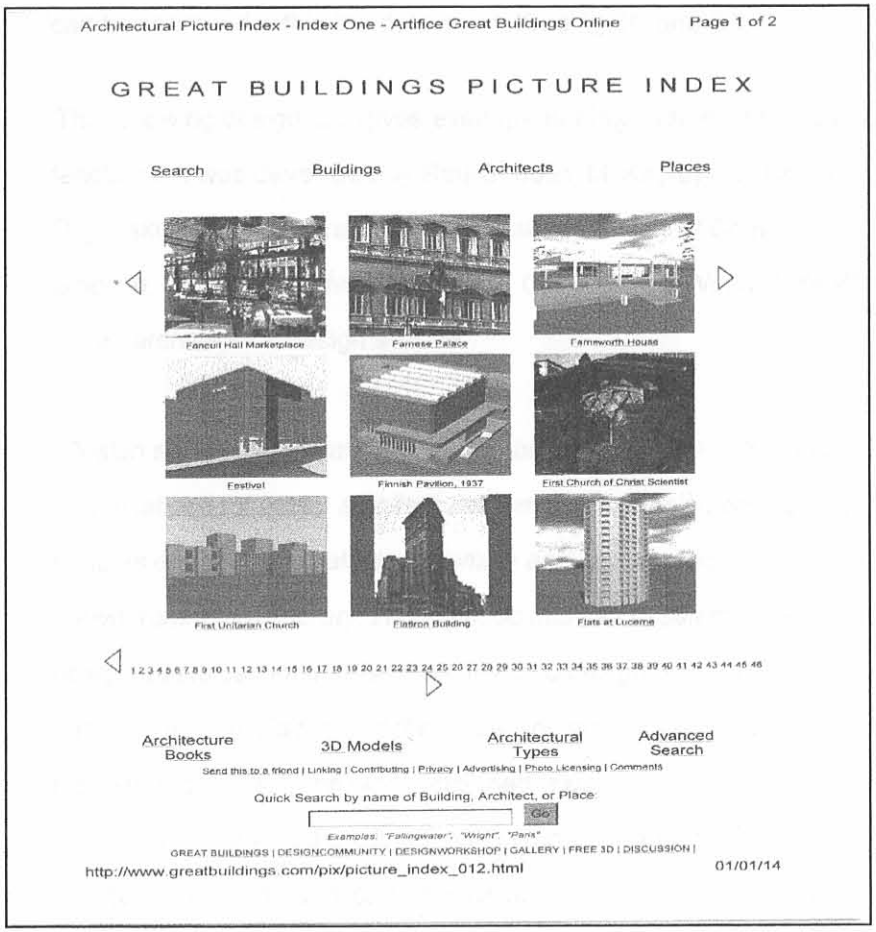


Fig 5C Web site of *greatbuildings.com* showing buildings index under the letter 'f'

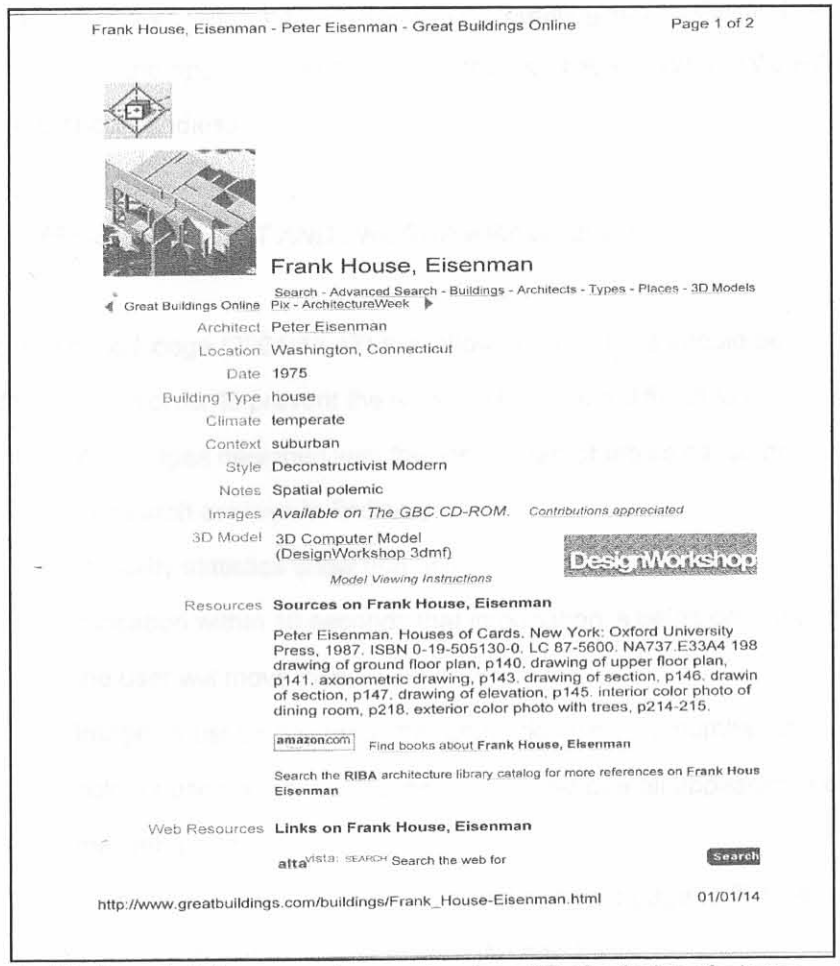


Fig 5D A *geatbuildigs.com* web page showing a 3D of a design of a house by Peter Eisenman

Great Buildings Online, a web site which is frequented by architects. It is linked to several other institutions such as the web site of the Royal Institute for British Architects, amongst others. The web site has 3D models in CAD format illustrating some of the buildings. Some are illustrated by photographs. Buildings are listed alphabetically and names can be searched within the data-base. (See fig 5C and 5D)

The following design tool gives even greater interaction and dynamic feedback. It was developed by Rau-Chaplin, McKay-Lyons, Doucette, Gajewski, Hu and Spierenburg (1998) at *the Faculty of Computer Science, Dalhousie University, Halifax, Canada* for a World Wide Web based architectural design service:

'Design and implementation of a Web-based graphical editor and visualisation tool for 3D architectural forms: This design development tool enables end-users to select, customise and visualize house designs drawn from a large library. Having used this tool to select a base house design, users can customise their selected design using a constraint-based Graphical Editor, and then view and walk through a 3D model of the resulting house. The work described is part of the larger LaHave Housing Project which explores the creation of an automated architectural design service based on an industrial design approach to architecture in which Architects design families of similarly structured objects, rather than individual ones. The houses in the library have been generated in terms of a modular kit of over 1400 3D parts.'

Having a modular kit with which to design a building is perhaps taking design to the extreme, but the possibility of creating such a design tool shows that the opportunities created by the Internet and World-Wide-Web are probably endless.

5.4 WEB-SITE FORMAT AND PROGRAMMING REQUIRED:

According to Hodge (2001:42-47) the following guidelines should be adhered to, in order to prevent the web-site becoming difficult to use :

- Web pages designed with frames instead of tables cause problems for search engines in finding data.
- Usability statistics show that unless the user is given a clear indication within 10 seconds that information is being downloaded, the user will move away to other web-sites.
- Images must be optimised by cutting down on the number of colours used without compromising on the overall appearance of the web-page.
- Scrolling is to be avoided, aim to put one web page to fit on a screen space (approximately one A4 size.)
- The following navigational aids should also be implemented:

a. Divide the web-site into categories,

b. Make all navigational options clear in the first proper page of the web-site,

c. Keep a consistent navigational presence throughout the site so that the user knows where to move between web pages by including links and allowing links to the top of the web page hierarchy,

d. Make sure that all navigational options are clearly visible wherever the user finds him/herself on the web page.

To create a web-site in HTML language is quite simple and the tools to create it can even be downloaded from Internet Web Sites. To create a web-site that will have possibilities of creating CAD, vector-based graphics, it should be written partly in *JavaScript*, which provides more powerful programming possibilities. This is also the recent programming language of CAD software such as *Microstations Triforma*. For this type of application, specialist programmers will have to be commissioned.

The development of a design- tool can be done in co-operation with software companies, such as *Microstations* or *Micro-GDS* and there should be interactive use of software programme capabilities and web-site data to optimise the tool.*(see Appendix C: Preliminary Cost Plan)*

5.5.1 LIVE-MAP

The research project *Live-Web* investigates '*Visualizing Web Presence for interaction'*. This research is currently being done by Rebecca Xiong in collaboration with Eric Brittain and Ramesh Raskar at the Massachusettes Institute of Technology (M.I.T.).

The Live Web Project seeks to enrich Web user's experience by visualizing the real-time activities of other users and enabling the user to interact with others. Currently, Web users have very little knowledge about the activities of fellow users. They cannot see the flow of on-line crowds or identify centres of on-line activity.

The World Wide Web contains much information for discussion and is not limited by physical constraints on the number of users or their location. By allowing users to exchange information easily, the Web can become an ideal interaction environment for education, work, or entertainment.

The first field in this research is called *'Live-Map'* (see Fig 5E.) Live-Map overlays user activities over a simple 2D site map. For example, a research

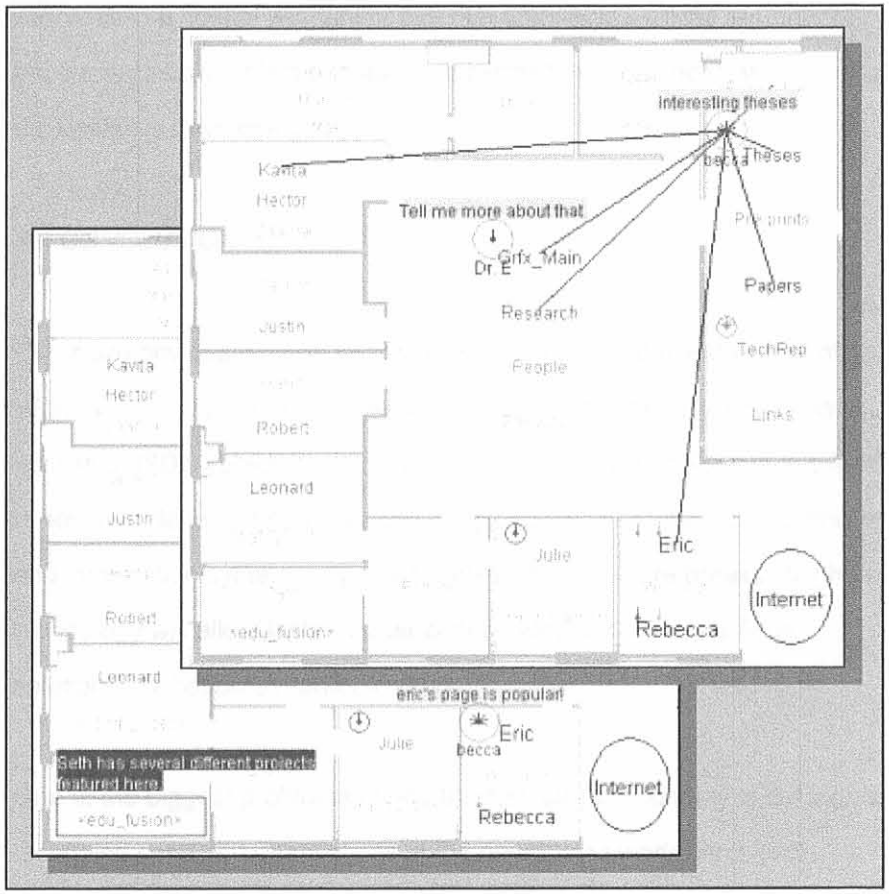


Fig 5E '*Live Map*' illustration

group Web site can be represented using a site map created from the floor plan . Each office contains one or more names that represent individual member's home pages. As Web visitors move from page to page, the corresponding icons will also move from room to room

This technology can be utilised with designers working in groups analysing patterns online, user-groups working together on a series of patterns and developing alternatives. Workshops can be held with student groups online. The lecturer or leader can be shown what is being developed and interaction and dynamic feedback can be achieved.

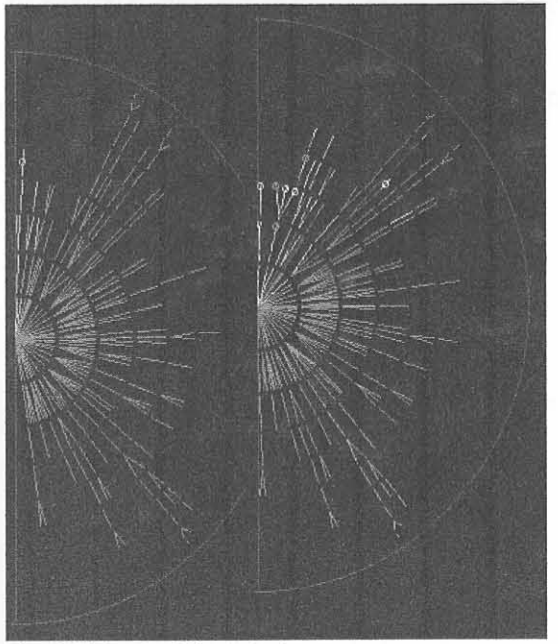


Fig 5F '*Live fan*' illustrated

5.5.2 LIVE-FAN:

The second field is called '*Live-Fan*' and it visualizes real-time user activity at *'Web-Boards'*, which are Web-based message boards. It uses the thread structure of the *Web-Board* to layout the messages in a fan-like fashion. It then overlays instantaneous and cumulative message accesses. Using this system, users can perceive broad activity patterns and individual behaviours of other Web users. This future web feature could be used by

practices in a design workshop, different architects working together on the same design project and allowing perception in online viewing of what the design is developing into.

5.6 CONCLUSION

There are obviously some disadvantages to the current technology of the World Wide Web. For most users, the web is too slow, and not all have access to ISDN cables or satellite dish receivers. Technology in this field is however developing rapidly and the globalization of the world economy and information systems is probably irreversible. Future breakthroughs in technology will allow faster, better connections and whoever finds solutions will become market-leaders.

One of the biggest problems facing the new global economy is the lack of technology and communications in the developing world. Architects however, have always had greater roles to play in the first world economies where the need for sophisticated buildings as artifacts is greater than the need for infrastructure only.

A new generation of architects, familiar with computer technology and the World Wide Web, should be able to utilize a delivery system that provides an online design tool based on software/ web-site technology.

The next chapter will investigate what type of input will be needed from such a design tool by analysing the design process.

THE DESIGN PROCESS

6.1 INTRODUCTION

The proposition in this chapter is that *the design process* analysed should indicate what type of input should be given and how design patterns can be implemented in this process.

The argument begins with the precept that the design process is cyclical. The designer will be involved in a recurring cycle of analysing information, thinking it through and exploring different options. This should be a creative process and the emphasis in this chapter will be on the creative aspects of the process.

Each designer is unique and develops his / her own way of working. There is no fixed method of design and different authors define the design process differently. Smithies (1981:55) summarises the design process as follows:

- Problem statement,
- Tentative solution,
- Criticism of the solution,
- Restatement of the problem,
- Next tentative solution, and so on.

These steps illustrate the cyclical nature of the process but also show that time to achieve a desired solution is limited. Hence the value of developing a rapid and accessible graphic design instrument. Smithies says that the first step is a tentative solution, which is developed or changed. Others say that there are more possible solutions.

Laseau (1980:164) defines the process as follows :

- Problem definition,
- Developing alternatives,
- Evaluating alternatives,
- Selection,
- Communication.

This definition shows that alternatives (or patterns) can help the designer, but also shows that at some point choices and decisions must be made.

For Laseau the designer is constantly looking at different options, developing one of these to bring about the appropriate design solution.

Can designers be guided by menus and checklists, and will they (within the constraints) be inspired to think creatively at the right time through examples or patterns? The design process includes searching for a solution. In a normal architectural practice situation time is limited. A design tool could assist in the research and decision making; it may mean that fewer alternatives need to be pursued. It should, however be open-ended enough to allow scope for its user's preferences. How are patterns applicable to the design process and how can they be introduced in a successful instrument to assist the designer?

(See diagrams of the creative design process and how patterns can be introduced, Fig 6B.)

In the design process, patterns should present ideas to the designer in the form of graphic images. The final concept is influenced by these ideas. The value of an idea, whatever the significance, should not be discarded because of biassed reasoning: The following statement by Walter Gropius [1] summarises the practical nature of the value of ideas that would need to be implemented in any design process:

'I have found that words and particularly theories not tested by experience, can be more harmful than deeds. When I came to the United States in 1937 I enjoyed the tendency among Americans to go straight to the test of every newborn idea, instead of snipping off every new shoot by excessive and premature debate over its possible value, a bad habit that frustrates so many efforts in Europe. This great quality should not get lost in favour of biassed theorizing and fruitless, garrulous controversy at a moment when we need to muster all our strength and originality in trying to keep creative impulses active and effective against the deadening effect of mechanization and over-organization that is threatening our society.'

Gropius's remark supports the value of a study such as this: the idea must be investigated and developed before biassed theorising or prejudice overrides its newness and significance. There should be a practical test of every newborn idea. Testing can be done early if information on the constraints and needs of the project or site is available. Mostly, in practice, these issues are addressed almost at the start. A user-friendly design tool should help the designer think about the right issues early on.

[1] Recorded in *The Decorated Diagram* by *Klaus Herdeg*, See Bibliography

6.2 *TYPICAL DESIGN PROCESSES IN PRACTICE:*

The design process could vary for different projects and for different situations. Design patterns could give input to each process, in different ways. The following possible situations are distinguished from the author's personal experience, for the situation in architectural practice:

A. A NORMAL CLIENT / ARCHITECT RELATIONSHIP: The process is regulated by Institutes of Architects and broken down into stages for fee purposes, (for example, see fig 7.1.) Design patterns will assist the architect in finding the design concept for the final sketch plan presentation.

B. AN ARCHITECTURAL COMPETITION (TO BE ADJUDICATED): Normally time is very restricted, especially for research or creative inspiration. The design patterns should be most helpful, keeping in mind the pressure that will be on the designer to find a good appropriate concept to present.

C. A PROPERTY DEVELOPMENT SITUATION WHERE THE ARCHITECT IS PART OF THE DESIGN TEAM : The feasibility of the project is related to certain factors that determine the design principles. Here design patterns in case studies of previous, similar projects would be helpful.

D. COMMUNITY DESIGN GROUP: The architect has to present his / her design ideas to the local community and communicate at different stages in the development of the design. Design patterns could help identify alternatives that can be presented to the community for them to give their input for choosing the final design concept.

E. A UNIQUE DESIGN PROCESS RELATED TO VERY SPECIFIC DESIGN REQUIREMENTS: This process may be determined by the use of existing facilities or the specific operating conditions of the end-user. Design patterns in case studies of similar projects could be helpful.

Zunde*(1982 :v-vi)* analyses design procedures in the design team, design methodology, problem definition, functional constraints, technical constraints etc. An interesting chapter is the seventh, dealing with aesthetics where aspects of design principles are discussed. Aesthetics is regarded as an almost separate entity that needs some of the architect's attention. The book nevertheless has some value for this study in the way it analyses constraints and the sources of information.

Most processes can be illustrated successfully through flow diagrams. The illustration of the process of design in all its phases is shown in Fig 6A as drawn up by Zunde (1982:9)[2]. This is a typical process where a client appoints an architect for a specific project.

When design patterns are investigated, however, only the creative part of this process is applicable. It is shown in the first part and a *'sketch'* is then presented, which will be the design concept. The designer is the architect or part of the architect's team.

Specialist input from other consultants is shown - this is normally part of the design development stage in which the design is developed to its optimum solution, shown here as the *'sketch scheme'*.

According to Zunde the design process as analysed from a technical perspective is:

- You have role players
- Information is provided
- Experience is needed
- The architect 'thinks' to produce a sketch.

The creative process in design is illustrated from information by Lawson (*see Fig 6B*)

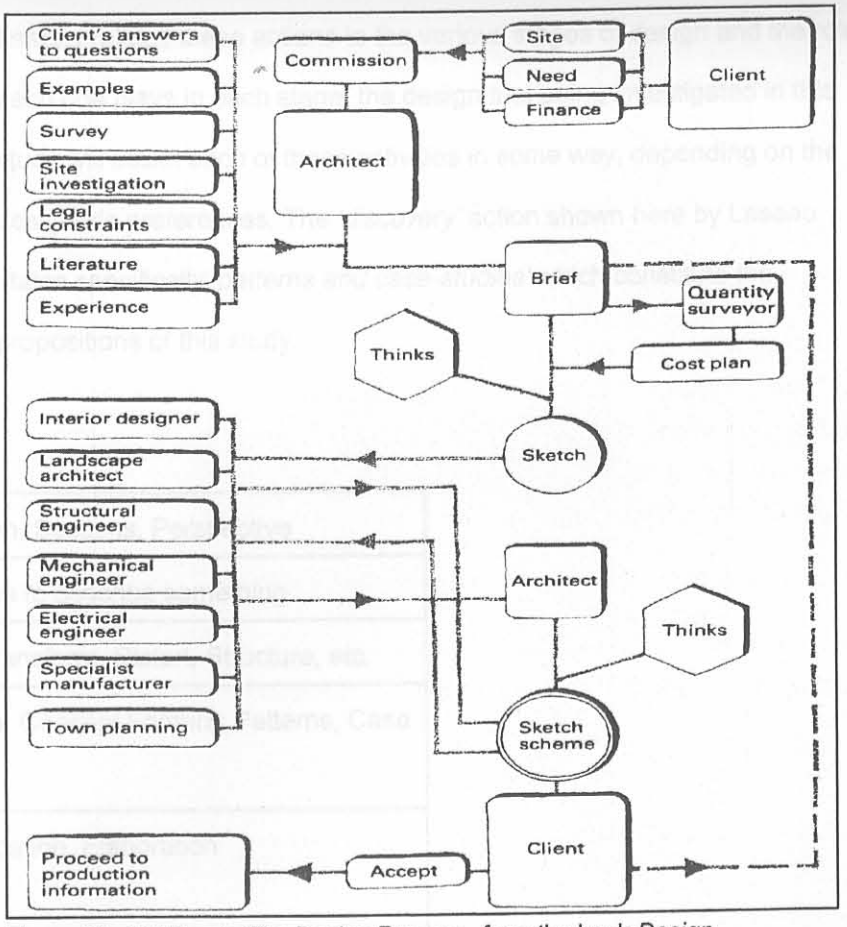


Figure 6A J M Zunde *The Design Process* , from the book *Design Procedures*

[2] *Design Procedures*: a mostly technical manual written for students of Architecture, Construction and Civil Engineering .

6.3 DESIGN AS A CREATIVE PROCESS:

6.3.1 CREATIVE ACTIVITIES

Design is a creative process and the solution should also be creative. According to Laseau (1980:166) the following *actions* are worked through by designers (these are not stages but actions related to the process of design):

Laseau relates these actions to the various stages of design and the role each one plays in each stage: the design tool being investigated in this study will assist each of these activities in some way, depending on the designer's preferences. The *'discovery'* action shown here by Laseau states specifically *'patterns and case-studies'* which constitute the propositions of this study.

Representation :	Includes Sketches, Plan Elevation, Sections, Perspective
Abstraction :	Graphic Symbols working as keys to describe something
Manipulation :	Artful Management or control: Transform, Distort, Structure, etc.
Discovery:	(A Process) Invention, Analogies, Concept Forming Patterns, Case Studies
Verification:	Articulation, Evaluation, Consolidation, Elaboration
Stimulation:	Creativity, Direction, Focus, Energy,Vitality

TABLE 6-1 *DESIGN PROCESS - CREATIVE ACTIONS: LASEAU*

6.3.2 THE CREATIVE PROCESS IN STAGES

The creative process in design will require thinking in two spheres: imagining and reasoning. The former is a right-brain activity and the latter a left-brain activity[3]. These are the root processes of design, the creative actions which every designer has to go through, no matter how long it takes for each of these stages.

The special requirements of a design or the creativity of the designer could play a role in speeding up or slowing down the process.

Lawson (1980) illustrates this creative process as a five stage model (it is well thought through):

1 First Insight	Formulation of Problem	Could Be Revisited, Redefined and Reformulated Moving Between Stage I and 2
2 Preparation	Conscious Attempt At Solution	This is Hard Work: Labouring to Solve the Problem
3 Incubation	No Conscious Effort	Thinker is Unwittingly Reorganizing and Re-examining Previous Deliberate Thoughts
4 Illumination	Sudden Emergence of Idea	Terminates Incubation Process
5 Verification	Conscious Development	Outline Idea is Tested , Developed, Elaborated Upon.

TABLE 6-2 *THE CREATIVE PROCESS OF DESIGN : LAWSON*

[3] Sperry (1981), won the Nobel Peace Prize for his experimentation on left and right hemisphere functions, Virkler(1983)

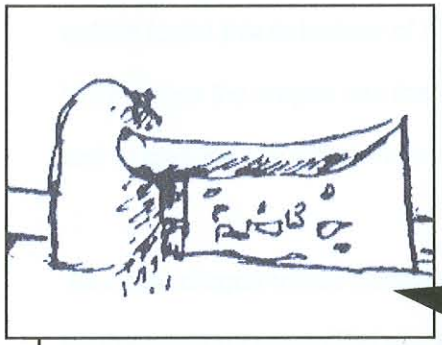
FIRST INSIGHT

formulation of problem

INFORMATION
CONSTRAINTS
BRIEFINGS

PREPARATION

conscious attempt at solution



RE-
VISITED

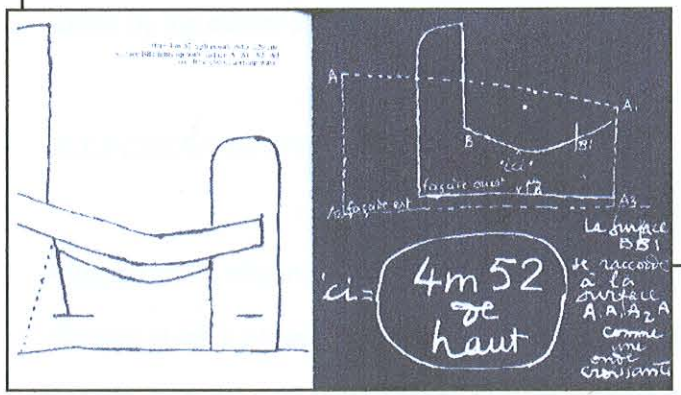
INCUBATION

no conscious effort

DESIGN PATTERNS
INSPIRATION
EXPLORATION

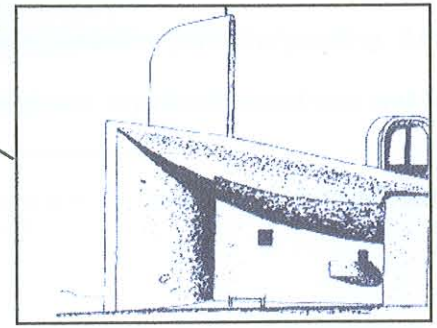
ILLUMINATION

sudden emergence of idea



VERIFICATION

conscious development



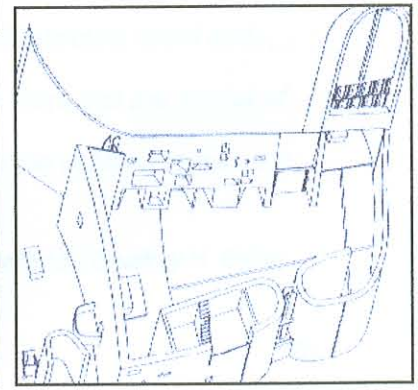


FIG 6B ***BRYAN LAWSON: THE CREATIVE PROCESS OF DESIGN*** *- Sketches of Ronchamp Chapel by LE CORBUSIER (1965) Added by author.*

These stages of creative search and discovery constitute the basis for the design process for any designer, not only architects. The author found this to be true of his own design method and attempted to introduce the stages into the design pattern chapters as a regular test of creative influence and inspiration.

See also diagrammatic illustration of the creative process - Fig 6B on the previous page (The sketches of *Ronchamp Chapel* were added by the author to illustrate the stages.)

6.3.3 CREATIVE INTUITION

Allsopp (1977) observes:

'Design is not a process: it is an intuition, but it is well known in western art and eastern philosophy that the powers of the mind to intuit can be cultivated.'

It is in these creative stages of design as shown by Lawson, that the intuitive aspects of the creative process are defined. The right brain activities of intuition involve incubation and verification, whereas the left-brain reasoning activities are first-insight, preparation and verification.

The intuitive aspects of the process are probably what cause each designer to be different and their way of working to differ. Le Corbusier (1887-1965), is known to have used painting to develop the aesthetics for his projects. After 1918 there was a growing relationship between his painting and architecture. He states[4] that it was the intuitive nature of painting that liberated him:

'The key to my artistic creativity is my work in the field of painting which I continue to practice daily. The basis of my intellectual quest and production lies in the active pursuit of painting. It is there that the source of my open-mindedness, my disinterestedness and of the independence - the

---

[4] *Le Corbusier, the Creative Search 1996 , recorded by Geoffrey H. Baker, (see Bibliography}*

integrity of my work - is found.'

As a young architect he was influenced by Cubist painting before designing the first modern buildings. These forms probably led to the first 'cubist' buildings.

Lawson (1996) conducted interviews with ten different architects on their preferred design method and analyses the way they experience the design process:

To all the architects drawing was very important. Robert Venturi was one of the designers analysed. As Denise Scott Brown, his spouse and partner, says of his sketches:

' They are never done as works of art but as communication with self.'

Santiago Calatrava, also interviewed, says of drawing:

' My graphical output is never as a result of a wish to produce a drawing but rather to understand a problem..'

Calatrava, being also a qualified structural engineer, depends heavily on the development of structural forms in his design process. There is extensive use of the section in his design sketches. Lawson also records the following warning from most of the designers in relation to drawing:

'There is also a distrust of drawing as being dangerously seductive, which seems a mature attitude. Perhaps only good artists are able to recognise the power of drawings to mislead or even to deceive.'

Most of the architects regard drawing as a tool rather than an end-product. When designing in groups, many architects draw while they talk, communicating design ideas to each other, which demonstrates the graphic thinking of designers and the importance of drawing. Architects need to sketch so as to allow the spontaneity and intuition required and to increase flow in creating the design. This does not eliminate the use of computers, but implies that designers could move to and fro between computer and hand sketch to develop a design.

Many of the architects interviewed by Lawson use CAD systems to design but want the computer to remain only one of the tools that can be utilised. It can be argued that creative intuition is not encouraged by working with computers. Lawson though, found that some architects make considerable use of the computer as a design tool. All of the architects that Lawson interviewed felt that the computer images are to be used as just another technique, equivalent to, for example, drawing and physical model-making.

The architects interviewed used the computer for CAD-programmes and not for inspiration and exploring possibilities and ideas, as this study proposes. In creating a design assisting tool on a web-site, the designer will use the computer at times during the design process, but he/she should still have the freedom to use his/her preferred design method.

6.4 CONSTRAINTS / LIMITS

Constraints play important roles in shaping the design and making it appropriate. *(See also chapter 7 where the principles of design are introduced into a typical constraint checklist in architectural practice.)* Constraints should be part of the information necessary to compose a design.

The design concept can be unique and well composed but if it does not take the relevant constraints into consideration, it could fail. The constraints are shown in chapter 8 and introduced into different fields of architectural design, in proposed menus. Constraints are part of formulating the problem. After verification they form part of the reasoning. Having constraint-checklists should assist in making the design appropriate.

There is probably no project that does not have constraints or limits. Students of architecture are confronted with this reality early on, having to present a design scheme from a formal assignment.

6.5 INFORMATION

Relevance of information and sorting the correct information is of critical importance, especially in the early stage of the design process. Irrelevant

DESIGN:	*CONSTRAINTS:*	*OTHER INFORMATION*
DESIGNER'S EXPERIENCE EXAMPLES PUBLISHED MATERIAL *(OR PATTERNS)* PUBLIC INFORMATION THE SITE: INSPECTION SURVEY SITE INVESTIGATION GEOTECHNICAL MINING OWNERSHIP THE INTERNET/ WORLD WIDE WEB	THE DESIGN INFORMATION SUPPLIED BY *PATTERNS* COULD SERVE AS INSPIRATION TO ASSIST THE INCUBATION PROCESS AND HELP TO COME TO A POINT OF ILLUMINATION. THE CONSTRAINTS CAN BE DIFFERENT FOR EACH FIELD: THE FIELDS FOR THE PURPOSES OF THIS STUDY ARE SHOWN IN CHAPTER 7	TECHNOLOGY COSTS : COST LIMITS / COST PLAN LOCAL AUTHORITY TOWN PLANNING LIMITS (CHAPTER 7: FIELDS FOR CONSTRAINTS *SITE* *FORM TYPE* *COMPOSITION OF FORM* *SPACE* *ENVIRONMENT* *GRID/MODULES* *INDOOR/OUTDOOR, ETC.*)

TABLE 6-3 *EXAMPLES: SOURCES OF INFORMATION*

information could mislead designers and have them fail to find the appropriate design solution. In most cases the site should be the most important source of information; buildings are not satellites that can be placed in orbit anywhere. Information is not always available and the architect has to search for all the relevant information required. In this regard architects regard the brief of the client as critical. The client's needs have to be spelled out and they have to be accurately listed.

Once the designer is in possession of the relevant information, the design principles spelled out in the following chapter can be employed to inspire and help in the process of discovery.

(SEE TABLE 6-3, PREVIOUS PAGE)

6.6 CONCLUSION

The *design process* analysed has shown:

- Some definitions,
- Practise situations,
- Flow Diagrams,
- Creative activities,
- Creative stages,
- Creative intuition -(questioning the use of computers to design),
- The importance of constraints,
- Relevance of information.

The next three chapters will look at different manners of analysing *design patterns* - to be implemented in this process.

PATTERNS: DESIGN PRINCIPLES

The proposition is that the *patterns of design principles* may be introduced into the typical process of design in practice, so as to assist designers and help them think through many possibilities.

7.1. INTRODUCTION - DESIGN PRINCIPLES:

Design principles can be defined as *fundamental truths as a basis of reasoning* in terms of design theory (see definition of terms). These principles should be portrayed by design patterns that go to the root of design theory.

In the study of Ching (1979), reviewed in chapter 2, he says :

'This is a study of the art of architecture. It is a morphological study of the essential elements of form and space and those principles that control their organization in our built environment. These elements of form and space are the critical means of architecture. While utilitarian concerns of function and use can be relatively short-lived, these primary elements of form and space comprise the timeless and fundamental vocabulary of the architectural designer.'

The design principle patterns should help in the process of exploration, as set out by Lawson:

1. *first insight*, 2. *preparation*, 3. *incubation*, 4. *illumination*, 5. *verification*. (see chapter 6.)

The aim of an appropriate design tool should be to provide input into all these creative stages and assist the designer at the right time to make decisions, to inspire, to help explore, to define the parameters and limits. To integrate these actions, it is important that the manner of presenting them must be integrated as well.

This can be achieved by grouping principles into fields as shown in the following proposed menus:

7.2 INTRODUCING PATTERNS AND CHECKLISTS

Theoretical design principles can be introduced in practice by a systematic grouping of the principles and relating these to the following fields of design patterns. These groupings can form menus within the software programme or web site which has relevant patterns in a data-base library together with checklists of constraints :*(See also menus and checklists proposed, following)*

7.2.1	*SITE*: PATTERNS RELATED TO A SPECIFIC NEED OF THE SITE
7.2.2	*FORM TYPE*: PATTERNS RELATED TO TYPES OF FORMS
7.2.3	*COMPOSITION OF FORM*: PATTERNS RELATED TO HOW FORMS ARE PLACED OR COMPOSED
7.2.4	*SPACE*: PATTERNS RELATED TO HOW SPACE IS CREATED
7.2.5	*ENVIRONMENT*: PATTERNS RELATED TO HOW THE DESIGN FITS INTO THE ENVIRONMENT
7.2.6	*GRID/MODULES*: PATTERNS RELATED TO REPETITION AND DESIGN MODULES
7.2.7	*INDOOR/OUTDOOR*: PATTERNS RELATED TO HOW THE INSIDE AND OUTSIDE RELATES

TABLE 7-1 FIELDS (MENUS IN SOFTWARE PROGRAMMES OR WEB-PAGES)

In the following tables each of the above fields should show a checklist of constraints. In a software programme each of the above fields can form a menu from which checklists are worked through with regard to constraints, and to which design principle-patterns are linked, as with Web-site hyper-links.

The patterns should form a database which should help the designer in his / her research. The constraints give a picture of delimitations that will develop the design and ensure that the design is relevant. For the purpose of this study only an example of each principle field will be analyzed and illustrated.

The checklist of the constraints mentioned above can be further extended; these checklists can be fine-tuned with user-group interactions.

It would still be the choice of the individual architect whether he / she wants to use the constraints checklists or not. They should be helpful though, to the practising architect.

7.2.1 SITE MENU

THE INFORMATION RELATED TO THE SITE IS OF CRITICAL IMPORTANCE TO THE EARLY DESIGN CONCEPT.

This menu has to give the designer options and alternatives to explore patterns to how his/her building will fit the site.

Important information is shown by the site and it's environment. The designer should first do a site/context investigation and see what exists with regards to:

*Possible **relationships** with other buildings,*

*Ideal areas on site for **Public** access,*

***Axes** that can be formed if required*

*The **context**,*

*How the **concept** can relate to the site,*

*Any **intersections** which may occur,*

*The existing **environment**.*

The patterns shown are, as previously mentioned, only examples of what can be included in a database. The possibilities of patterns are probably endless. The constraints checklist could assist the designer, or he/she could choose to ignore them.

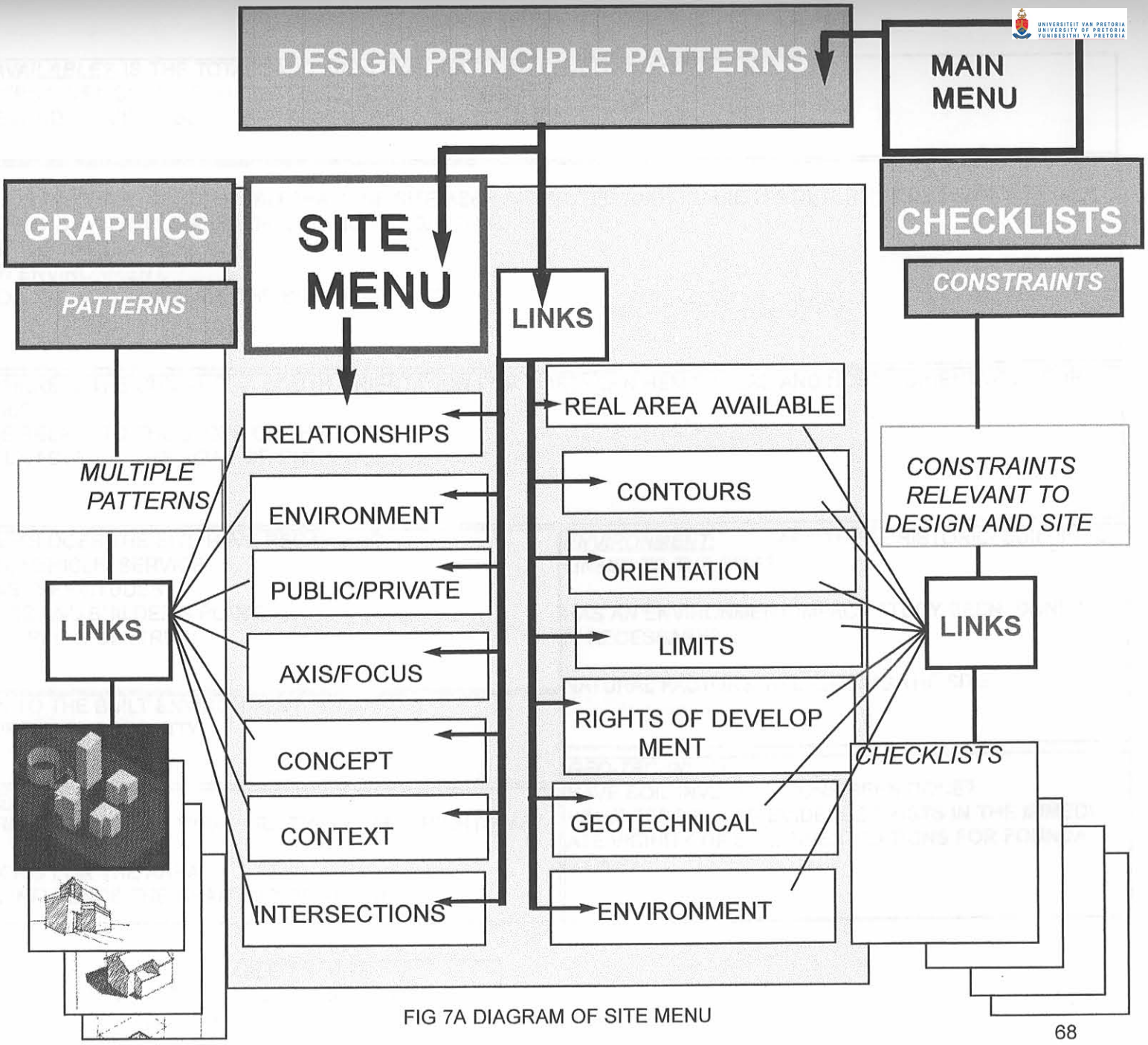


FIG 7A DIAGRAM OF SITE MENU

REAL AREA AVAILABLE? IS THE TOTAL LAND AREA AVAILABLE FOR DEVELOPMENT ?
WHAT PHYSICAL BARRIERS EXIST, SUCH AS :FLOOD LINES, STEEP SLOPES ?
WHAT PORTION OF THE LAND IS BUILD ABLE?

CONTOURS? IS CONTOUR INFORMATION AVAILABLE?HAS THE SITE BEEN INSPECTED AND GRADIENTS DETERMINED VISUALLY?ARE CONTOURS SLOPING TOWARDS A FAVOURABLE ORIENTATION REGARDING:
VIEW, ORIENTATION, STATUS / ADDRESS,
IMPACT OF BUILDING ON ENVIRONMENT,
CAN AVAILABLE TECHNOLOGY ACCOMMODATE THE SITE GRADIENT?

ORIENTATION ? WHERE IS THE SUN ANGLE: SOUTH ORIENTATION FOR NORTHERN HEMISPHERE AND NORTH ORIENTATION FOR SOUTHERN HEMISPHERE?
HOW DOES THIS ANGLE RELATE TO THE SLOPE OF THE SITE :
THE VIEW , IF APPLICABLE THE ROAD OR ENTRANCE?

LIMITS? WHAT LIMITS DOES THE SITE HAVE REGARDING:
ACCESS : PEDESTRIAN, VEHICLE, SERVICE
BUILDING RESTRICTIONS : SERVITUDES
CONSTRUCTION PROCESS AND BUILDER'S PLANT
EXPOSURE (AS WITH SHOPPING CENTRES)

CONTEXT: IN RELATION TO THE BUILT ENVIRONMENT
OR NATURE IN THE VICINITY

DEVELOPMENT RIGHTS:
ARE THERE EXISTING RIGHTS IN PLACE, WHAT ARE THEY? WHAT RIGHTS MAY BE GRANTED?
LOCAL PLANNING POLICIES FOR THE AREA
HOW WILL THE DESIGN INFLUENCE THE GRANTING OF RIGHTS?

ENVIRONMENT: ARE THERE HISTORIC/ BUILDINGS LINKED TO THE SITE?

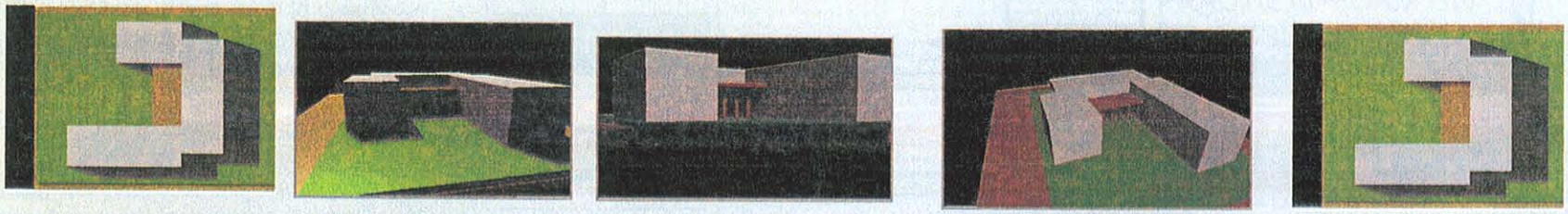
HAS AN ENVIRONMENT IMPACT STUDY BEEN DONE?. IS IT NECESSARY?

NATURAL FACTORS INFLUENCING THE SITE

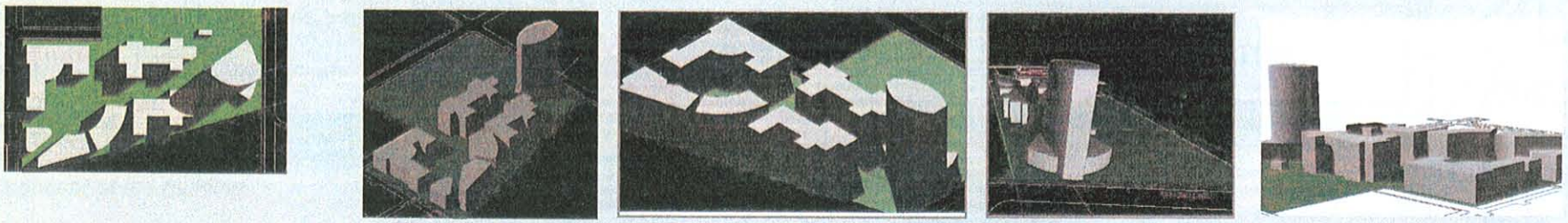
GEO-TECHNICAL:
HAVE SOIL INVESTIGATIONS BEEN DONE?
WHAT REPORTS OR EVIDENCE EXISTS IN THE IMMEDIATE VICINITY OF SOIL INVESTIGATIONS FOR FOUNDATIONS?

TABLE 7-1 *SITE*
CONSTRAINT CHECKLIST

FORM TYPE: 'ORGANIC'



INSIDE/OUTSIDE: 'OPEN COURTYARD'



SITE: 'ENVIRONMENT'

EXAMPLES OF PATTERNS

FIG 7-1

THIS MENU SHOULD ASSIST IN EXPLORING POSSIBILITIES OF FORM.

The designer should have some initial idea of which form could be appropriate. Client's needs could give some direction. Some clients would want to make a statement, others want to be discreet.The constraints checklist should assist. The designer may have his/her own notebook to which information can be added or deleted.

The patterns of form should clearly show possibilities which the designer can use, develop or even elaborate upon:

***Simple form**: other than complex,*

***Complex form**: forms that are composite (forms put together to form a whole),*

***Geometrical form**: related to basic geometrical surfaces or solids,*

***Addition**: a form created by adding similar of the same module-types,*

***Subtraction**: a form created by subtracting forms from it(cut-outs),*

***Conceptual form**: a form that creates the concept of the building,*

***Forms creating space**: the empasis is not on the form itself but the space that it creates.*

The patterns shown should be self explanatory. Links to ***architectural language*** may also have advantages, *(see Chapter 9).*

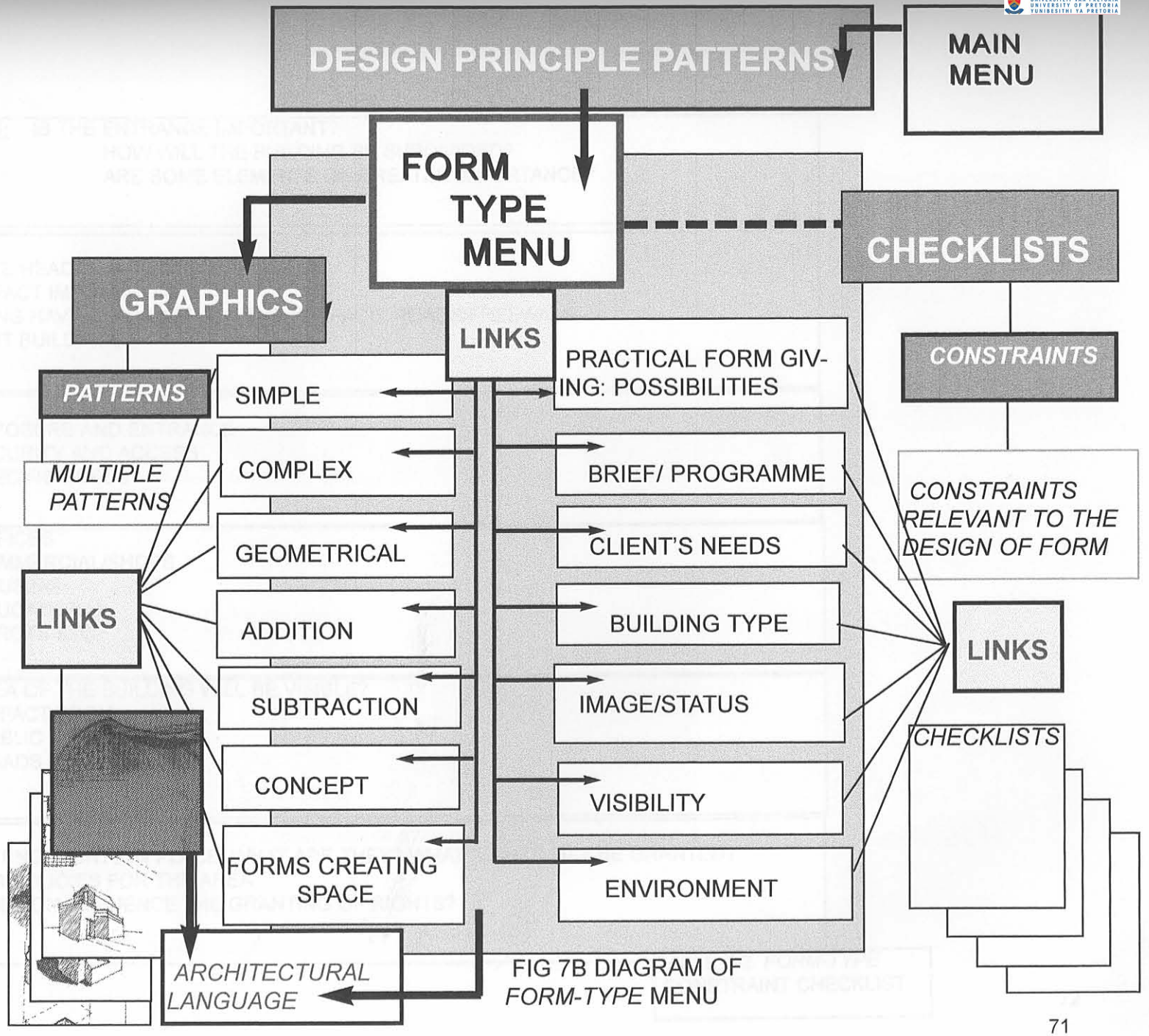


FIG 7B DIAGRAM OF *FORM-TYPE* MENU

CONSTRAINTS:
FORM TYPE

PRACTICAL FORM GIVING: IS THE ENTRANCE IMPORTANT?
HOW WILL THE BUILDING BE SUBDIVIDED?
ARE SOME ELEMENTS OF GREATER IMPORTANCE?

IMAGE/STATUS:
IS IT A CORPORATE HEADQUARTERS?
IS THE VISUAL IMPACT IMPORTANT?
DOES THE BUILDING HAVE EXPOSURE TO: PUBLIC SPACE, ROADS/FREEWAYS,
OTHER IMPORTANT BUILDINGS ?

CLIENTS NEEDS: EXPOSURE AND ENTRANCE
SECURITY AND ACCESS
SPECIFIC NEEDS

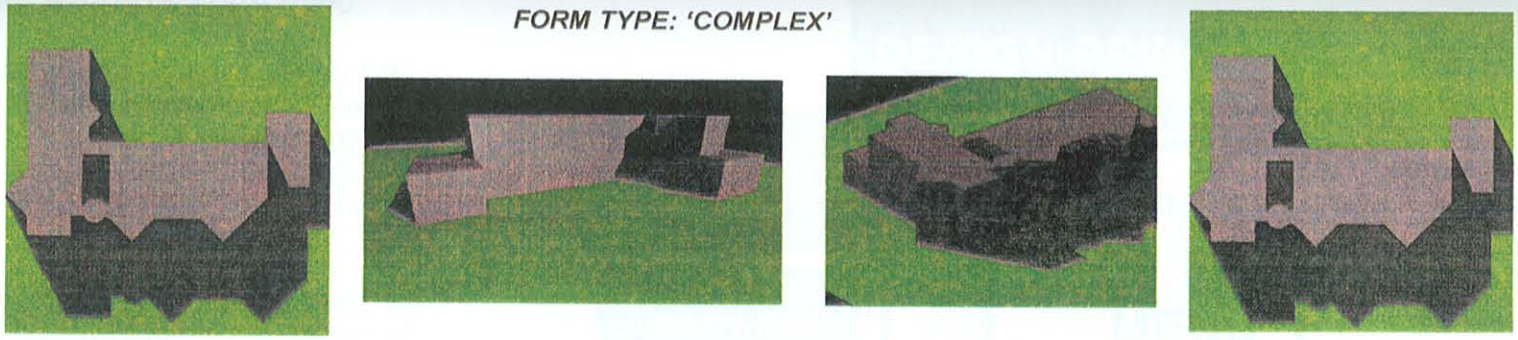
BUILDING TYPES: OFFICES
COMMERCIAL/SHOPS
HOUSING
EDUCATIONAL
SPROTS ETC.

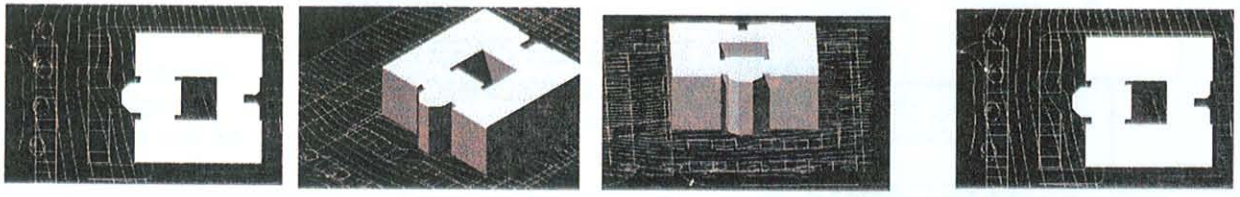
VISIBILITY: WHAT AREA OF THE BUILDING WILL BE VISIBLE?
VISUAL IMPACT FROM:
PUBLIC SPACE
ROADS OR FREEWAYS

ENVIRONMENT:
ARE THERE EXISTING RIGHTS IN PLACE, WHAT ARE THEY? WHAT RIGHTS MAY BE GRANTED?
LOCAL PLANNING POLICIES FOR THE AREA
HOW WILL THE DESIGN INFLUENCE THE GRANTING OF RIGHTS?

TABLE 7-2 *FORM-TYPE* CONSTRAINT CHECKLIST

FORM TYPE: 'COMPLEX'





FORM TYPE: 'SYMMETRY'

FORM COMPOSITION:
'SPIRAL CONCEPT'

EXAMPLES OF PATTERNS

FIG 7-2

7.2.3 COMPOSITION OF FORM MENU

THE COMPOSITION OF FORM MENU WILL EXPOSE THE DESIGNER TO HOW THE DIFFERENT BUILDINGS OR SECTIONS OF A BUILDING WILL RELATE TO ONE ANOTHER AND HOW THIS GROUPING WILL BE COMPOSED.

If only a single building is being designed, this menu may not have a role to play. Groups of buildings, such as complexes or campuses or a building in its urban context should benefit from design patterns shown here.

The constraints checklist may assist the designer in fine-tuning the clients' brief or design programme. (Each designer will differ in the way he / she approaches this section.)

The following patterns are shown:

***Axis**: how the buildings are grouped around it,*

***Symmetry**: as used in the grouping of buildings,or **Asymmetry**,*

***Scale**: the scale of buildings in relation to each other and the environment,*

***Relationship**: spatial or odering relationships,*

***Grouping**: Forming clusters of different groups for example.*

***Forms creating space**: how several forms, grouped and composed can cretae space.*

Links to ***social preferences*** menu could be useful.

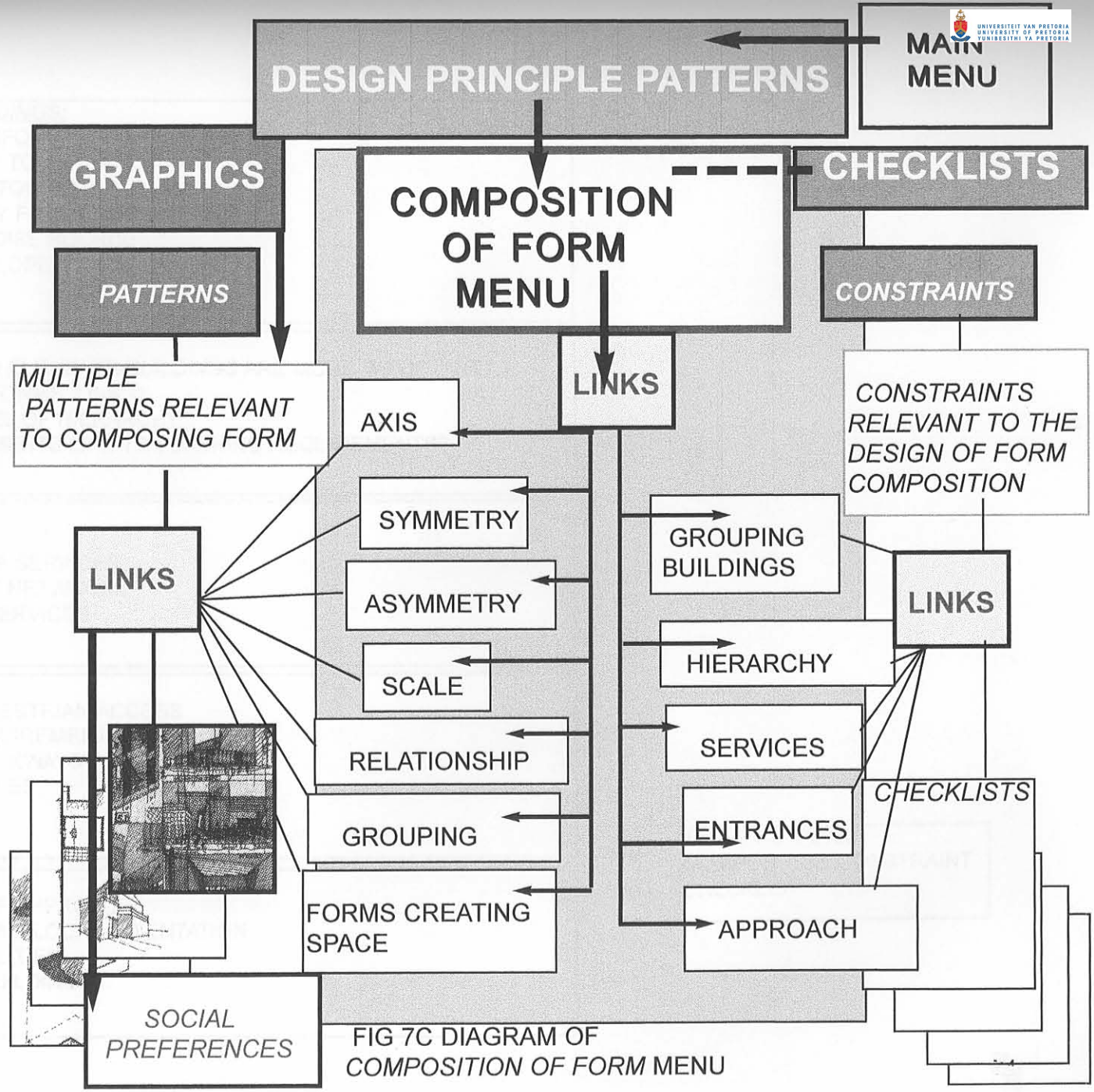


FIG 7C DIAGRAM OF *COMPOSITION OF FORM* MENU

GROUPING OF BUILDINGS:

FORMAL OR INFORMAL ARRANGEMENT
RELATIONSHIP TO ENTRANCE/AXIS
ORIENTATION TOWARDS SUN ANGLE
AWAY FROM WIND DIRECTION
or NOISE SOURCE
CONTOURS: SLOPE OFSITE

HIERARCHY: *WHICH ELEMENTS/BUILDINGS* ARE MORE IMPORTANT?

DIVISION OF FORMS: LINKS?
SECOND LEVEL OF HIERARCHY
HOW DO ELEMENTS LINK TO PLANNING REQUIREMENTS?

SERVICES:

NETWORK
CONCEPTS OF SERVICES
ECONOMY OF NETWORKS
ACCESS TO SERVICES

ENTRANCE:

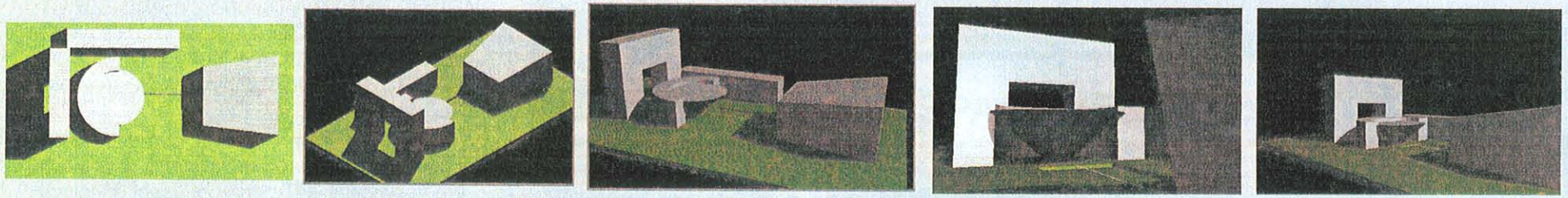
VEHICLE/ PEDESTRIAN ACCESS
PARKING REQUIREMENTS
COVERED WALKWAYS
FOYERS/LOBBIES

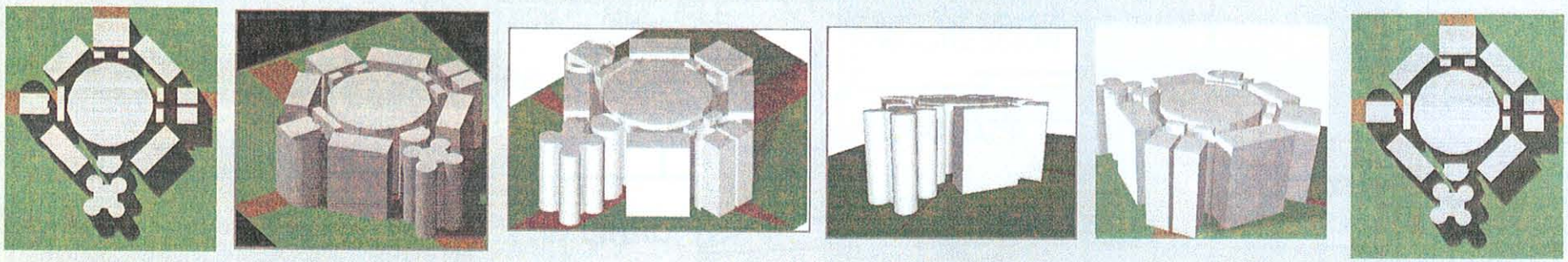
APPROACH:

DIRECTION OF APPROACH
APPROACH AND LOCAL ORIENTATION
AXIS POSSIBILITIES
HEIGHT OF BUILDINGS

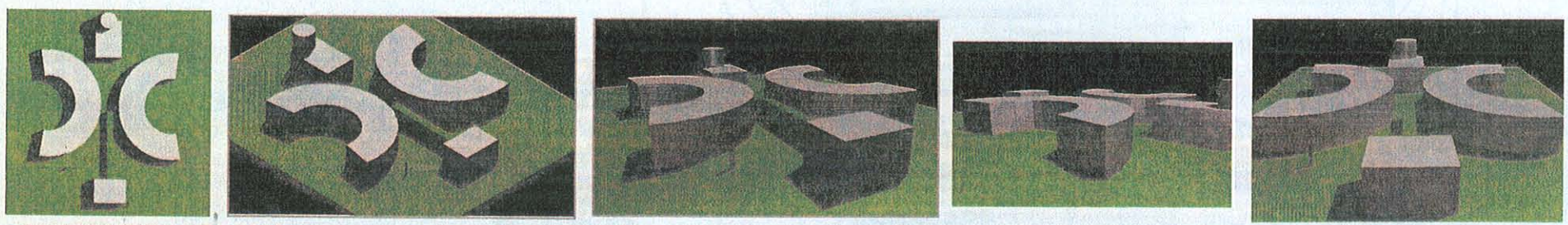
TABLE 7-3 *FORM COMPOSITION* CONSTRAINT CHECKLIST

COMPOSITION OF FORM:
'ASYMMETRY'





FORM: 'COMPLEX'



COMPOSITION OF FORM:
'SYMMETRY'

EXAMPLES OF PATTERNS

FIG 7-3

THE SPACE MENU WILL GIVE MORE THREE-DIMENSIONALITY TO THE DESIGN CONCEPT. IT IS RELATED TO THE PREVIOUS MENUS, BUT THE VERTICAL DIMENSION ALSO COME INTO FOCUS:

This menu may also work well with a group of designers: Brain-storm sessions and graphically exploring ideas together. The analysis of the aspects of space may be too complex for one designer to pursue in isolation.

***Progression**: How space is experienced or can be experienced by the person moving through it.*

***Approach**: what elements could assist in defining the approach to a building,*

***Transition**: How the one space is linked to the other and how the experience of moving from one space to another can be manipulated by the designer,*

***Formal or Informal Space**: could be related to the architectural language chosen,*

***Public or Private Space**: may be related to the security or access to certain areas, with its practical implications,*

Links to *Landscaping* possibilities could assist early thinking in these lines.

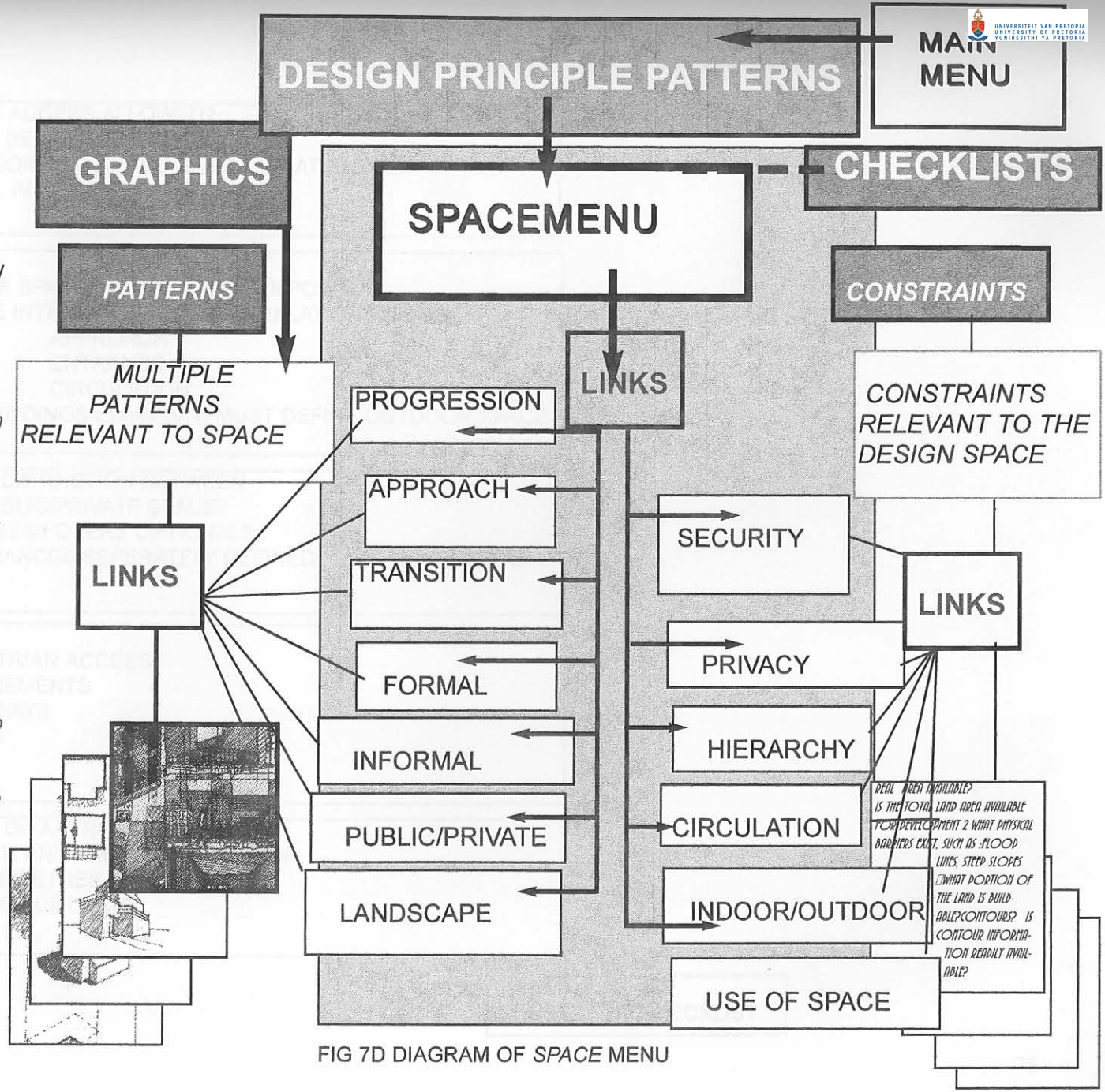


FIG 7D DIAGRAM OF *SPACE* MENU

CONSTRAINTS:
SPACE

SECURITY: IS PUBLIC ACCESS ALLOWED?
ITEMS TO BE PROTECTED
PROTECTION REQUIRED AGAINST WHAT ELEMENTS?
HOW WILL ACCESS BE MONITORED?

HIERARCHY: IS OUTDOOR SPACE PROGRESIVELY IMPORTANT
DOES THE INTERIOR SPACE HAVE RELATIONSHIP TO:
APPROACH
ENTRANCE
CIRCULATION
WHICH BUILDINGS ELEMENTS MUST DEFINE OUTDOOR SPACE

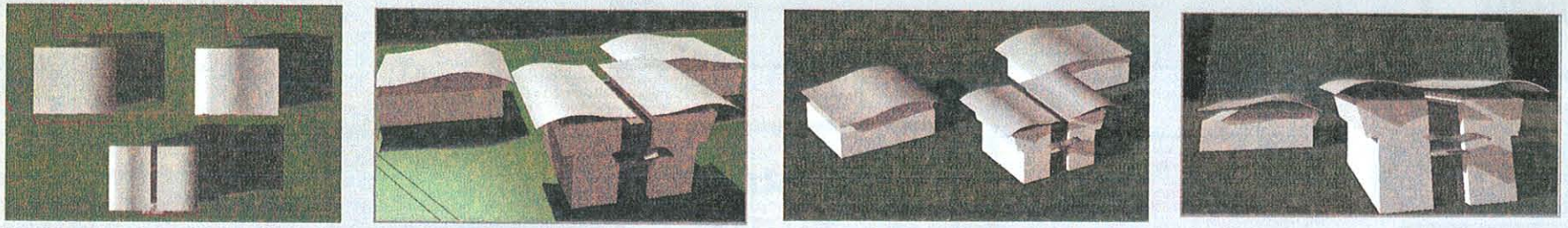
PRIVACY: IS THERE DISTINCTION BETWEEN
PUBLIC/PRIVATE SPACE?
ARE LOBBIES/FOYERS OPTIONAL?
ARE ENTRANCES SEPERATELY DEFINED(GROUPS OF BUILD INGS)?

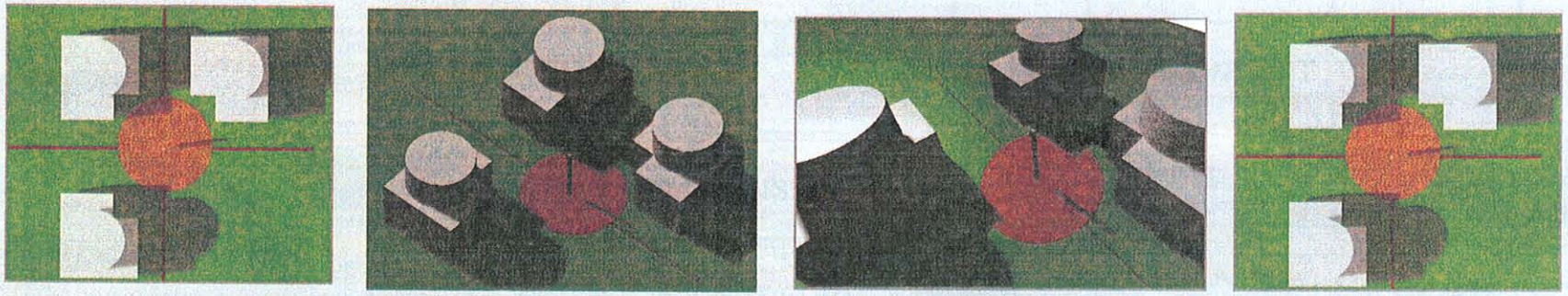
ENTRANCE:
VEHICLE/ PEDESTRIAN ACCESS
PARKING REQUIREMENTS
COVERED WALKWAYS
FOYERS/LOBBIES

APPROACH: DIRECTION OF APPROACH
APPROACH AND LOCAL ORIENTATION
AXIS POSSIBILITIES
HEIGHT OF BUILDINGS

TABLE 7-4 *SPACE*
CONSTRAINT CHECKLIST

FORM COMPOSITION: 'RELATIONSHIP'





FORM COMPOSITION: 'RELATIONSHIP 2'

COMPOSITION OF FORM 'GROUPING'

EXAMPLES OF PATTERNS

FIG 7-4

7.2.5 ENVIRONMENT MENU

THE INFORMATION RELATED TO THE ENVIRONMENT IS THE RELATIONSHIP WITH THE BUILDING IN IT'S CONTEXT

This menu has to give the designer options and alternatives to explore patterns to how the building can relate to buidings, elements and steets around it.

*Possible **relationships** with other buildings,*

***Approach** possibilities,*

***Axes** that can be formed if required,*

*The **context**,*

*How the **concept** form can relate to the environment,*

***Landscaping** in the area,*

*The **scale** of the buildings in relation to others.*

The patterns shown are, as with the other menus, only examples of what can be included in a database. The possibilities of patterns are probably endless. The constraints checklist could here benefit the search for environment clues.

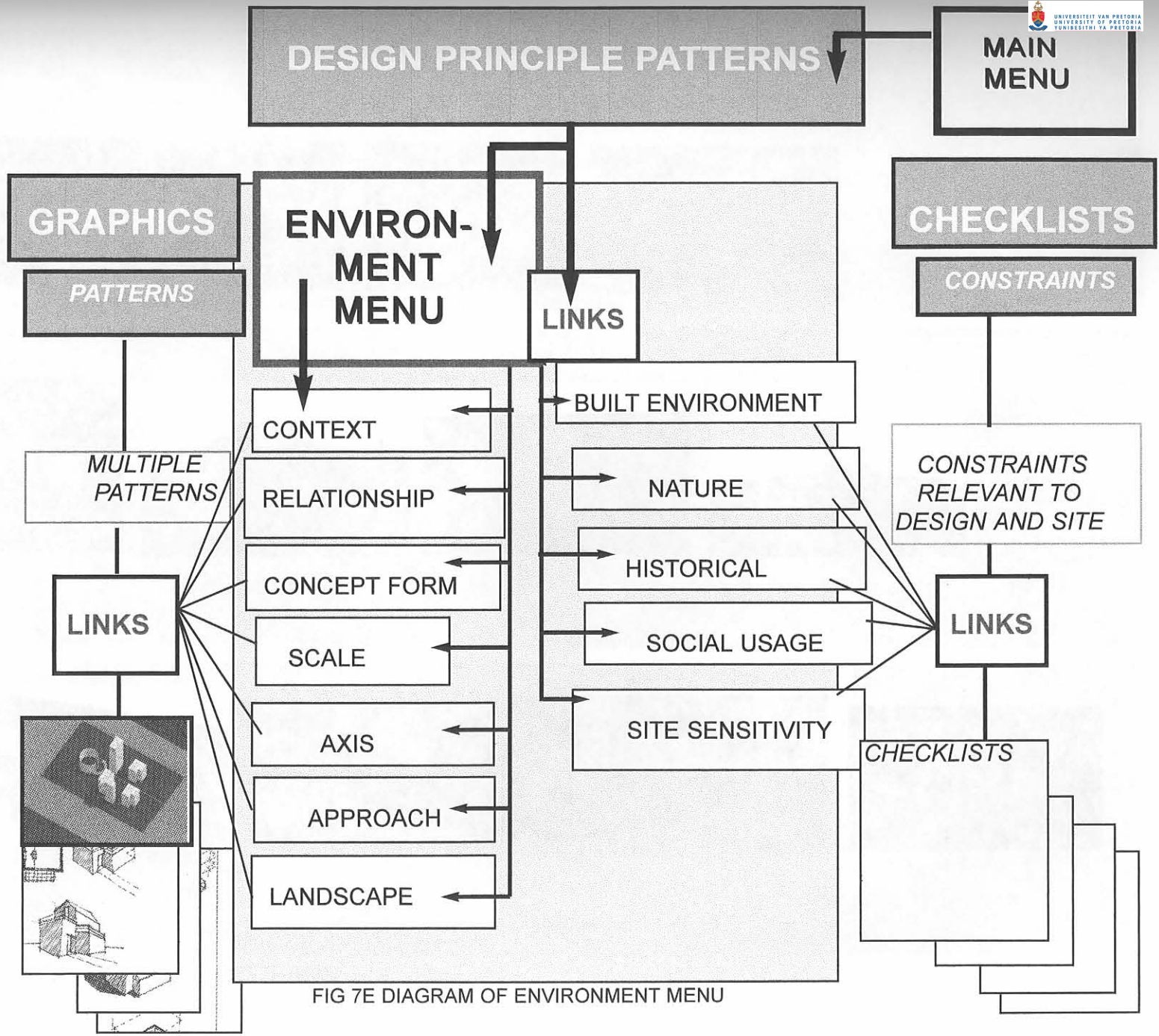
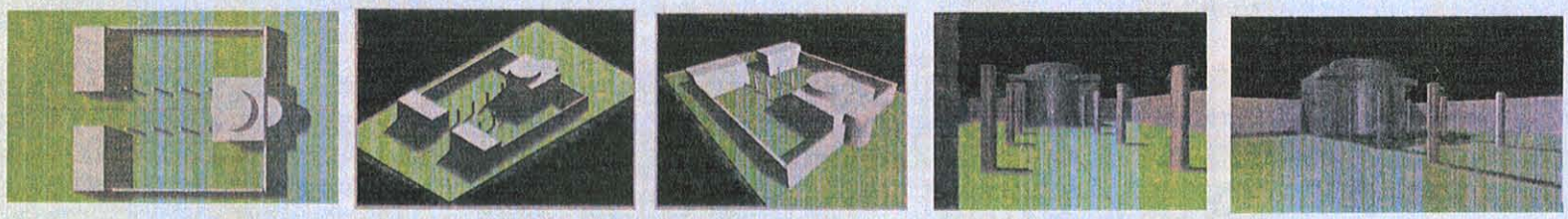
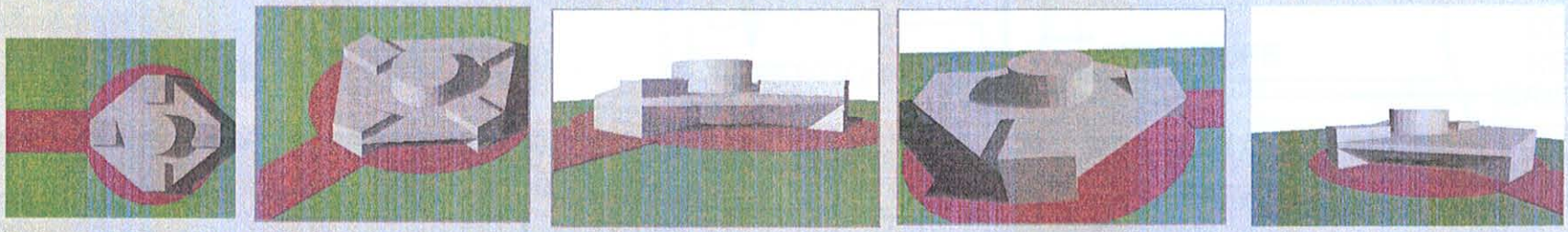


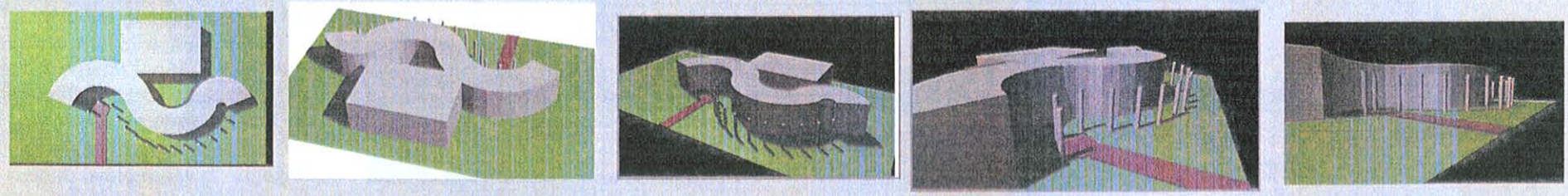
FIG 7E DIAGRAM OF ENVIRONMENT MENU

COMPOSITION OF FORM:
'ASYMMETRY'





FORM: 'COMPLEX'



COMPOSITION OF FORM:
'SYMMETRY'

EXAMPLES OF PATTERNS

FIG 7-5

7.2.6 GRID/MODULES MENU

THE INFORMATION RELATED TO THE GRID/MODULES MENU HAS TO DO WITH STRUCTURE AND REPETITION.

This menu has to give the designer options and alternatives to explore patterns to how the modules and grid of the building can influence the concept.

***Repetition** of modules,*

***Rhythm** possibilities,*

The type of grid required:

Freedom** or **Constrained** or **Ad Hoc

*How **Landscaping** can complement or contrast the grid,*

The patterns shown are, as with the other menus, only examples of what can be included in a database. The constraints checklist could here assist the search for early decision-making on items that could also follow later in design development. Thinking about them at this stage may help to avoid many changes to the design concept.

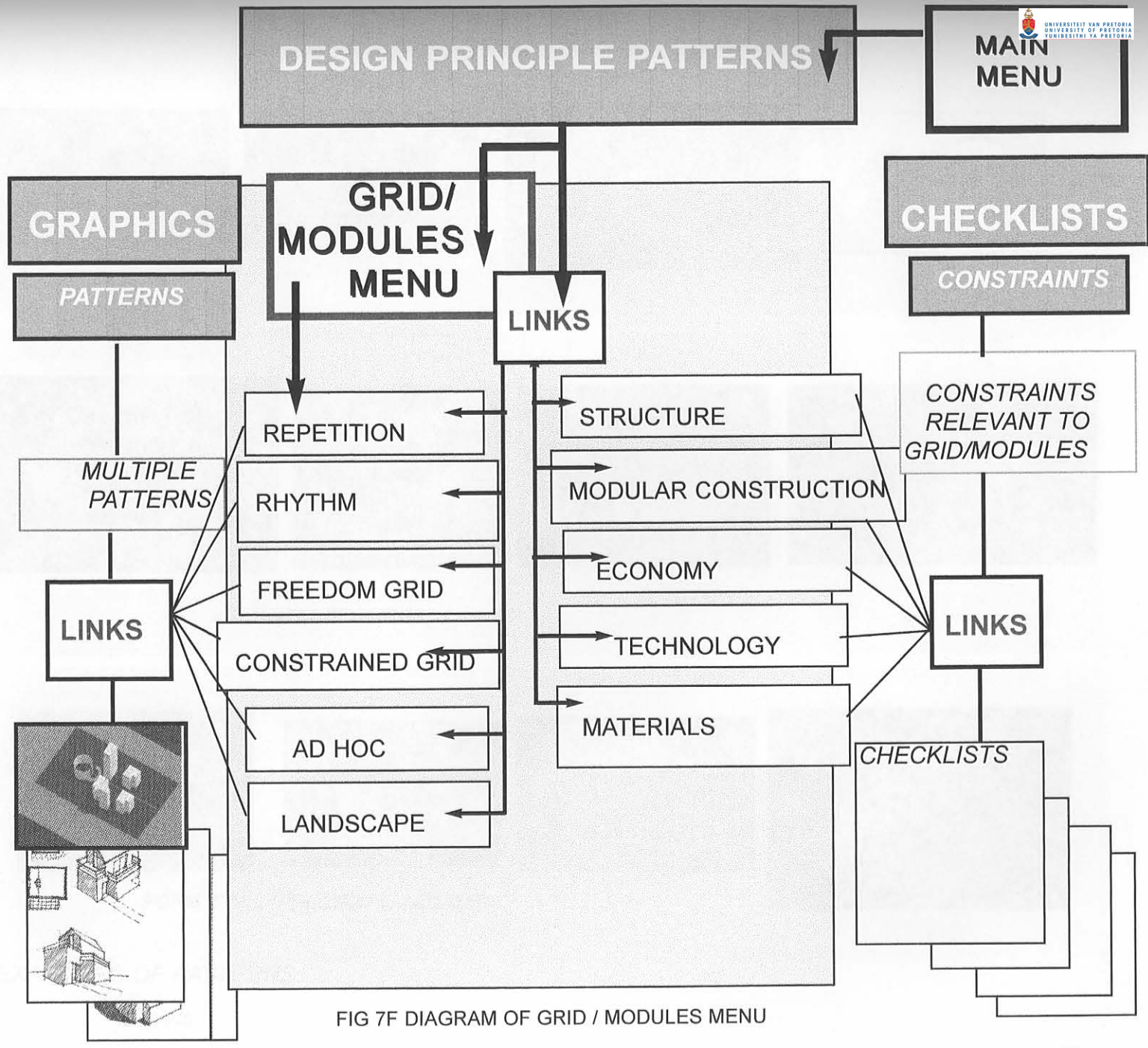
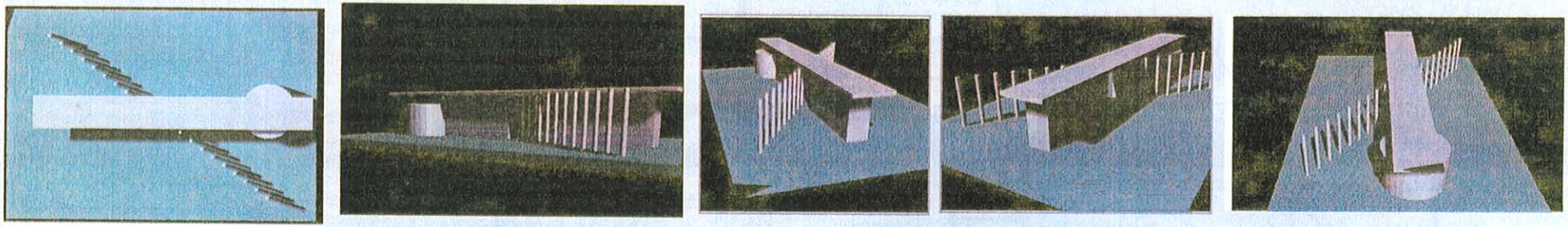
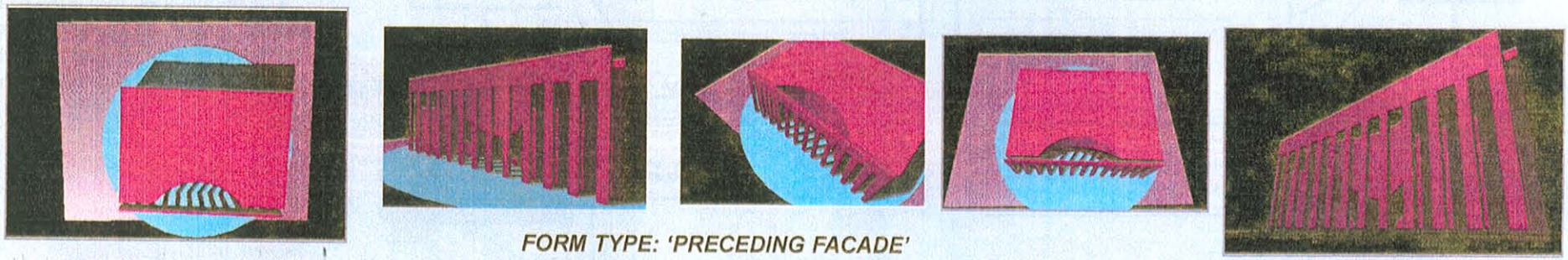


FIG 7F DIAGRAM OF GRID / MODULES MENU

FORM TYPE: 'SPIRAL'



SITE:'INTERSECTIONS'



FORM TYPE: 'PRECEDING FACADE'

EXAMPLES OF PATTERNS:

FIG 7-6

7.2.7 INDOOR/OUTDOOR MENU

THE INFORMATION RELATED TO THE INDOOR/OUTDOOR MENU SHOWS HOW THE OUTSIDE OF THE BUILDING AND INTERIOR IS LINKED.

This menu has to give the designer options and alternatives to explore patterns to how indoor space and outdoor space can be formed:

***Squares**,*

***Courtyard** possibilities,*

***Recessed** space:*

***Building** and **Landscape** interaction,*

*How **mass or scale** can complement the outdoor space,*

The patterns again are shown as with the other menus as only examples of what can be included in a database. The constraints checklist could here assist the search for how outdoor space would function.

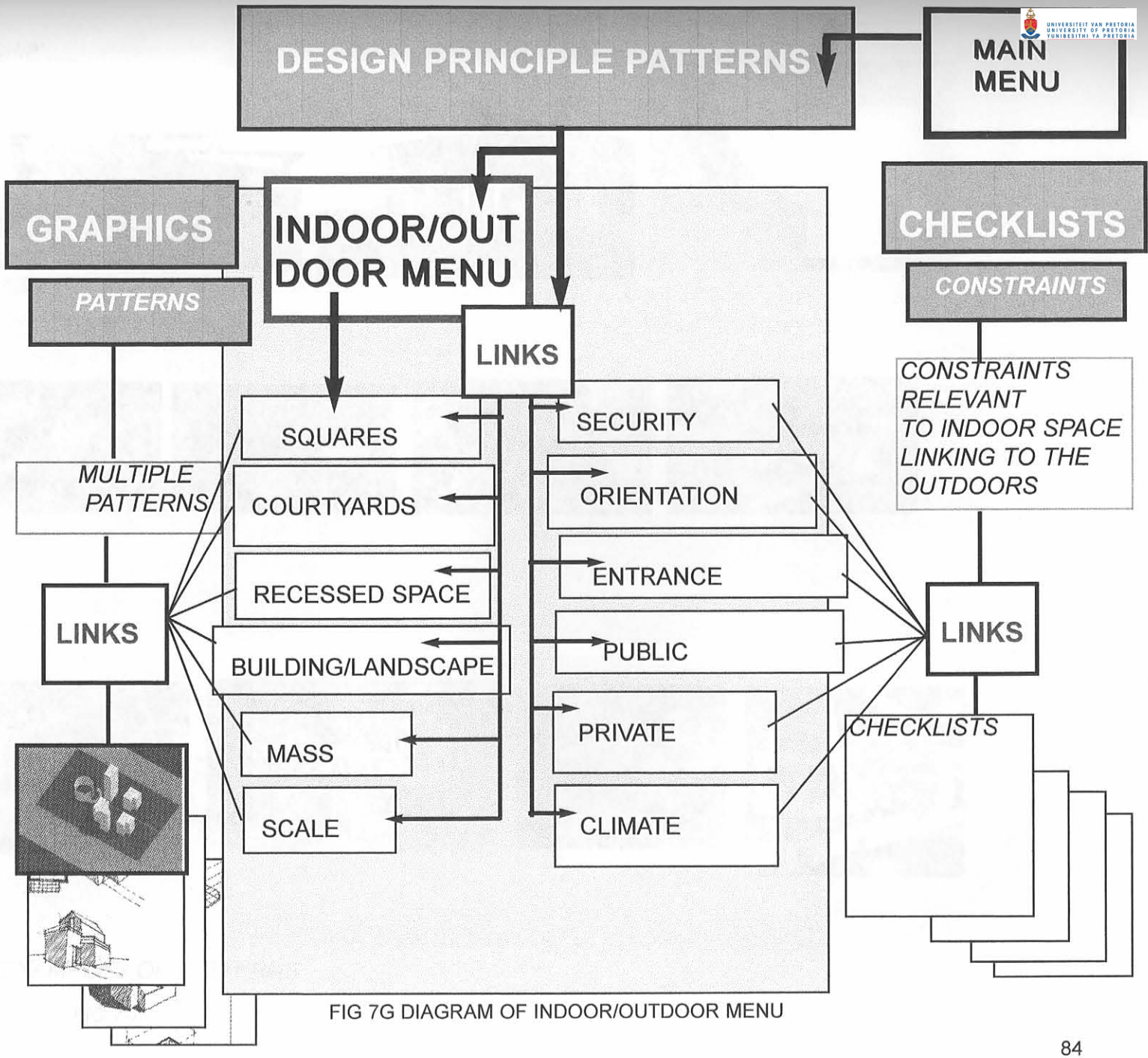
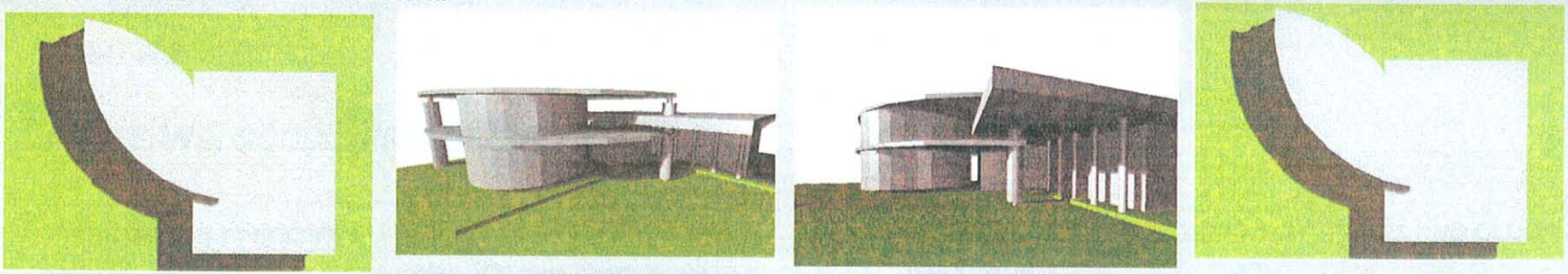
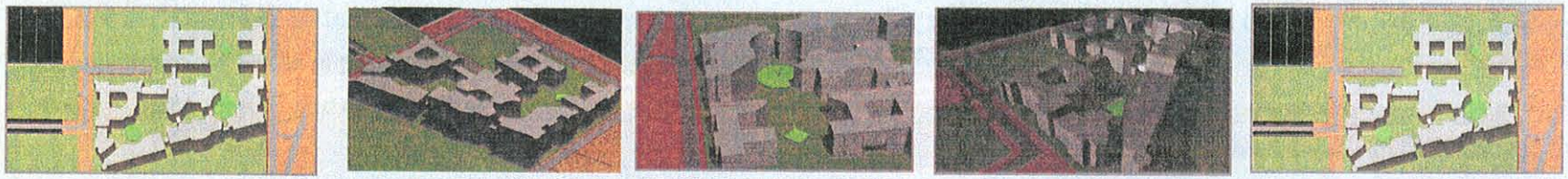


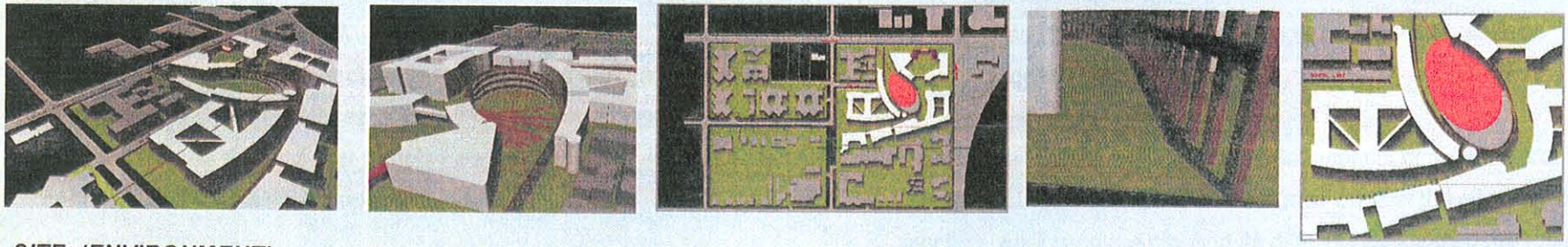
FIG 7G DIAGRAM OF INDOOR/OUTDOOR MENU

FORM COMPOSITION: 'RELATIONSHIP'





SITE: 'RELATIONSHIP'



SITE: 'ENVIRONMENT'

EXAMPLES OF PATTERNS

FIG 7-7

PATTERNS: SOCIAL PREFERENCES

The proposition investigated in this chapter is that *patterns of social preferences* focussing on the variables of human needs could be introduced by menus to have the designer consider them.

Choices can be made by the designer that are to some degree related or not related to the needs of people. The aim of this chapter would be to analyse human needs and to group them in fields to express patterns.

Van der Rhyn (1992:63) warns that:

'The concept of human needs, for one, is very controversial, as it is constantly changing, culturally determined and reflected by trendsetting in design'

This study attempts to steer clear of the problems that can be created by the cultural and fashion issues of human needs, and hopes to stay focussed on the patterns that people need as has been expressed over centuries in the built environment.

8.1 INTRODUCTION: MODERN LIFESTYLES AND OLDER SOCIAL PATTERNS

The following comparisons illustrate the differences between the patterns of older city social spaces and the way we live in the twenty-first century:

- Markets of stalls in open space courtyards *as activity centres* in town squares or courts, in contrast with the enclosed mall-type *shopping centres* built around anchor shops that promote high turnover of sales.
- Public space as created in older cities in contrast with the invasion of motor cars affecting the quality of these spaces.
- Street scapes with activities and open terrace activities on the street area compared with modern security issues, such as fencing and access control to buildings.

Most of the studies done on the social aspects of architecture, are related to the city and the development of theories on how the city (or cities) should function. Analysing the city and its different buildings does focus on the greater scale of architecture and on social activities expressed in built form.

Some architects specialise in urban design and become experts in *'larger-scale' architecture*:

- How the buildings in a city should be composed,
- How the space created by a group of buildings should be created,
- What building types should be grouped together, etc.

8.2 THE CITIES AS ROOTS OF ARCHITECTURAL ENTITIES AND SOCIAL CENTRES

Rossi (1966) said:

'As the first men built houses to provide more favourable surroundings for their lives, fashioning artificial climates for themselves, so they built with aesthetic intention. Architecture came into being with the first traces of the city; it is deeply rooted in the formation of civilization and is a permanent, universal and necessary artifact.'

Rossi looks at the elements of which cities are composed and the ways in which these are grouped together to form neighbourhoods. He also analyses the elements of a city in terms of building types and reveals the underlying fundamental structure of all buildings of a specific type. He is therefore proposing the possibility of a *typology* giving laws to architects how to build in the city.

De Carlo (1982:36) mentions the squares and streets in historical cities:

'Used as we are to read towns on maps, we tend to identify squares as expansions of streets: expansions which usually occur at crossings, where one or more secondary streets flow into a main one. Being used to read streets as channels for the movement of persons and vehicles, we tend to accept the existence of squares as one accepts the existence of joints in fluid pipes: swellings necessary to solve the fitting between different flows, avoiding eddies and reducing as far as possible losses of pressure. In reality, the third dimension; form, time and use give towns a much higher degree of complexity than can be represented bidimensionally on their plans. On the other hand, urban streets are channels of movement, but also places for activity, exchange, individual and collective experience and socialisation.'

It is in this *socialisation experience* that patterns exist that people long for in city-living. Special places can be created by squares, streets and street scapes, and the architecture can complement these spaces.

This section of the study does not attempt to analyse the extent of urban design principles (though it may touch on the borders of this field.) It does, however, attempt to analyse social patterns of what people seem to prefer in their social interaction with regards to the built environment. Cities are where people are organised and grouped to live together. The urbanisation of the world population is probably also an irreversible process.

Urban design 'specialists' would draw up master plans for cities or campuses, for example, and use different methods to develop and update these master plans until it is built as planned.

On the other hand, as stated in the introduction, spontaneous patterns of building are also developed by ordinary people, and are sometimes in sharp contrast to the 'specialist' or architects' ideals. These patterns could be valid and valuable to society. These could be ideas from ordinary people and the way cities 'evolved' over the centuries. Rudofsky (1977:9), analyses the subject and states:

'Architecture without architects , as I call the topic at hand, is not just a jumble of building types traditionally slighted or altogether ignored, but the silent testimonial to ways of life that are heavy on acute insight, albeit light on progress. It goes to the roots of human experience and is thus of more than technical and aesthetic interest. Moreover, it is architecture without a dogma.'

Rudofsky also indicates the resistance amongst architects and designers to give credit to the exhibition that followed his book. There was also resistance to these building types, as though the architects were threatened by architectural types that did not require 'architectural design' from professionals.

8.3 PREVIOUS RESEARCH AND STUDIES

8.3.1 CHRISTOPHER ALEXANDER AND OTHERS (USA)

Alexander, *et al* (1977) identified the following elements, building types and events, amongst others, that he says exist in timeless patterns and the way people preferred to build over centuries.*(See also Pattern Language; Review of related literature.)*

The simplicity of these patterns can be incorporated into designs to show what is good and/or what is preferred, and the elements, building types and events can be linked to the ideal theories and principles to help the designer think of people's needs.

ELEMENTS	*BUILDING TYPES & ENVIRONMENT*	*EVENTS*
Entrance	Restaurants	Work
Light	Shop/ Market	Play
Streets, Squares	Homes	Family Life, Elderly
Gates	Streets	Walking
Water	Roads, Public Space	Networking
Outdoor Room	Clustering Homes	Construction
Scale Limits, Etc	Boundaries, Etc	Transport, Etc

Table 8-1 Alexander, *et al: Elements, Building Types and Events* categorised.

8.3.2 LEON AND ROB KRIER (EUROPE)

Leon Krier (1981), analyses the following elements of building in the European city context:

- MONUMENTS
- ARCADES
- COLONNADES
- ORDER
- FOCUS
- LAYERS
- FACADE
- TEXTURE

Rob Krier also addresses social patterns or typologies in the urban context, but with many different concepts. *(See Fig 8.1, circular public space patterns)*

He says that historically and socially, the cities are built patterns of human lifestyles and some cities have elements that make them more attractive and more pleasant to live in than other cities that ignore these elements.

Some questions may arise that the designer will be challenged with in the choice of his / her design concept:

- Are these elements still valid for the way people [illegible]?
- Must new types of spaces be created that better incorporate the problems of transport and vehicles and pedestrian circulation?

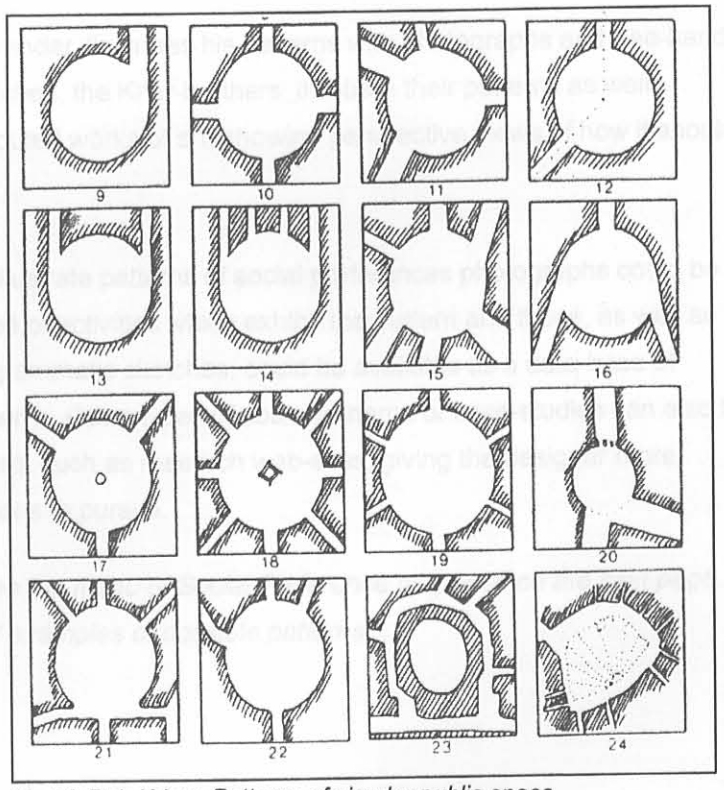


Fig 8A Rob Krier : *Patterns of circular public space*

8.4 URBAN DESIGN PRINCIPLES; LANDSCAPING AND SOCIAL SUSTAINABILITY:

Input from an urban design specialist may be needed to develop architectural design patterns on an urban scale. This can be developed separately, and linked to the web-site, or it could be accommodated at a later stage in the development of the software tool. Links could be provided to other web-sites that have other relevant information, such as:

- Urban design principles,
- Landscape design patterns,
- The important social issue of sustainability, specifically in relation to the built environment.

These fields could also be addressed in a checklist or with links to research data on this subject.

A separate menu in the software program or web-site should provide the input of what people seem to prefer. As with the other menus, the way the designer utilises or explores this information must be flexible and options left for the designer's discretion. Some projects may warrant more social preference input than others.

The creative process of design must not be complicated by too many issues. The sketches can be scanned into computer programmes for use on the web-site. There can also be links to design principle menus, containing patterns which accommodate people's needs.

8.5 PATTERNS OF SOCIAL PREFERENCES

Alexander illustrates his patterns with photographs and free-hand sketches, the Krier-brothers illustrate their patterns as well-executed works of art, showing perspective views of how it should be.

To illustrate patterns of social preferences photographs could be taken of activities which exhibit the pattern and these, as well as diagrammatic sketches, could be available as a data-base of patterns. Other types of social patterns or case-studies can also be linked, such as research web-sites, giving the designer more options to pursue.

(See the menu of Social Preference proposed on the next page, and examples of possible patterns)

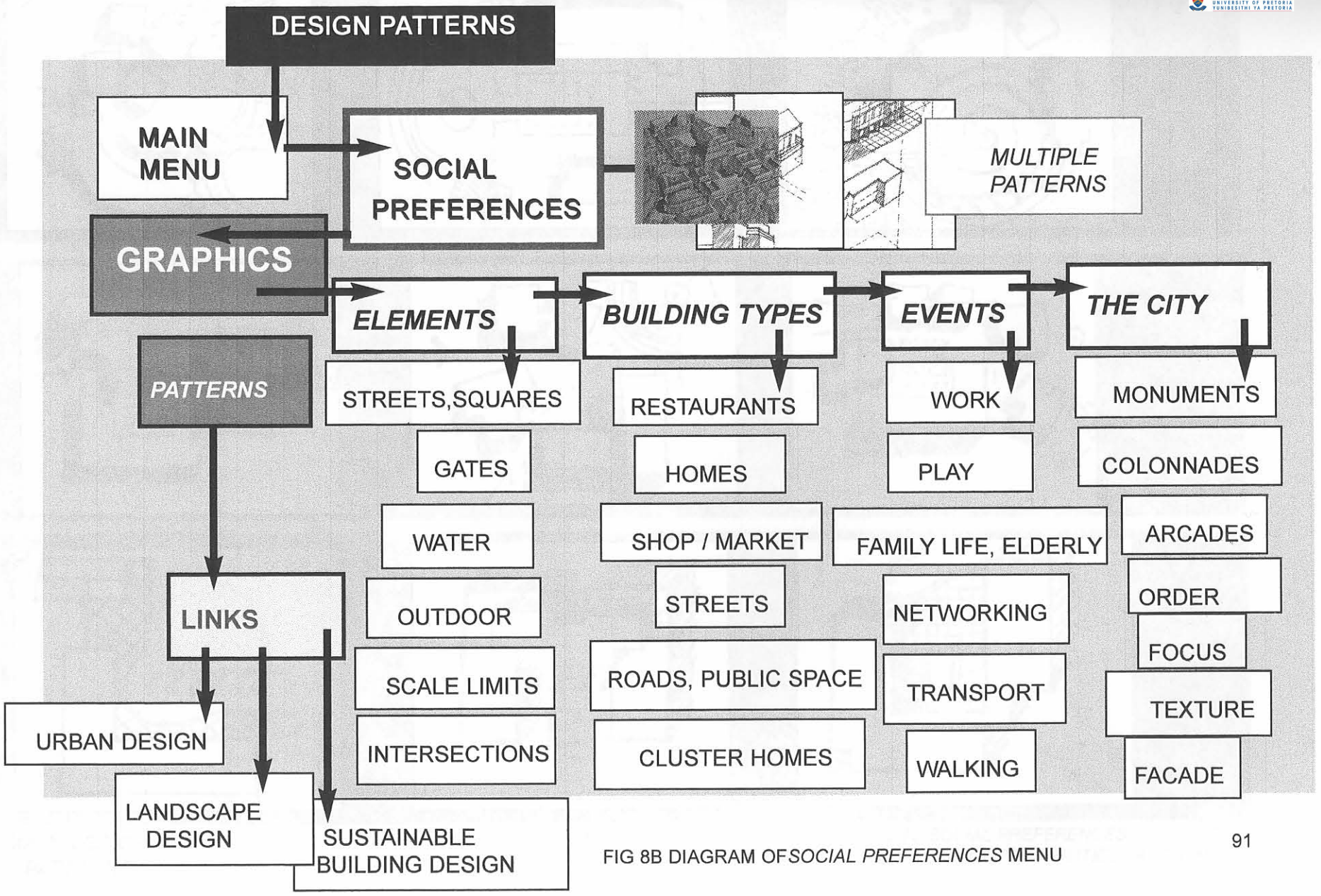
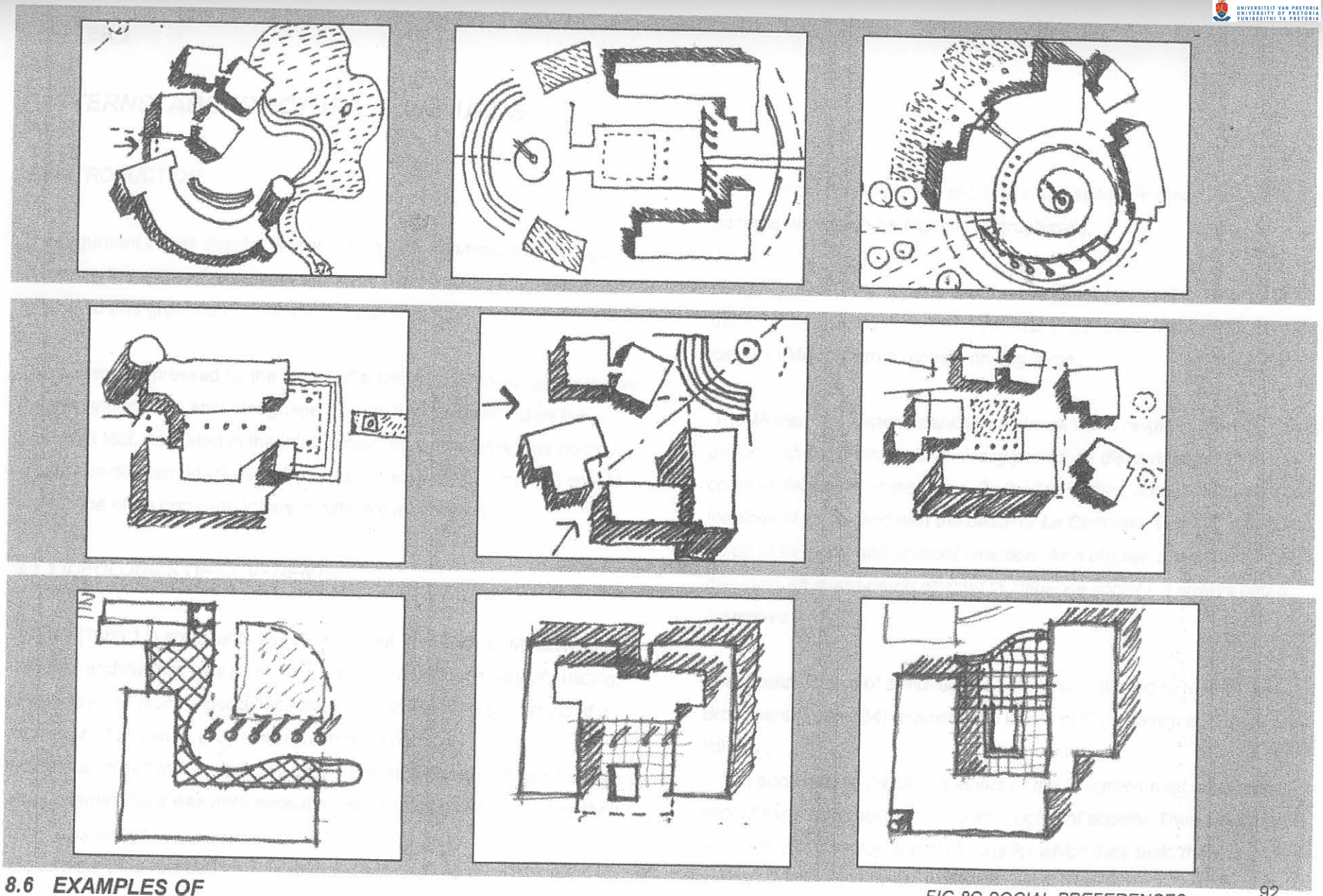


FIG 8B DIAGRAM OF *SOCIAL PREFERENCES* MENU



8.6 EXAMPLES OF PATTERNS

FIG 8C SOCIAL PREFERENCES: PUBLIC SPACE POSSIBILITIES (AUTHOR)

PATTERNS: ARCHITECTURAL LANGUAGE

9.1 INTRODUCTION:

The argument of this chapter is that *patterns of architectural language*, analysing the ideas of architectural movements, may be expressed, organised and grouped in software menus.

The patterns expressed by the ideals of architectural movements will give the designer choice about language or style if it is expressed by the proposed tool. As stated in the introduction, these patterns may portray ideas from different ideologies. Patterns (as excellent examples) should portray the often opposing ideals in different movements.

9.1.1 IDEOLOGIES OF MOVEMENTS:

Glancy (1989:11) comments as follows about the ideals of Modernism:
'Modern architecture was as much a moral crusade as a way of building. It was seen as morally good because it told no lies. The elevations of a modern building were drawn straight from its plan...
Modern architecture was morally right because it used materials honestly. At the same time it was right because it sought to satisfy real rather than imaginary needs.... '
Modernism thus had definite ideologies which are expressed in the language of the elevations and forms and space. In these ideals there are patterns which can be expressed graphically.

Jencks (1980:10) suggests that the Modern movement attempted to be utopian; we know very well that the many Modernist manifestos gave the ideals of Modernism a utopian driving force :

'The Modern Movement, capitalised like all world religions, had its Heroic period in the twenties and its classy period, its dissemination and commercialisation, in the fifties. By the late sixties, it had lost much of its ideological power and with the death of Le Corbusier in 1965, it had lost much of its moral and spiritual direction. As a utopian movement, or at minimum an avant-garde attempt to influence society, it always had a normative role.. '

The utopian ideals of a movement are not only limited to Modernism. Broadbent (1990:164) analyses the ideals of Rationalism in Europe as follows :
' ..that according to the philosophers of the Enlightenment, architects should express in built form, the ideologies of society. Thus they should envisage and develop social utopias for which their task, then, is to find appropriate three-dimensional built forms.'

Rationalism was an attempt to bring back historical values to the cities of Europe - it also expressed certain ideologies. By means of perspective visions of what the cities could be like, European architects were influenced to design accordingly.

9.1.2 MOVEMENTS AND ARCHITECTURAL LANGUAGE

Historian, J. Mordaunt -Crooke (1987:10) writing in the era of Post-Modernism states:

'Style in Architecture is a way of building codified in imaginistic form. Since the Renaissance which left us the notions of individual style - architects have often been perplexed by the twofold nature of their calling: building as service and building as art: the eternal tension between form and function...

The modern movement tried and failed to abolish style by abolishing choice. Post Modernism or rather Post functionalism has recreated the dilemma by resusicating choice. Today the wheel of taste has turned a full circle. The twentieth century has had to discover what the nineteenth Century learned so painfully: Eclecticism is the vernacular of sophisticated societies; architecture begins where function ends.'

This statement that Modernism tried to abolish style by abolishing choice, raises the valid but sometimes very controversial issue; that of *style or architectural language.*

When analysing 20th century avant-garde movements in architecture, in retrospect it is interesting to note a cyclic pattern with regard to architectural language:

Mordaunt-Crooke remarks that the wheel of taste has turned a full circle. It seems that it has turned twice in one century. The twentieth century has experienced for the first time in the history a cycle of Classicism, Modernism, Classicism (Rationalism, Post Modernism) and now again Modernism (New Modernism, Deconstruction). A swing of the pendulum from historic to new/functional to historic/contextual to new modernism can be clearly seen.

The debate concerning patterns in movements could well be around the question: *'Is there a non-style in architecture?'* Is Modernism a non-style or merely an abstaining from applying decoration to buildings?

9.2 MOVEMENTS

9.2.1 MODERNISM

In architectural circles today everybody is familiar with the term Modern and has a clear vision of its architectural language. Some would rather prefer the word Functionalism to describe the movement. The term Modern is a relative one (modern will always be going out-of-date), but Modernism has become a movement which has changed the face of the world. Its success and expansion have been in step with many technological developments since 1920 and the many new materials which have been introduced.

Examples are:

- The use of steel reinforced concrete in structural applications,
- Glazing technology with regard to windows and facade treatment,
- Building systems and mass-production.

Historians and critics have at different times asked many penetrating questions and published suggested answers regarding where the profession finds itself. S. Giedion (1957), in the Modernist tradition, asks many relevant questions for the time. He points this out in the foreword: *'When one is standing in the midst of an evolving period, only a few signs can occasionally be traced or noticed. Only later, when checking backward can one judge whether truly constituent facts had been recognized or whether the argument had gone astray.'*

As a scholar of his time he speaks as a mentor and promoter of Modernism. However, he is honest in his reasoning that only the future will show if the signs (these could be interpreted as patterns) were valid. It is difficult to judge patterns or signs in contemporary movements although time does test these patterns. Do they bring permanent values or are they only fleeting fashions? Most Modernists of this era believed the movement was to stay forever.

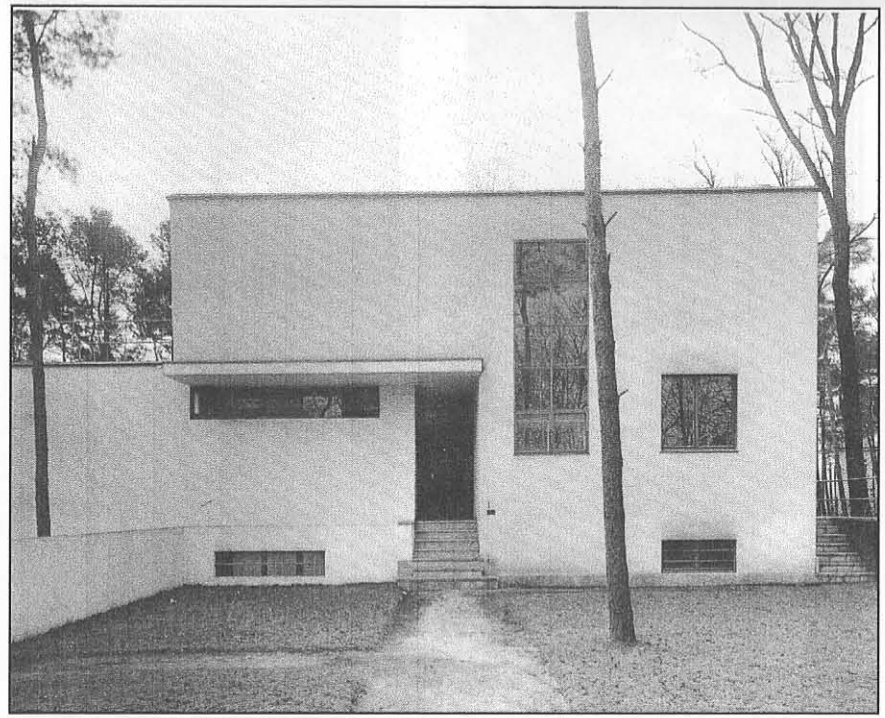


Fig 9A *Walter Gropius, own house 1925: Modernist example*

9.2.2 POST MODERNISM

Venturi (1966: 22) published his essay against Modernism less than ten years after Giedion's book, and states:

'Architects can no longer afford to be intimidated by the puritanically moral language of orthodox Modern architecture. I like elements that are hybrid, rather than 'pure', compromising rather than 'clean', distorted rather than 'straight forward, 'ambiguous rather than 'articulated'.....
boring as well as 'interesting', conventional rather than 'designed', accommodating rather than excluding, redundant rather than simple, vestigial as well as innovating, inconsistent and equivocal rather than direct and clear. I am for messy vitality over obvious unity. I include the non sequitur and proclaim the duality...
I am for richness of meaning rather than clarity of meaning; for the implicit function as well as the explicit function. I prefer 'both-and' to 'either or', black and white, and sometimes gray, to black or white. A valid architecture evokes many levels of meaning and combination of focus: Its space and its elements become readable and workable in several ways at once.'

Venturi might well have started the Post-Modernist movement with this essay, since there was a change in architectural language from this time on. Architects recognised that context is important. Historical elements were again used in designs.

The Modernist Movement did propound ideals that ignored the historical value, especially the context of buildings, to a great extent. Post Modernism

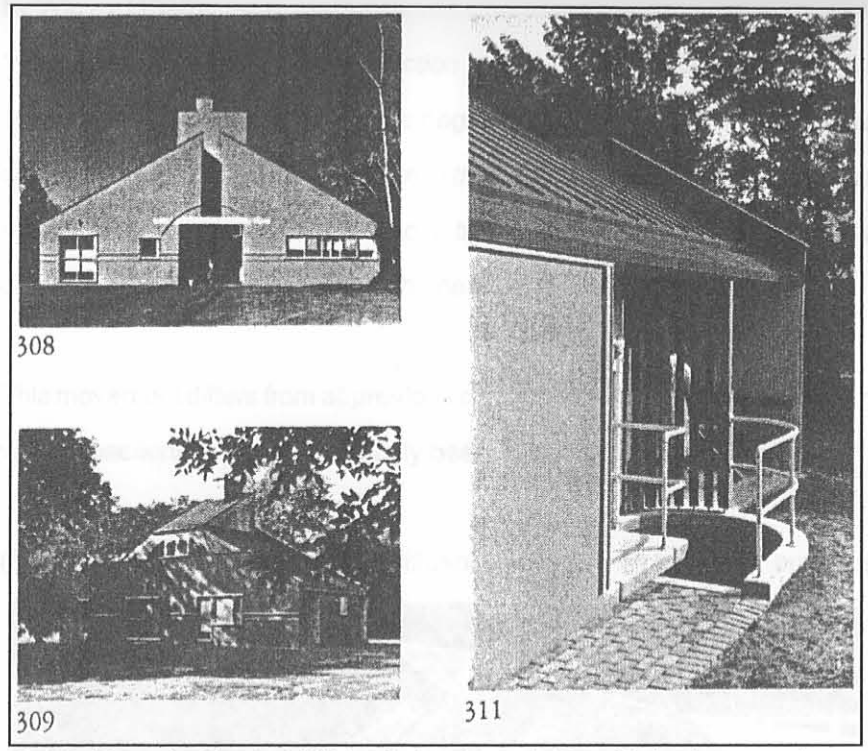


Fig 9B *House in Chestnut-Hill* by Robert Venturi : Post Modernist example

as a reaction to this tendency gave attention to context. It used mostly historical *elements*, in many instances not blending them well. The commercialisation of Post Modernism probably caused many poorly designed buildings to be built the world over and the movement was short-lived.

9.2.3 *NEW MODERNISM*

We are undoubtedly in a period of further evolution. Today architects who have learnt from the past failures of Modern Architecture are designing sophisticated modern buildings with sophisticated technology giving the world timeless modern buildings (see Fig 9C.) Modernism or Functionalism is still in existence.

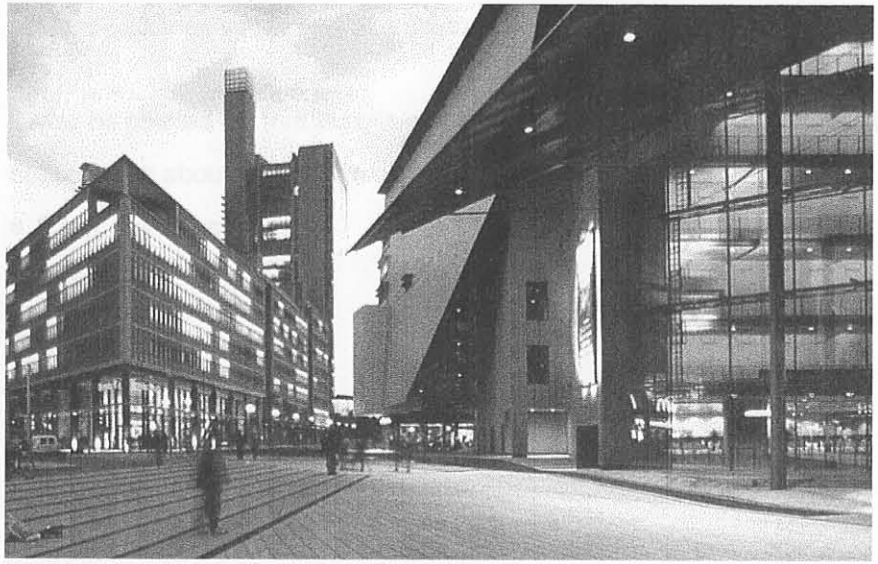


Fig 9C Renzo Piano, Potzdammer Platz: *New Modernism*

Since the 1990's some architects have experimented in Deconstructivism, which could be described as creating a new order from disorder. Deconstruction originated in the philosophies of Derrida, a movement totally different from previous orders and traditions. In the words of Derrida, quoted by Wigley (1990):

'Now the concept of de-construction itself resembles an architectural metaphor. It is often said to have a negative attitude. Something has to be constructed, a philosophical system, a tradition, a culture, and along comes a de- constructor and destroys it stone by stone, analyses the structure and dissolves it. Often enough this is the case....'

This movement differs from all previous principles and orders and has drawn varied reactions. It has undoubtedly been creative and avant-garde.

(See Fig 9D.) It will probably influence modern architecture but It is

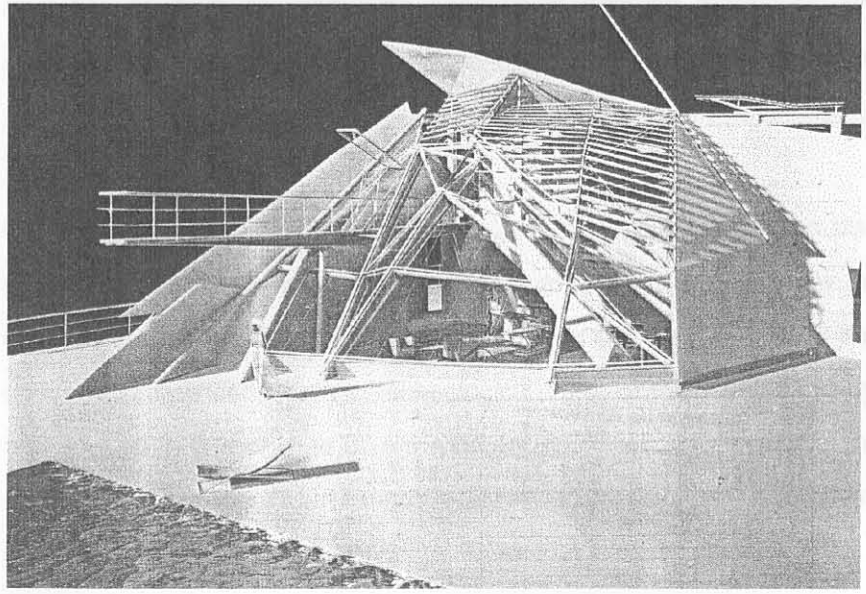


Fig 9D Coop Himmelblau, The open house California: *Deconstructivism*

debatable whether the movement will have a serious worldwide following. There are however, in any movement, unique design patterns that have to be investigated.

Commercial architects have also borrowed from the vernacular and produced styles that are popular but not new. Sometimes producing new classical buildings without the aid of craftsmen, sometimes designing very eclectic buildings which exhibit a mixture of elements from the past.

It may be pointed out that in spite of all the theories, architecture is after all not so much about descriptive words, but about:

- Form, mass, volumes
- Function
- Composition
- Scale
- Relationships
- Language
- Space
- Progression
- Planes
- Order (or disorder)
- Style (or no style)
- Symmetry (or asymmetry)
- Humanity (not robots?)

9.3 THE CONTINUING RELEVANCE OF FORM

About form and its timelessness: de Carlo (1982:37) says:

'Forms may be suitable or unsuitable; vital or weary or dead: evolutive or incapable of adaptation; they may encrust if their use is changed or be always open, whatever the change of use; they may be persistent or vanishing; they may keep their integrity only within a system of correspondences, or enrich in not corresponding; they may have univocal meaning that answers the expectations of specialized groups.. or multiple meanings that at different levels are eloquent to everyone; and also: revealing conflicts or expressing consensus; inferring repression and alienation or stimulating criticism and therefore deliverance; they may have intrinsic meaning or meaning derived from transplantation: from literature, most of the times; etc.'

De Carlo is observing that forms will be tested by time (as Gideon also remarked);forms include changes to the urban environment and how the changes influence it. Of this we are certain, cities change. Our society and culture are influenced greatly by technological changes; the best of buildings will have to face a change of environment and economic realities. The continuing relevance of form cannot be separated from the realities of a fast-moving, further developing world, in a future that is not so clear.

As generations pass we could become intimidated by the new, the avant-garde. The professors of Neo–Classicism early in the twentieth century avoided Modern Architecture and were threatened by it. The avant-garde will always be there, attempting to do what was never done before, maybe even go back to the past once again.

Alexander and Krier believe in the past, Derrida and the deconstructivists believe all previous orders must make way for the new order, dissolving that which was previously acceptable.

9.4 PATTERN FOCUS :

The aspect of style or language in architecture may be controversial but the patterns should not be analysed for their style or fashion value but for the value of the language or style principle to the designer. There are in Classicism and Vernacular patterns valuable principles that may even benefit a Modernist designer.

Some designers may never use the classical, some may never use the vernacular patterns, it should always be open-ended and be left to individual preference. The following table suggests a possible pattern focus for the movements analysed. The examples of the patterns could be categorised according to these elements:

1. MODERNISM	***2. CLASSICISM***	***3. VERNACULAR***
1.1 HIGH TECH	*2.1 NEO CLASSICISM*	*3.1 TRADITIONAL*
1.2 NEW MODERNISM	*2.2 POST-MODERN*	*3.2 INFLUENCES*
1.3 DECONSTRUCTIVISM	*2.3 RATIONALISM*	*3.3 SPONTANEOUS*
PATTERN FOCUS	***PATTERN FOCUS***	***PATTERN FOCUS***
FUNCTION	COMPLEXITY	ORGANIC
SIMPLICITY	FORMALITY	INFORMAL
COMPLEXITY	HIERARCHY	STRUCTURE
PURIST	FORM	BUILDING METHOD
ORDER	STYLE	RANDOM ORDER
DISORDER	ORNAMENT	SPACE
FORM ACCENT	GEOMETRY	PROGRESSION
'NO STYLE'	FACADE	
GEOMETRY	PROPORTIONS	
VOLUMES	SPACE	

TABLE 9-1 PATTERN FOCUS IN MOVEMENTS

The designer could find ideas and inspiration from Modernist, Classical or Vernacular patterns to help in the discovery of the design solution. The patterns related to language or style should not prescribe to the designers which style to choose but rather give them input regarding the choices already made and show possibilities of further developing the language chosen.

Architectural language choice is personal and subjective. The avant-garde architect believes in New Modernism or Deconstructivism for example and sees his choice of style as an outflow of his conviction. Commercial architects for instance could be more flexible in their choice, and client preferences and prescriptions may play a role in determining the style or language.

9.5 DEVELOPING AND PRESENTING PATTERNS OF LANGUAGE:

To show the style or language properly, a number of architectural detail elements will have to be shown. Adding detail however, could be very time-consuming. It is therefore suggested that *photographs* of design examples be used to illustrate the patterns.

The question of copyright and authorship will have to be addressed - architects will have to give permission for their work to be published or used to illustrate patterns.

(See also menu and examples of patterns, following.)

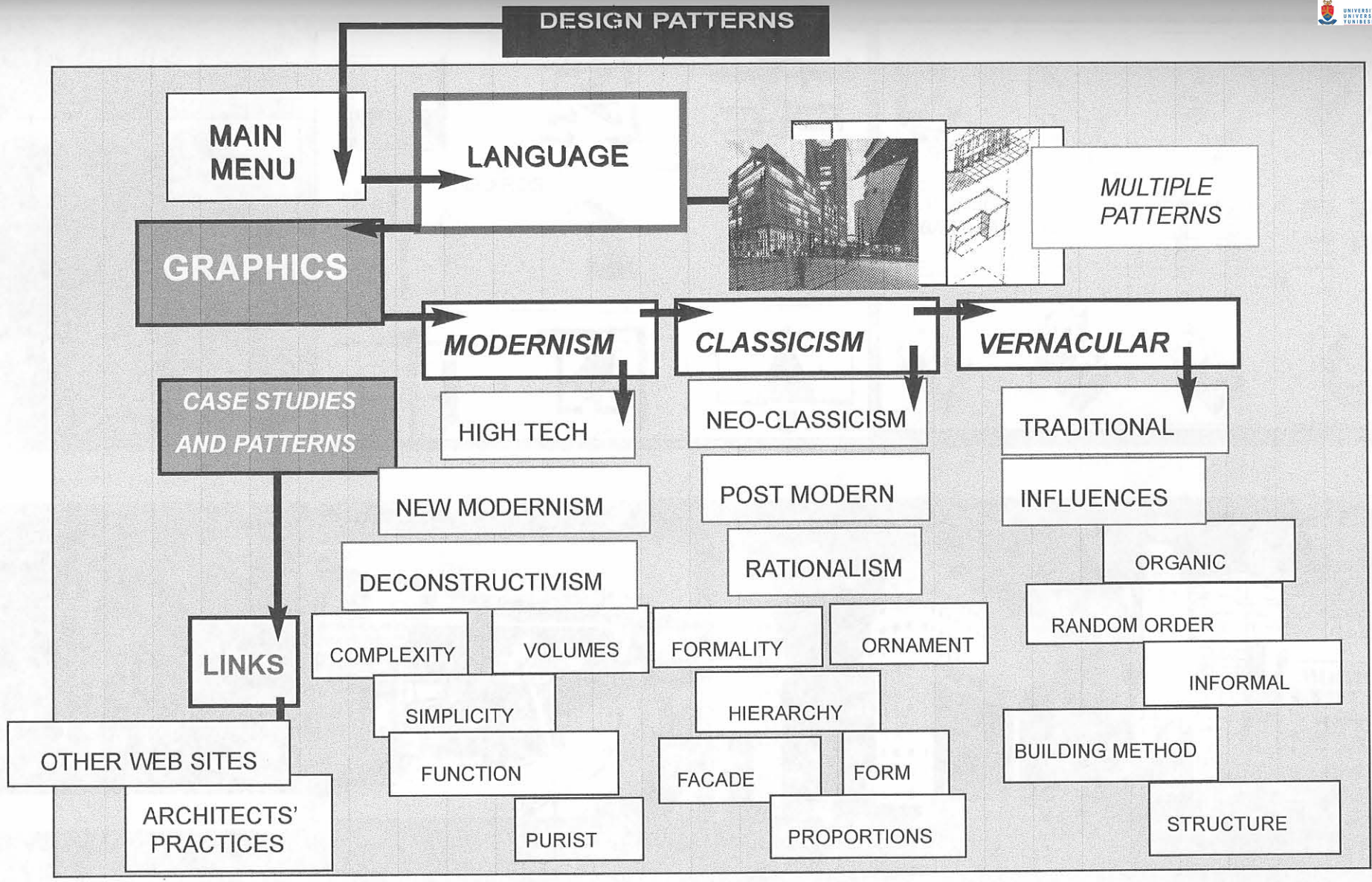
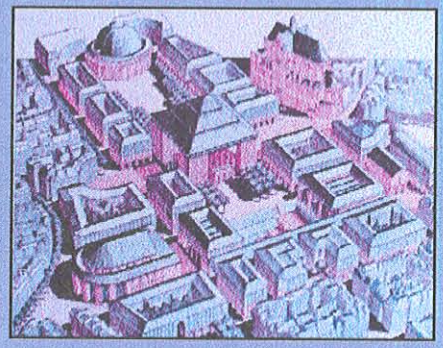
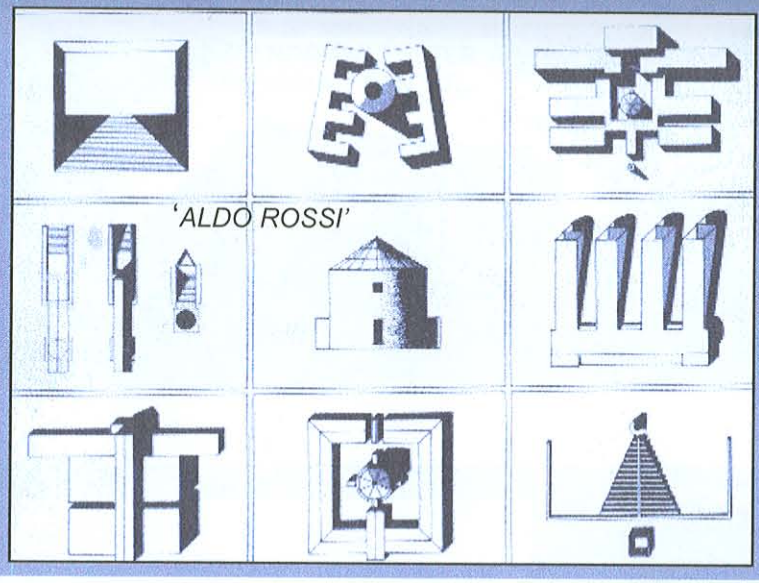


FIG 9E DIAGRAM OF*ARCHITECTURAL LANGUAGE* MENU

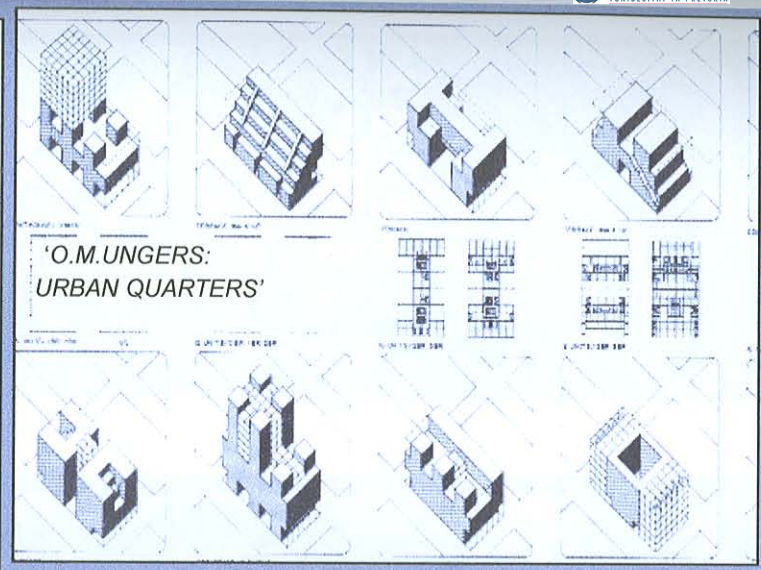
RATIONALISM



'L KRIER: LUXEMBOURG RECONSTRUCTION'

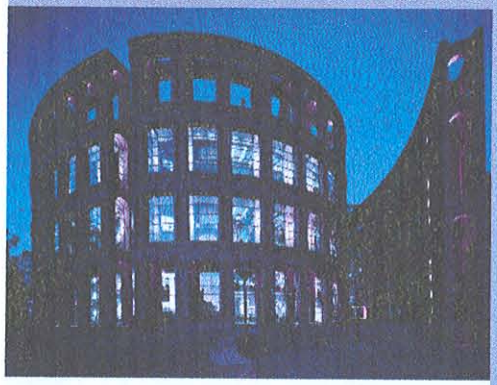


'ALDO ROSSI'



'O.M.UNGERS: URBAN QUARTERS'

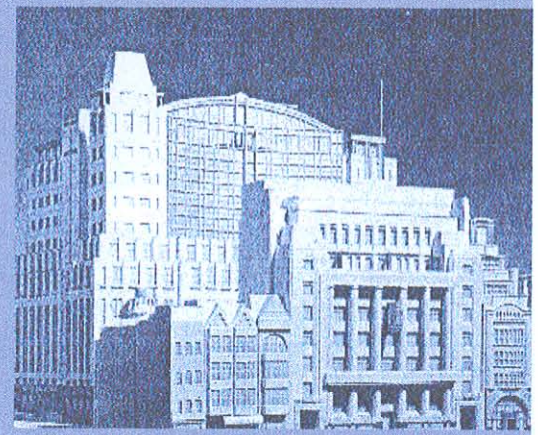
POST-MODERNISM



MOSHE SAFDIE
VANCOUVER LIBRARY

JAMES STIRLING:
STUTTGART STAATSGALERIE

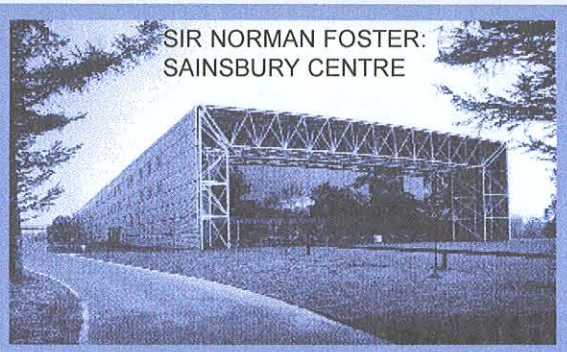
MICHAEL GRAVES
PORTLAND BUILDING



KOHN,PENDERSOHN FOX :
CANARY WHARF

FIG 9 F ARCHITECTURAL LANGUAGE : CLASSICISM

ALSOP & STORMER:
MARSEILLES TOWN HALL



SIR NORMAN FOSTER:
SAINSBURY CENTRE

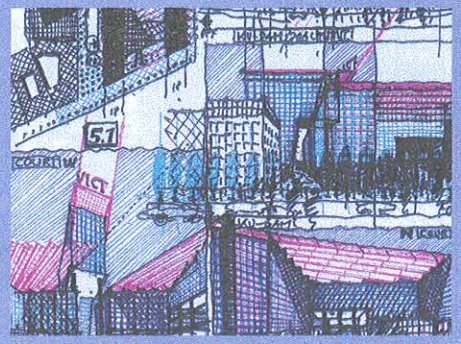
RENZO PIANO:
POTZDAMER PLATZ

RENZO PIANO:
AIRPORT FASCADE

KISHO KUROKAWA:
EHIME PREFECTURE MUSEUM

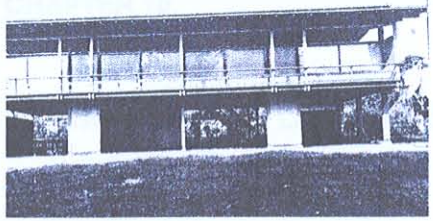
CHRISTIAAN
DE PORTZAMPARC
CITY DE LA MUSIC

RENZO PIANO:
IMAX THEATRE

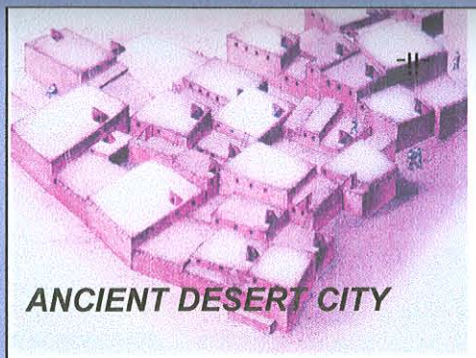


RENZO PIANO
POTSDAMMER PLATZ

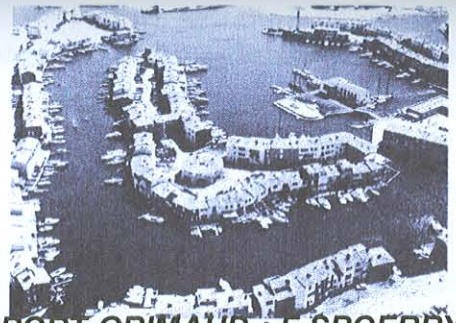
FIG 9G ARCHITECTURAL LANGUAGE: NEW MODERNISM



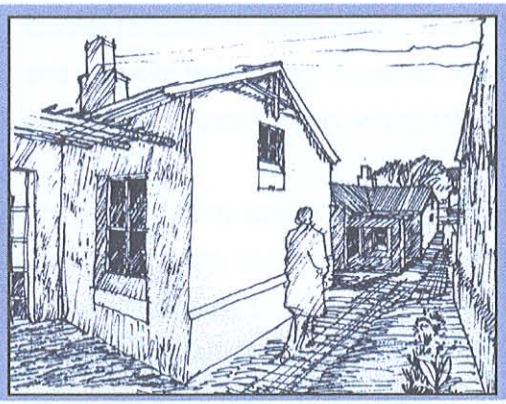
JAPANESE REGIONALISM

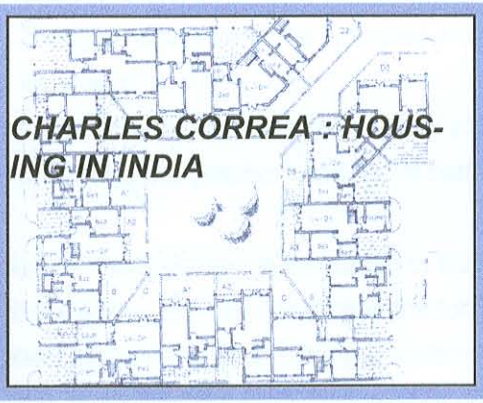


ANCIENT DESERT CITY

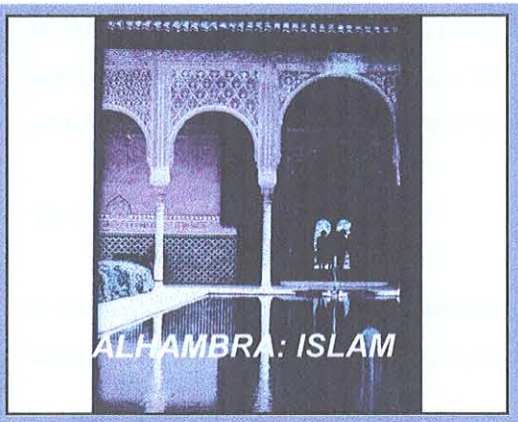


PORT GRIMAUD : F SPOERRY

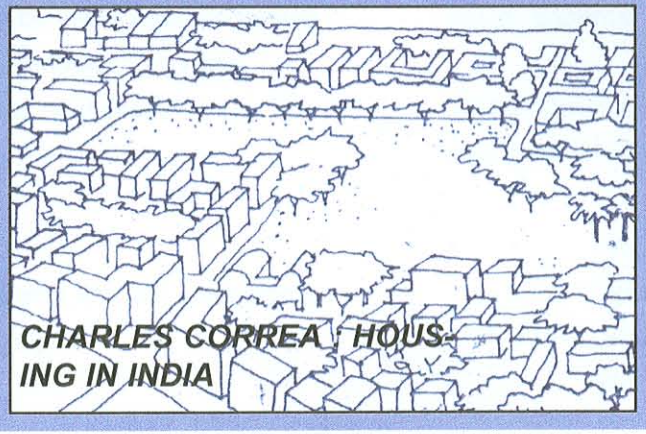




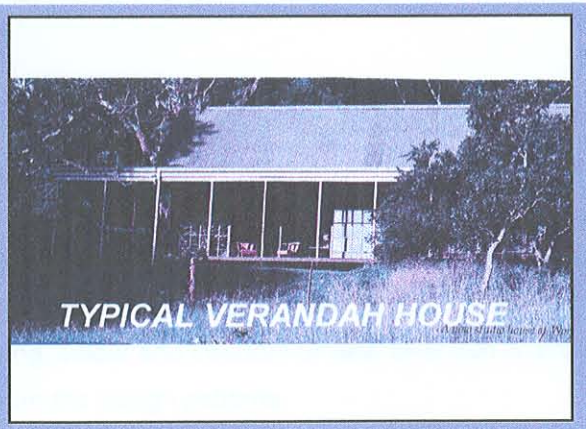
CHARLES CORREA : HOUSING IN INDIA



ALHAMBRA: ISLAM



CHARLES CORREA : HOUSING IN INDIA



TYPICAL VERANDAH HOUSE

VERNACULAR

FIG 9 H ARCHITECTURAL LANGUAGE: VERNACULAR

CHAPTER 10.

SUMMARY AND CONCLUSIONS

During the investigation of design patterns and graphics, it became clear that this is not a new subject in architectural research. Many previous studies focused on these topics. The recent developments in computer and web-site technology, however, have shown many further development opportunities, which this study has shown.

Though this study was done using the format of Problem and Proposition, the subject of the study is not a scientific or mathematical one, in which the answers to the problem can only be right or wrong. Design Patterns and Graphics are part of the creative fields of the subject of *architecture as art* and the propositions are therefore quite subjective. The subjectivity of possibilities as to how a design tool should be made appropriate and the way it should be developed must be taken into account when answering the question: '*Were the propositions confirmed?*'

10.1 SUMMARY: FIRST ASPECT

In the twofold Problem, and related Sub-problems, *the first challenge* was to examine *how to develop an appropriate design tool*:

10.1.1 Graphics can be used to illustrate design in several ways:

- Exploratory thinking, inviting the user to participate.
- Pedestrian or aerial views can be utilised to highlight certain design aspects.
- Development of design can be shown in many different ways.
- Open-endedness can be achieved by principles shown without reference to style or architectural language.
- Design concepts and the way they were derived can be illustrated.
- Colour can be utilised to distinguish elements consistently, improving the graphic 'reading' of patterns.

Dynamic graphics are important in the sense of illustrating forms in the round and allowing the user freedom to see the form from all sides, thus obtaining better understanding of it.The proposition that graphics can be used effectively is confirmed by the examples of graphic illustration of design patterns.

10.1.2 Computer Graphics, as in CAD systems, are well developed in 2D and 3D and the study has shown:

- Vector lines in mathematical CAD systems have superior possibilities to bitmaps, in manipulating graphics,
- Shading, colour and freedom of view selection is available to illustrate the design patterns,

- Dynamic graphics can find its rightful place in computer graphics, giving the designer freedom to choose the view that he/she prefers.
- Animation, illustrating design development by exploding elements of a design, can easily be achieved by creating elements in layers.
- The inter-active possibilities of Computer Graphics will allow the designer choice of options, thus confirming proposition two.

There are, however, many other opportunities for further study on the subject of using computers in design - as the section describing current research at MIT has shown.

10.1.3 Is the computer the ideal instrument for storing and retrieving design data? This question was asked in the introduction. There are many examples of web-sites that function as data-bases, most of them operate with sophisticated storage and retrieval software.

The Software and web sites investigated have also demonstrated that the Internet has grown substantially in the past 10 years and that the possibilities of a web site and networking are infinite and open-ended. . The proposed web site example (Fig 6A) identified the following menus or web-pages:

- *Design Principles* linked to multiple patterns and constraints checklists,
- *Social Preferences* linked to multiple patterns, as well as other links,
- *Architectural Language* linked to multiple patterns and possibly to architect's practices.

Other web sites have been found during this research that are functioning in different ways as design-assisting tools, some linked to patterns and others to buildings and even modular design kits.

This confirms the third proposition of the first part of the problem and also shows truth in the assumption that the grouping and organising of patterns would be done differently by each person.

The problem of **how** to develop an appropriate design tool was answered in Graphics, Computer Graphics and Web Sites. The timing is ideal for this web-site to become a practical reality.

10.2. SUMMARY: SECOND ASPECT

The second aspect of the problem is *to find a way of implementing* the patterns in the design process :

10.2.1 The Design Process has been defined in various ways but *the creative stages* as defined by Lawson (1980) were found to be valuable in the context of developing a design pattern tool :

- *First insight :* formulation of the problem.,
- *Preparation:* conscious attempt at solution,
- *Incubation:* no conscious effort,
- *Illumination*: sudden emergence of idea,
- *Verification:* conscious development.

A question was raised earlier in the study concerning the use of computers, namely: *Does the use of computers curb the creative flow in the design process?*

The nature of creative intuition may seem to question the use of a computer to assist in design. Computers, however, are in fact used more and more by architects. Inspiration from Internet/World Wide Web data-bases is common among many architects, which confirms this proposition.

However, constraints and information relevance must also be taken into account with any design project, and these are crucial to making the design relevant.

10.2.2 Design Principles: In the introduction a question was raised, which this study attempted to answer: *Can valid theories and principles as taught at universities be reconciled with the practical realisation of designs in practice?*

In answering this, design principles were shown to have many possibilities of being implemented in practice by the following suggested menus/web pages:

- Site,
- Form type,
- Composition of form,
- Space,
- Environment,
- Grid / modules,
- Indoor / outdoor.

These fields are linked to design patterns and to the relevant constraints checklists (the examples of patterns speak for themselves).

The proposition is confirmed, but further study or investigation of the compilation and use of the menus and especially constraints checklists may be necessary.

10.2.3 Another question that was asked early in the study was: *Should patterns as developed by ordinary people be reintroduced into the design process?* These *social preferences* were shown to be implemented in a web-site menu by patterns related to:

- Elements : Streets, gates, water features, intersections,
- Building types: Restaurants, homes, shops/markets, streets, etc.
- Events: Work, play, networking, etc.
- City elements: Monuments, colonnades, arcades, etc.

The proposition is valid but the aspects of links to other subjects, such as Landscape Architecture, Urban design, Sustainable building design should be studied further (see also 10.4). This is beyond the scope of this study.

10.2.4 Architectural Language in movements of the 20th century has been shown to express definite ideologies in the major movements:

- Modernism,
- Post Modernism
- New Modernism

The aspect of style or architectural language may be controversial but architectural design cannot be studied fully without investigating and illustrating the patterns found therein. The issue of copyright and ownership of ideas, will have to be further investigated.

The problem of finding a **way** to introduce patterns in practice was addressed by the analysis of the design process, the patterns of design principles, social preferences and architectural language.

10.3 CONCLUSIONS AND RECOMMENDATIONS:

This study has contributed to the subject of design patterns illustrated by graphics in the following ways:

10.3.1 It has shown that the computer and web-sites / software programmes *can be utilized as design tools*, though the way of implementing it will always be subjective.

10.3.2 Designers are individuals and each has his / her own preferred design method that is often difficult to define. However, open-endedness can be achieved by web page formats and links. (Further investigation may show that the format of such a tool might differ slightly or even quite radically from what was proposed.)

10.3.3 The interactive possibilities of CAD-systems make them ideal vehicles for exploring design patterns and having freedom to all possible views.

10.3.4 The opportunities available to create a design tool today, were shown by examining the possibilities of web-sites and the Internet.

Creative intuition in the design process need not be limited by the use of computers: a web-site with design patterns will probably be well-frequented by architects.

A database of design patterns would take some time to develop. It could be created initially by sketches (bitmap-images) and later developed to 3D CAD-images. The patterns created on CAD have shown that there are endless possibilities.

To illustrate patterns of architectural language and social preferences, photographs may be used. For this, the aspect of author's copyright and consent will have to be addressed. If used on a web-site, these patterns illustrated will probably have to be public-domain (users will have free

access). Links can also be formed to the architectural practices that designed the building.

A web-site could be created and patterns added on a regular basis. The data-base should be able to grow and expand. Sponsorships from CAD software companies could be pursued, as venture capital may be needed to get the web-site developed. Software companies can also become business partners (see Preliminary Cost Plan, Appendix D).

Advertising could provide some funding. The patterns should also be portrayed in CAD format, possibly on compact disk and could become part of a software package together with CAD programme upgrades. Pattern contributions from users can be invited, and user-group interaction should help to refine the format.

Links to the web site will become important, as well as the advertising and circulation of a web address. Links to sites frequented by architects should be established, such as architect's institutes (across the globe).

10.4 FURTHER STUDIES AND RESEARCH:

To analyse design patterns and computer graphics thoroughly, further investigation by the author and others may be needed. Other possibilities are:

10.4.1 The subject of *design patterns created with CAD-systems*, could be the topic of further PhD-level studies locally or at other institutions, such as The Design Technology Department at M.I.T. (see Chapter 4, section 4.8).

10.4.2 The subject of *utilizing the computer to design* could also be a topic for further studies, analysing the design process further, specifically with regards to harnessing the potential of the computer.

10.4.3 A *research institute investigating architectural design patterns* could be created with support from a local university or technikon (technical college). This could be linked with many other relevant disciplines:

- *Web-site development and data-base retrieval* should be investigated, possibly by a *department of information technology* at a local university or possibly an IT-college.

- Other research centres of *Computer Graphics*, can be linked, such as M.I.T. (Design Technology) and Harvard University (The Martin Centre). These centres are on the forefront of developments in this field.

- The aspect of Social Preferences having links to other subjects, such as *Landscape Architecture*, *Urban design*, *Sustainable building design* should be investigated further. It

could open opportunities for research by others in these fields.

- Networking with other universities and colleges can be achieved by *conducting workshops with students, focussing on design patterns and developing alternatives.*

Such workshops may also present opportunities for discovering new patterns. These can be held at schools of architecture and could also assist students in establishing their preferred design method.

Because design patterns are universal they can be used by architects or students in any country. An accessible tool, being a web-site or graphic manual (or both), could greatly assist designers.

It is believed that the present study will have made some valuable suggestions in the development and realisation of a database of design patterns in architectural practice. ◘

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12 ABSTRACT

Design Patterns in Architecture:

Towards A Proposed Graphic Instrument to Assist Designers

By

Stephanus Mauritz Kruger

Leader: Prof Hans Wegelin

Department of Architecture.

Degree: Master of Architecture.

In this study the following is examined:

- Firstly, *how* to develop an appropriate design tool for architects by graphically exploring, analysing and organising architectural design patterns.

And further how graphics can be used to illustrate design, how computer graphics and the computer can be utilized as an instrument for storing and retrieving design data in terms of software and web sites applications.

- Secondly, finding a *way* of including patterns as part of a user-friendly instrument, to be implemented in the design process in practice.

By also investigating the design process, specifically the creative process, and the possibility of implementing the following pattern-types in a web-site: design principles, social preferences and architectural language.

12 EKSERP

Patrone van Ontwerp in Argitektuur:

'n Voorgestelde Grafiese Instrument om Ontwerpers van hulp te wees

Deur

Stephanus Mauritz Kruger

Leier: Prof Hans Wegelin

Departement Argitektuur.

Graad: Magister in Argitektuur.

In hierdie studie word die volgende ondersoek:

- Eerstens, *hoe* om 'n toepaslike ontwerp instrument te ontwikkel vir argitekte deur die grafiese ondersoek, ontleding en organisering van argitektoniese ontwerp patrone.

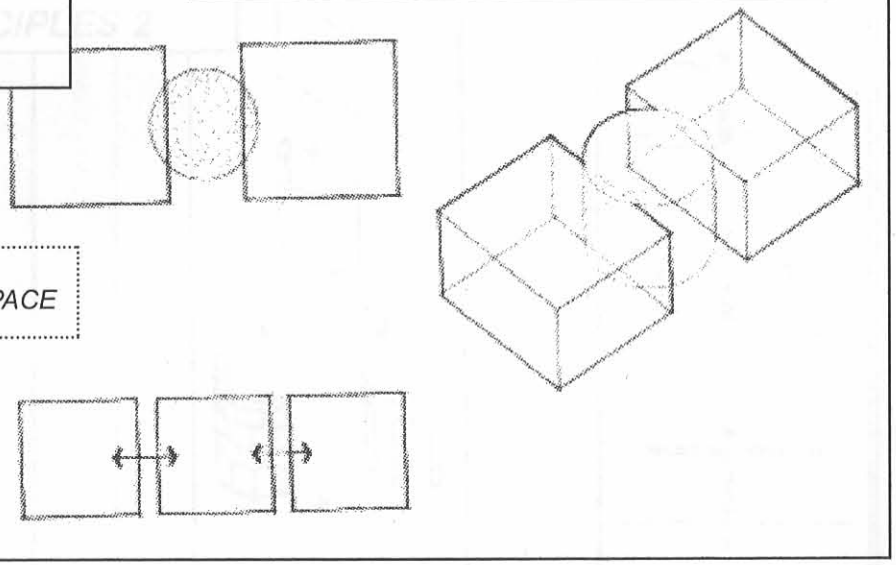
Om verder te ondersoek hoe ontwerp grafies voorgestel kan word, rekenaar grafika en die rekenaar gebruik kan word as 'n instrument om ontwerp-data te stoor en te bewerk in terme van sagteware en webbladsye.

- Tweedens, om *'n manier* te vind om patrone te implementeer in 'n maklik bruikbare instrument, in die ontwerp proses in die praktyk.

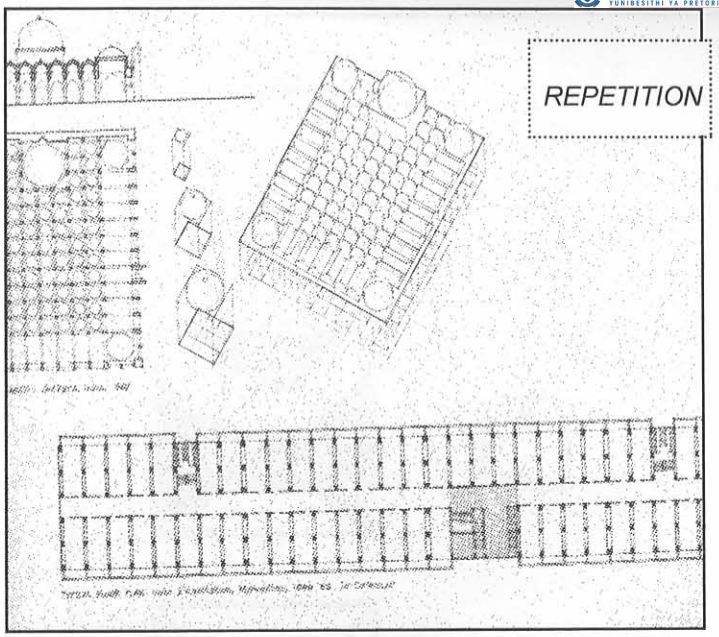
Om verder ook die proses van ontwerp, spesifiek die kreatiewe deel daarvan te ondersoek, en die moontlikheid om in webblaaie die volgende patroon-tipes te implementeer: ontwerp beginsels, sosiale voorkeure en argitektoniese taalgebruik.

APPENDIX A : DESIGN PRINCIPLES 1

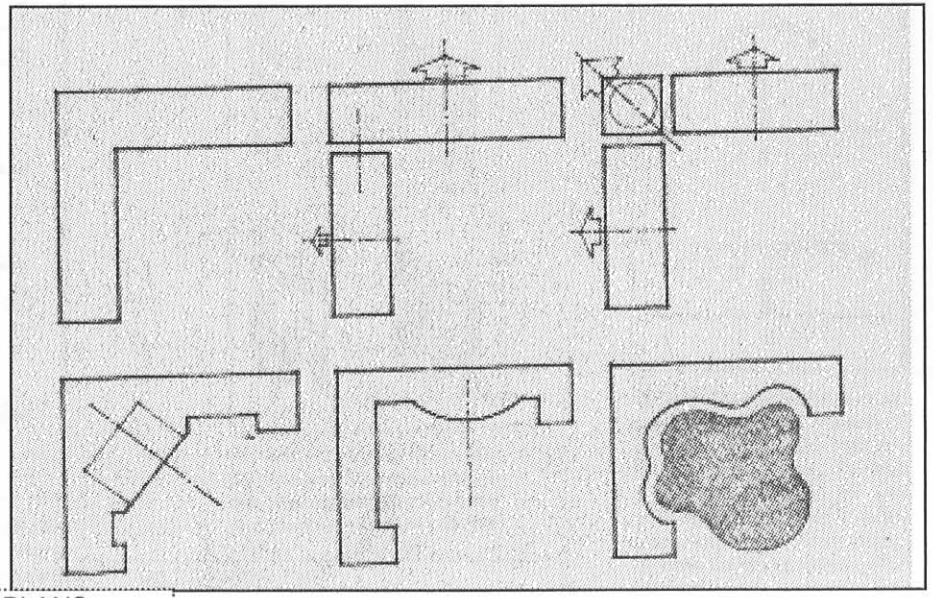
1. Francis Ching
ARCHITECTURE:FORM,SPACE,ORDER



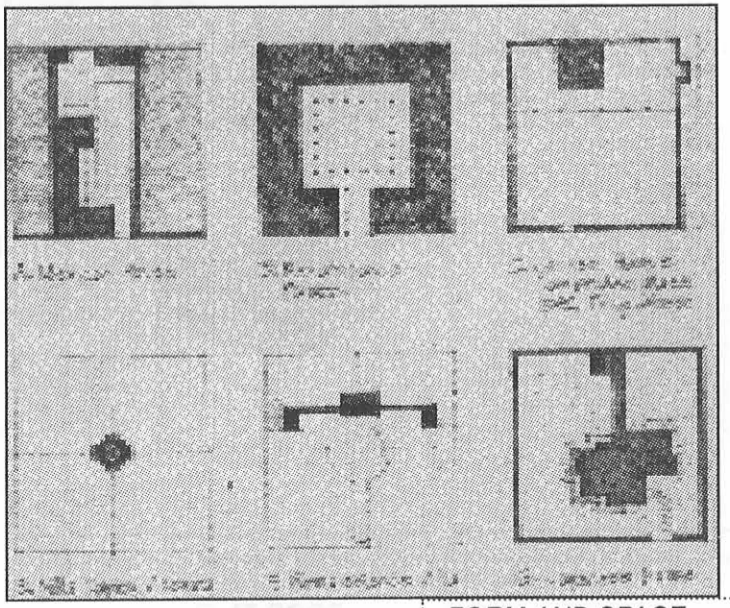
SPACES LINKED
BY A COMMON SPACE



REPETITION



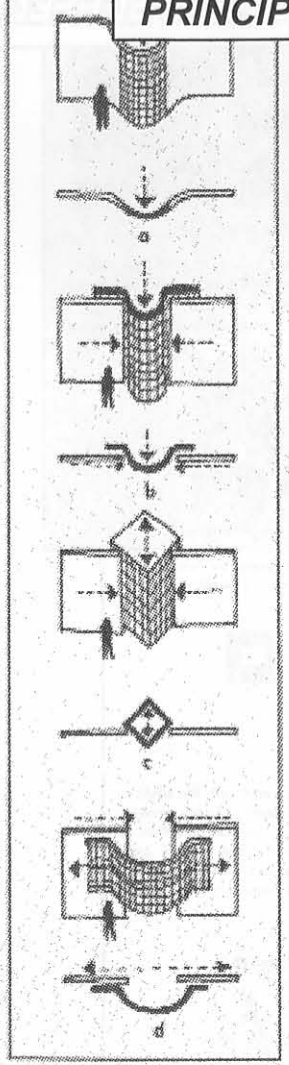
L-SHAPED PLANS



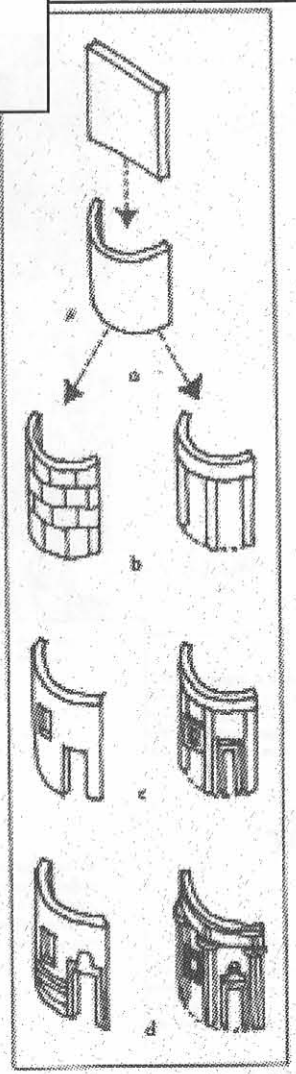
FORM AND SPACE

APPENDIX A : DESIGN PRINCIPLES 2

1. Thomas Thiis-Evensen
ARCHEPATTERNS IN ARCHITECTURE

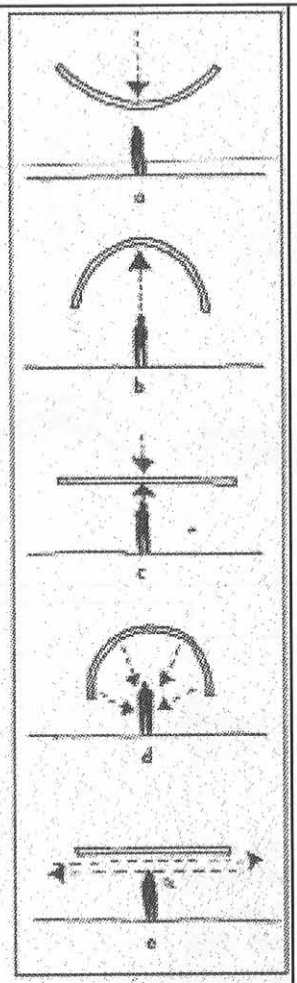


364 a–d. Bay window motifs: (a) as a bulge in the wall, (b) cut out of a split in the wall, (c) as overlapping element in the wall, (d) as attached to the wall.

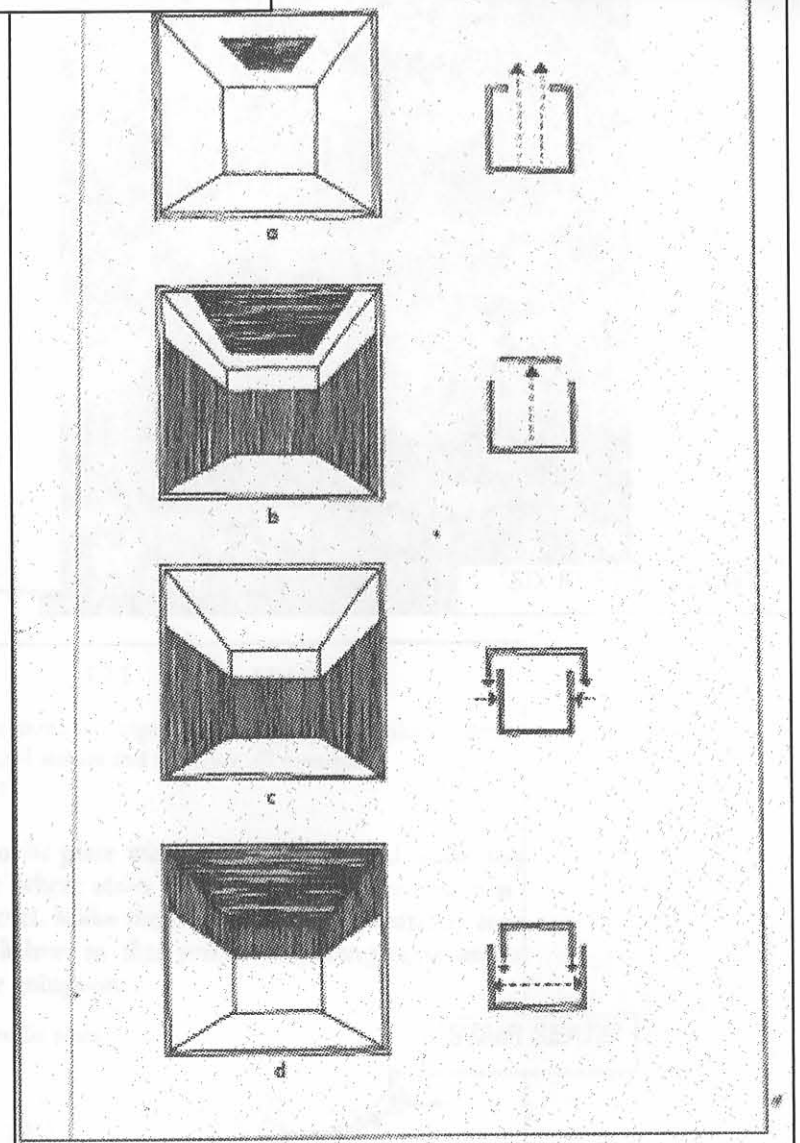


177 a–d. The themes of the wall: (a) monolithic, (b) construction system (massive-skeleton), (c) openings (doors — windows), (d) articulation, (dimensions —

PATTERNS OF:
BAY WINDOWS, THEMES OF WALL AND ROOF RELATIONSHIPS



427 a–e. The roof and its relationship to the sky above. It is able to (a) receive the sky, (b) resist the sky, (c) balance the sky. The roof and its relationship to the surroundings. It is able to (d) close the space, excluding the surroundings, (e) open the space, including the surroundings.



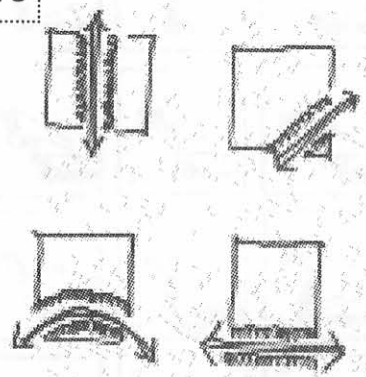
582 a–d. Flat roof and the articulated transition between ceiling and walls: (a) opening articulation, (b) uplifting articulation, (c) expanding articulation (d) sinking articulation.

FLAT ROOF
AND THE ARTICULATED CEILING

APPENDIX B : SOCIAL PREFERENCES 1

1. Christopher Alexander and others PATTERN LANGUAGE

'SHORTCUTS'



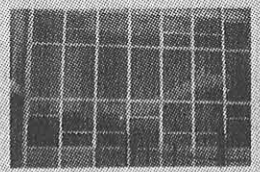
Shortcuts.

'SIX FEET BALCONY'

'OPEN STAIR'

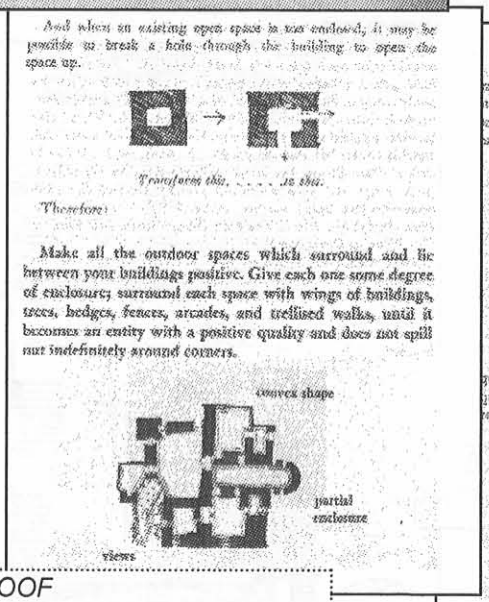
The beauty of open stairs.

By contrast, in industrialized, authoritarian societies most stairs are indoor stairs. The access to these stairs is from internal lobbies and corridors; the upper stories are cut off from direct access to the life of the street.



This is not an open stair—don't be fooled.

'FLAT ROOF AND THE ARTICULATED CEILING'



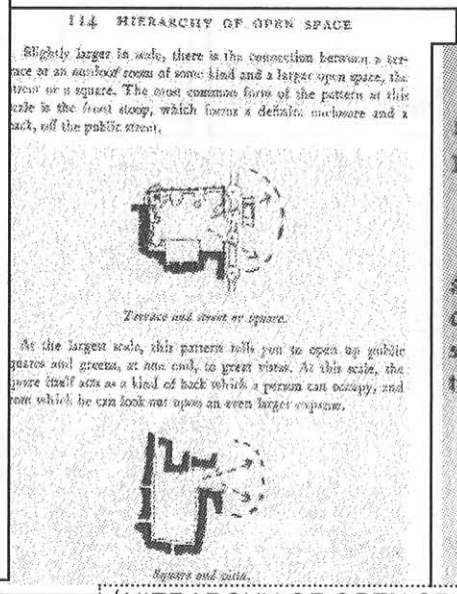
And when an existing open space is too enclosed, it may be possible to break a hole through the building to open the space up.

Transform this . . . . to this.

Therefore:

Make all the outdoor spaces which surround and lie between your buildings positive. Give each one some degree of enclosure; surround each space with wings of buildings, trees, hedges, fences, arcades, and trellised walks, until it becomes an entity with a positive quality and does not spill out indefinitely around corners.

'HIERARCHY OF OPEN SPACE'



114 HIERARCHY OF OPEN SPACE

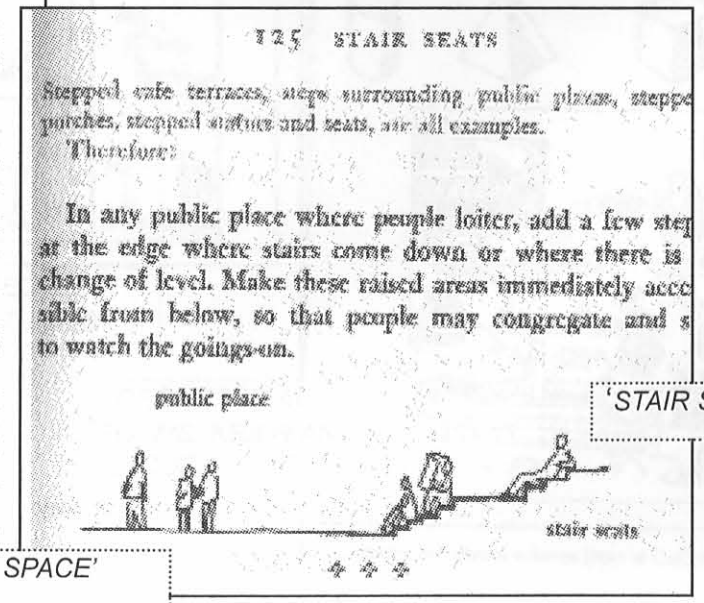
Slightly larger in scale, there is the connection between a terrace or an outdoor room of some kind and a larger open space, the street or a square. The most common form of the pattern at this scale is the front stoop, which forms a definite enclosure and a back, off the public street.

Terrace and street or square.

At the larger scale, this pattern tells you to open up public spaces and greens, at one end, to green vistas. At this scale, the space itself acts as a kind of back which a person can occupy, and from which he can look out upon an even larger expanse.

Square and patio.

'STAIR SEATS'



125 STAIR SEATS

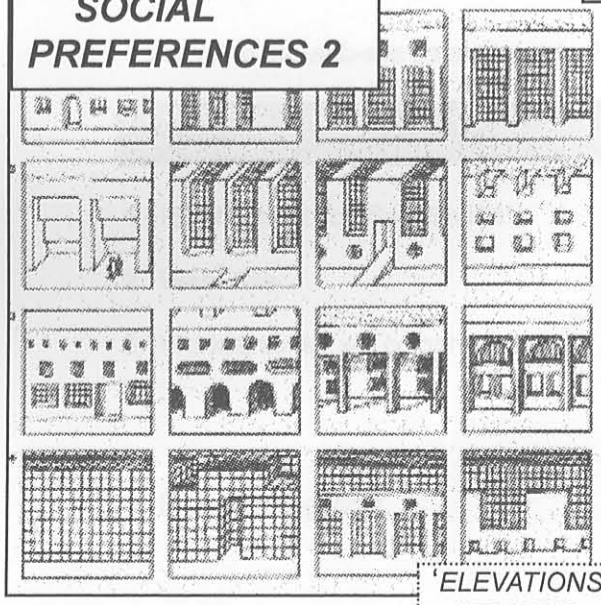
Stepped cafe terraces, steps surrounding public places, stepped porches, stepped statues and seats, are all examples.

Therefore:

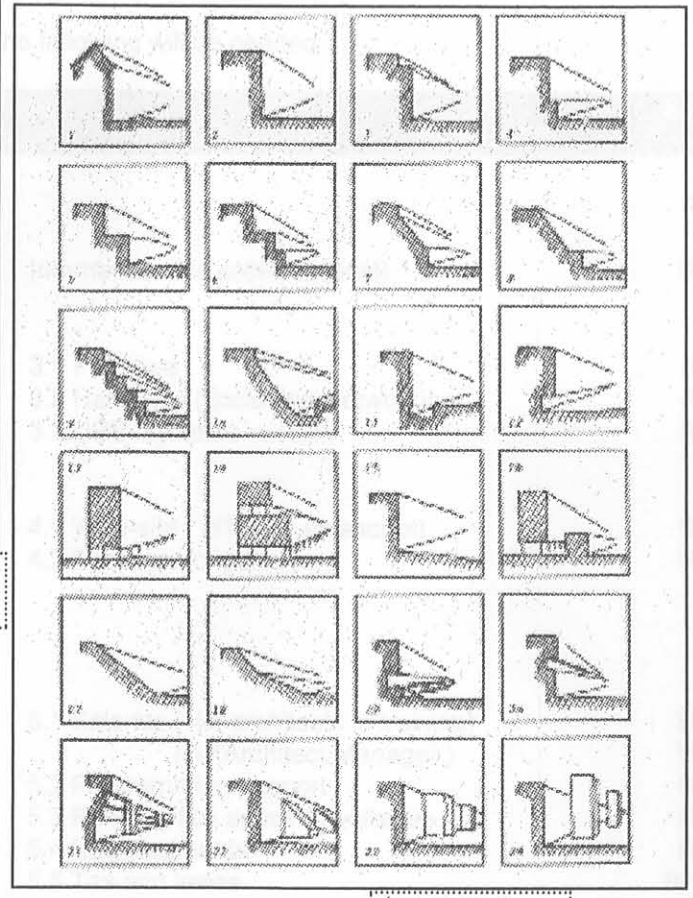
In any public place where people loiter, add a few step at the edge where stairs come down or where there is change of level. Make these raised areas immediately acce sible from below, so that people may congregate and s to watch the goings-on.

APPENDIX B : SOCIAL PREFERENCES 2

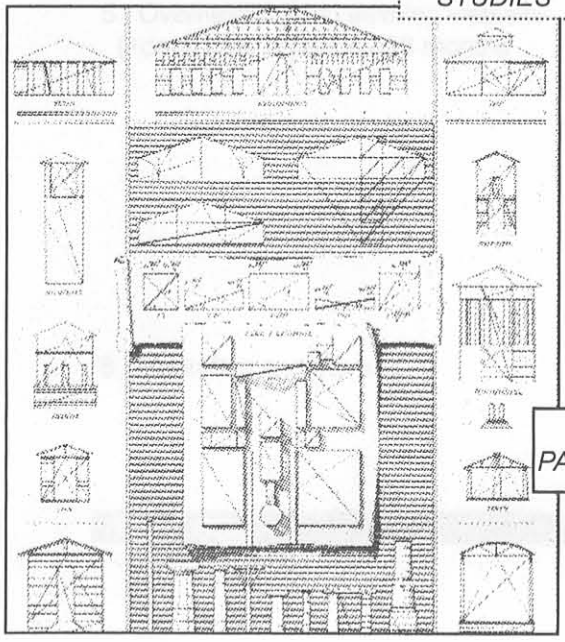
2. Leon and Rob Krier, Le Corbusier
URBAN PATTERNS



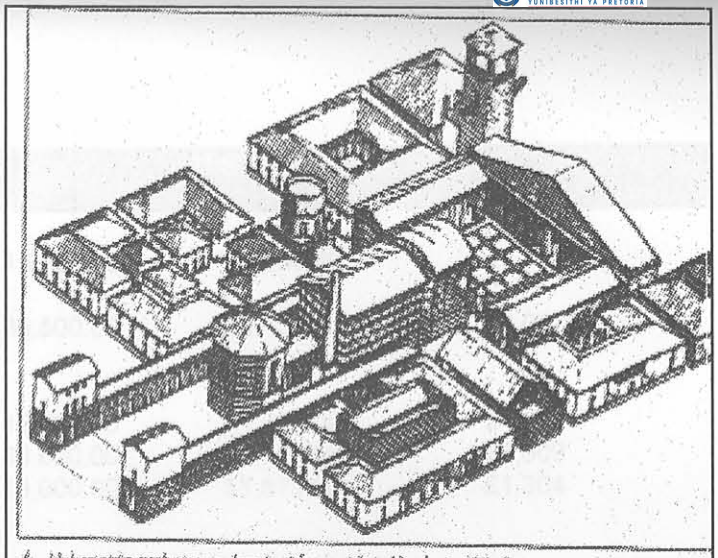
'ELEVATIONS STUDIES'



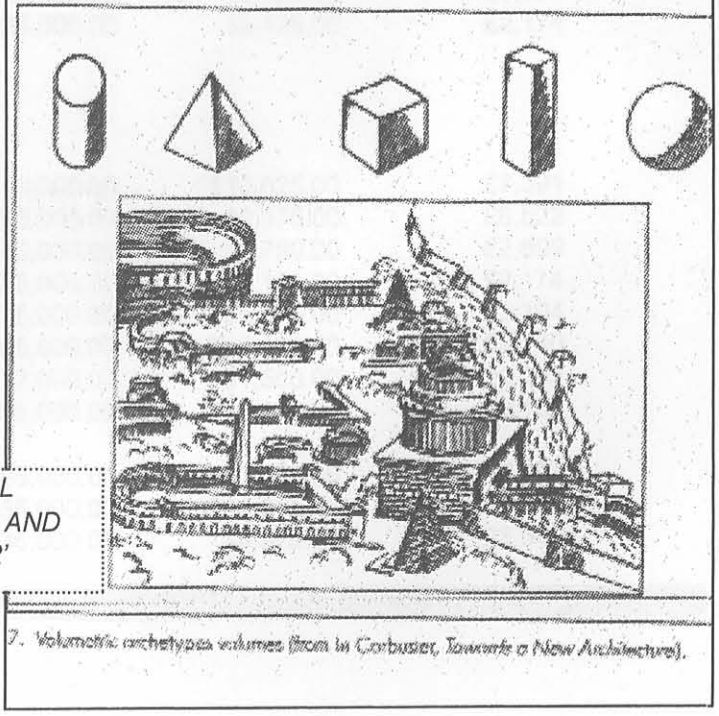
'SECTION STUDIES'



'ELEVATION PATTERNS: SCHOOL'



6. Volumetric archetypes (project for a school by Leon Krier).



7. Volumetric archetypes volumes (from le Corbusier, Towards a New Architecture).

'GEOMETRICAL FORMS: KRIER AND LE CORBUSIER'

APPENDIX C

PRELIMINARY COST PLAN *2001.08.01(ALL EXCHANGE RATES AS OF DATE)*

To develop the web-site as a *design tool* the following will be needed:

EXPENSES		S.A	U.S.A.	U.K.
1. ISDN connection/Satellite Dish		R 15,500.00	$1,937.50	£1,348
2. Web -Site	Internet service provider (host)	R 35,500.00	$4,437.50	£3,087
3. Workstations (x4) compromising of				
	3.1 Furniture	R 15,000.00	$1,875.00	£1,304
	3.2 Hardware (including Networking)	R 30,000.00	$3,750.00	£2,609
	3.3 UPS- systems	R 15,000.00	$1,875.00	£1,304
4. Programming input				
	4.1 Web-site (HTML +Javascript)	R 45,000.00	$5,625.00	£3,913
	4.2 Database of patterns	R 25,000.00	$3,125.00	£2,174
5. Overhead cost to develop web-site (+data) over a period of 6 months				
	5.1 Salaries (4X architects in training)	R 85,000.00	$10,625.00	£7,391
	(1XArchitect/Manager)	R 75,000.00	$9,375.00	£6,522
	5.2 Programming support	R 30,000.00	$3,750.00	£2,609
	5.3 Rental office space (available)	R 25,000.00	$3,125.00	£2,174
	5.4 Disbursements	R 15,000.00	$1,875.00	£1,304
	5.5 Tax and levies	R 105,000.00	$13,125.00	£9,130
	5.6 ISDN Monthly	R 12,000.00	$1,500.00	£1,043
	5.7 Cost of financing/loss of interest-income	R 105,000.00	$13,125.00	£9,130
6. Marketing and travel				
	6.1 Travel (1xmonth) to software company :	R 85,000.00	$10,625.00	£7,391
	6.2 Marketing	R 135,000.00	$16,875.00	£11,739
	6.3 Project launch	R 35,000.00	$4,375.00	£3,043
TOTAL COST:		*R 888,000.00*	*$111,000.00*	*£77,217.39*