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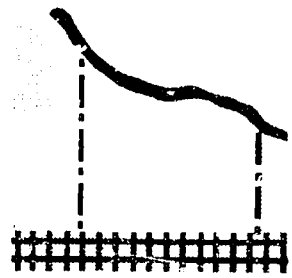
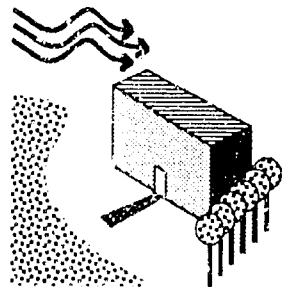


BUILDING TRAINING SERIES

TECHNICAL GUIDE TO SITE SELECTION, PLANNING AND BUILDING DESIGN



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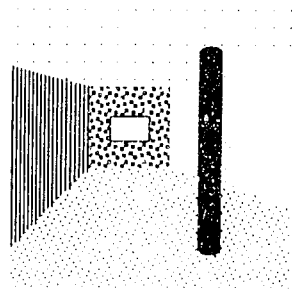

Chemonics / 8 El Fawakeh Street / Mohandisseen, Cairo / Tel.: 3602545, 3482247 / Fax: 3606472 / Telex: 93037

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B U I L D I N G T R A I N I N G S E R I E S

TECHNICAL GUIDE TO SITE SELECTION, PLANNING AND BUILDING DESIGN

Prepared By Chemonics
And
The Organization Of Reconstruction And Development Of The Egyptian Village

Ministry Of Local Government

January 1992

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INTRODUCTION

Chemonics Building Development Section has devised a number of activities to improve the capacity of local officials to plan, design, finance and construct buildings. These activities include training, technical assistance and information management.

THE BUILDING TRAINING SERIES

The training is delivered through a number of seminars addressing site selection, planning and building design; regulatory framework for buildings; and building maintenance and repair. Each topic is dealt with through a single building training series.

SITE SELECTION, PLANNING AND BUILDING DESIGN SERIES

This series addresses the first issue: site selection, planning, and building design. The methodology used in this series presumes the impact of both technical and non-technical material on building construction. It also includes technical material designed to assist architects and engineers in developing construction documents for successful building projects. This material is considered essential for the construction of appropriate public buildings, ensuring that no basic consideration is omitted throughout the project. Therefore, this information is of great importance for project designers, planners, and finance and follow-up officials.

The series consists of five training activities as shown in Figure 1. Its approach is participatory and staged over time.

Initial activities separately target local technical staff in a five-day seminar, and local managers and decision-makers in a two-day seminar. These two seminars are followed by a two-month field assignment during which participants use the information and tools learned in the seminars.

The fourth training activity is a one-day conference which brings all trainees together to discuss and iron out problems related to the use of course material and to the working environment. Finally, the LDII-P

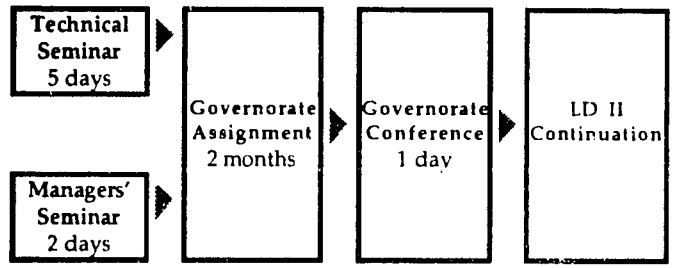

Figure 1 Site Selection, Planning and Building Design Schedule

project continues to monitor training impact and assist in the use of course material.

TECHNICAL SEMINAR

The seminar is designed to achieve the following objectives:

- Increase participants' understanding of the importance of good site selection, site planning and building design.
- Improve the site selection, planning and building design skills of participants.
- Provide a forum for the exchange of experience, ideas and information among the participants.
- Improve participants' ability to produce quality architectural project documentation.

Training Method

Technical and non-technical issues related to site selection, planning, and building design, are covered in illustrated lectures by specialists in the field. Most of the material used is presented in the workbook at the end of this document. The specialists will explain the material and discuss how it can be used effectively. Particular attention will be paid to improving performance through careful examination of technical considerations for both the Site Selection and Planning and the Building Design process, and through the use of checklists.

Table 1 shows the technical seminar's schedule

DAY HR	1	2	3	4	5
9:00	Opening Seminar Objectives	Site Planning	Building Design	FIELD VISIT	Planning Form Exercise
10:00	Project Cycle Evaluation Test Good Site Selection & Planning Good Building Design	Site Planning Case Study	Building Design Case Study		Group Reporting
11:00	Break	Break	Break		Break
11:30	Site Selection	Group Reporting	Group Reporting		Future Training Seminar's Evaluation
12:30	Site Selection Case Study	Non-Technical Issues	Non-Technical Issues		
1:30	Group Reporting	Group Reporting	Group Reporting		End

Trainees will also work through case studies, which will allow them to practice using the material covered in the presentations, particularly the technical considerations and checklists. Small groups will work separately with assistance from the specialists, and will report on their findings during the plenary sessions.

The groups will discuss issues raised by the material presented. A specialist will be available to assist with technical issues. Each group will report on its findings during the plenary sessions.

After each lecture, time will be set aside for each group to document its ideas on the technical issues presented in the lecture and to identify any problems.

ORGANIZATION OF THE GUIDE

This guide consists of two main sections: lectures to be delivered at the seminar and the work book, including case studies to be studied and discussed by the participants as a practical application of the lecture material and an opportunity for exchanging experience.

The first lecture, "Project Cycle", indicates the building project's various phases, and places site selection, planning, and building design within the overall project cycle; and briefly outlines the other components of the cycle. The second lecture, "Site Selection and Planning", and the third lecture," Building Design", offer more details on these two phases and the related stages.

The work book at the end of this guide includes each phase's technical considerations, checklists, and case studies.

LECTURES

FIRST LECTURE

PROJECT CYCLE

This section describes, in sequence, the different phases of an architectural project. These phases can be approached differently according to the particular function of the project, but they generally apply to all projects. Effective project management and the participation of concerned parties in all phases of the project cycle are essential to the success of the project.

PARTICIPATION

The participation of the owner, user group, contractor and officials throughout the project cycle is central to its success. Participation facilitates the exchange of information, allows discussion of alternative points of view, and encourages good working relationships between the different parties involved in the project. This ensures support for the project during its development and use.

The architect is responsible for meeting regularly with interested parties to discuss various aspects of the project. The owner and users, in particular, should be given opportunities to explain their needs and voice any concerns. Group meetings, attended by all concerned parties, are a particularly good forum for discussion of project issues.

The architect is generally considered the group leader. Group members should include all parties immediately concerned with the project. Individuals and agencies not in the group but relevant to its function should be consulted for advice, with group members acting as liaisons between them and the project.

PHASES OF THE PROJECT CYCLE

The typical building project cycle consists of five main phases: 1) Project Planning, 2) Site Selection and Planning, 3) Building Design, 4) Implementation and 5) In-Service Building (see Table 2.). Figure 2. illustrates the impact of the different project phases on the final product.

Table 2. Project Cycle's Phases and Stages

PHASE	STAGES
PROJECT PLANNING	• Identifying requirements • Collecting data • Preparing the project program • Assessing project feasibility
SITE SELECTION AND PLANNING	• Site selection • Site planning
BUILDING DESIGN	• Pre-design • Schematic design • Design development • Construction documents
IMPLEMENTATION	• Bidding • Construction and site inspection • Handing-over
IN-SERVICE BUILDING	• Operation • Maintenance and Repair • Renovation • Adaptive Re-use

Project Planning Phase

During the planning phase, the functional requirements of the project are identified. Information is then gathered to prepare the project program, which is a table presenting project requirements and coordinating its spatial and functional elements. Finally, the feasibility of the project is assessed. Careful execution of this phase ensures that project staff have a proper understanding of the project, which is crucial for the following phases.

1- Identifying requirements

First, project requirements are identified with the owner and user group, and as a result the number of occupants and the services required. The planner/architect then establishes the owner's spatial requirements, in terms of areas and the functional relationships between spaces.

2- Collecting data

Good project planning requires background research on the project type. This gives project staff an understanding of both the possibilities and limitations of the project to be implemented. On the basis of the information gathered, owner requirements are clarified.

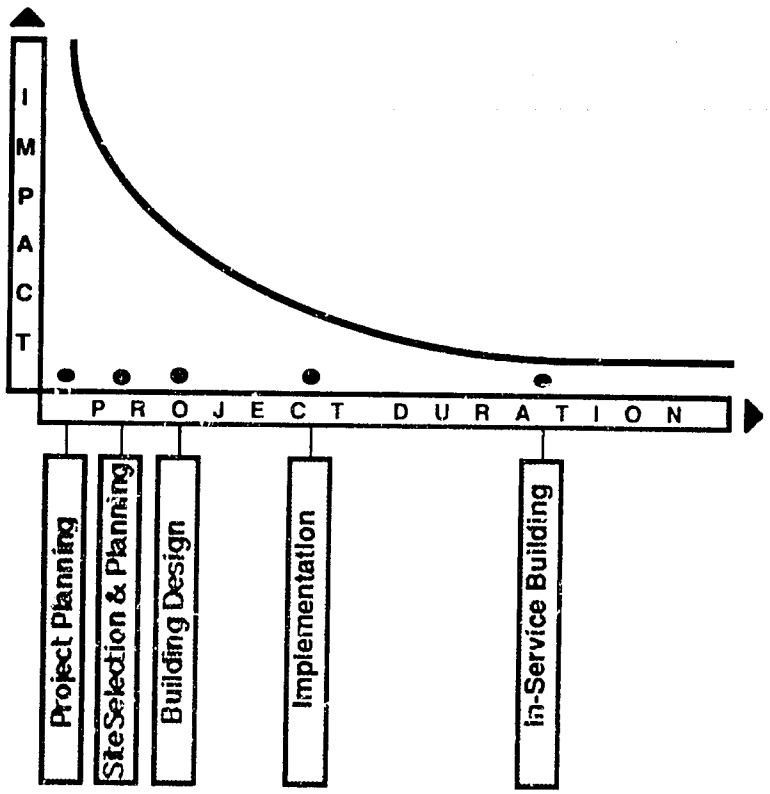

Figure 2. Impact of Different Project Phases

3- Preparing the project program

The background information gathered is used to tabulate project requirements, presenting its spatial and functional elements. This table is called the project program.

4- Assessing project feasibility

The project should then be appraised on both its technical and non-technical merits, via a formal feasibility study if its size or special conditions warrant. If deemed feasible, the project is implemented.

Site Selection And Planning Phase

The site selection and planning phase comprises two main stages: Site Selection and Site Planning. A detailed discussion of the site selection and planning phase is presented in section three of this guide.

1- Site Selection

If no specific site is designated for the project, a site selection process should be undertaken. Different sites are considered, assessed and the most suitable one selected.

2- Site Planning

During planning of the site, site analyses should be conducted. These should be based on consideration of community services and utilities and of site characteristics. On the basis of the site analyses, a site program is developed and a preliminary plan is prepared. This plan is then reviewed by the owner and by interested parties (i.e. user groups and public officials) for approval.

Once the preliminary plan is approved, a final site plan is prepared. This becomes an integral part of the construction documents, serving as the basis for the building design phase of the project. Issues related to building location and orientation within the site are all settled at this stage.

Building Design Phase

The building design phase consists of four main stages: pre-design, schematic design, design development and construction documents. A detailed discussion of the building design phase is presented in the third lecture included in this guide.

1- Pre-design

During this stage, the owner defines the building requirements, and information is gathered to formulate the building design problem and establish the building program.

2- Schematic Design

The building is then conceptualized, appropriate solutions are investigated and possible design alternatives are presented.

3- Design Development

All design alternatives are then evaluated from architectural and financial perspectives, and construction feasibility is assessed. The most appropriate design alternative, i.e. the one that is most responsive to the design problem and the owner's requirements, is then selected for further development.

4- Construction Documents

The selected design is then fully documented, to ensure proper construction, by means of multi-disciplinary drawings and written materials.

Implementation Phase

After the design phase is over, implementation of the project begins. This phase comprises three stages: bidding; construction and site inspection; and handing-over.

1- Bidding

When the project is bid, a suitable contractor is chosen to implement the project. Selection should be based primarily on the contractor's ability to fulfill the technical requirements of the bid. Price, although obviously important, should be a secondary consideration.

2- Construction and site inspection

During construction, the project manager and architect inspect the site to ensure that construction proceeds according to the construction documents. Site tests should be conducted and any change orders and recommendations by the owner and architect acted upon.

3- Handing-over

After the project manager and architect have ensured that the building complies with the construction documents and is completed and ready to be occupied, the building is handed over to the owner.

In-Service Building Phase

The in-service phase continues throughout the life of the building, from its handing-over to its demolition. This phase comprises four stages: operation; maintenance and repair; renovation; and adaptive re-use.

1- Operation

As soon as it is handed over to the owner, a suitably qualified janitor should be employed to clean and monitor building operation. Training should be given to the janitor, particularly if the building contains equipment or instruments that need special care.

2- Maintenance and repair

A maintenance schedule should be established for the building and for facility grounds. This schedule should plan preventive maintenance and should set aside funds for corrective maintenance work. Usually the janitor is responsible for building maintenance, but for large or complicated projects specialized maintenance staff should be appointed.

3- Renovation

Renovation takes place when a building has deteriorated and can no longer function as intended. An overhaul is then necessary. Renovation might involve a rethinking of the whole design concept, and/or additional construction to improve the original function of the building.

4- Adaptive re-use

Sometimes a building outlives the need for its original function. A well-designed and constructed

building can then be adapted for another use. This usually involves extensive renovation, spatial re-allocation and additional construction for either the entire building or a part of it. The existing building is then subject to another project cycle, from design to construction.

SECOND LECTURE

SITE SELECTION AND PLANNING

The site selection and planning phase uses the information gathered during project planning to present, at the end of the process, a final site plan addressing all the owner's requirements.

This phase has a major impact on the final product, as shown in Figure 2. However, the amount of time allotted to site selection and planning is often short in relation to its importance. Project staff must therefore ensure that sufficient time is allocated to the site selection and planning process to guarantee a successful product.

SITE SELECTION

The choice of site is crucial since it affects the success of the entire project, and since the rest of the project cycle is based on the site selected at this stage. An inappropriate site choice can also be costly, if not impossible, to remedy. A school built in a noisy area, for example, would need expensive sound-proofing and possibly an artificially ventilated indoor environment to enable the building to function properly.

SITE PLANNING

Decisions made during the site planning stage (e.g. on building location and orientation) are also important, since they set the context within which the building design phase is conducted. A faulty decision made at this stage can have long lasting negative effects throughout the project cycle and the life of the building. However, alterations to the site plan can be made, if necessary, during the building design phase, and a feedback loop remains active during both phases.

Site planning is also affected by policies and strategies formulated at the city and urban planning levels (e.g. on zoning, building height, setbacks, etc.). The site plan must respond to these policies and this, in turn, influences the building design.

OTHER PARTICIPANTS

Nationally, the General Organization for Physical Planning (GOPP) is responsible for formulating city and village master plans, planning regulations and guidelines that control the form of urban and rural built environments. These regulations and guidelines directly affect the site selection and planning process. Other institutions with (mostly indirect) influence on site planning include the Ministry of Agriculture, Governorate Planning Directorates and executive and popular councils.

The Governorate Housing Directorate and Markaz Engineering Department are usually responsible for site selection and planning, but sometimes they commission outside consultants, especially for large projects.

SITE SELECTION AND PLANNING PHASE

The site selection and planning phase consists of two main stages: Site Selection and Site Planning. It ends with the preparation of a final site plan which forms an integral part of the construction documents and is used for bidding, contracting and project implementation. Figure 3. details the site selection and planning process for a typical building project.

Site Selection

Site selection should be based on investigations carried out by site visits and through analysis of relevant data. The analysis performed at this stage aims to select the most suitable site for the project. Project staff should be aware that selection of an inappropriate site can irreparably damage the whole project, however well the building is subsequently designed.

Data Gathering

Data and information gathering is critical to the site selection stage. Field methods include: site reconnaissance (taking a general idea of the site and its surroundings); windshield surveys (a quick look at the site from a vehicle, particularly useful for large sites); and interviews and questionnaires, especially useful for housing projects.

A checklist has been developed to assist in recording the data gathered during field visits. A copy is provided in the workbook.

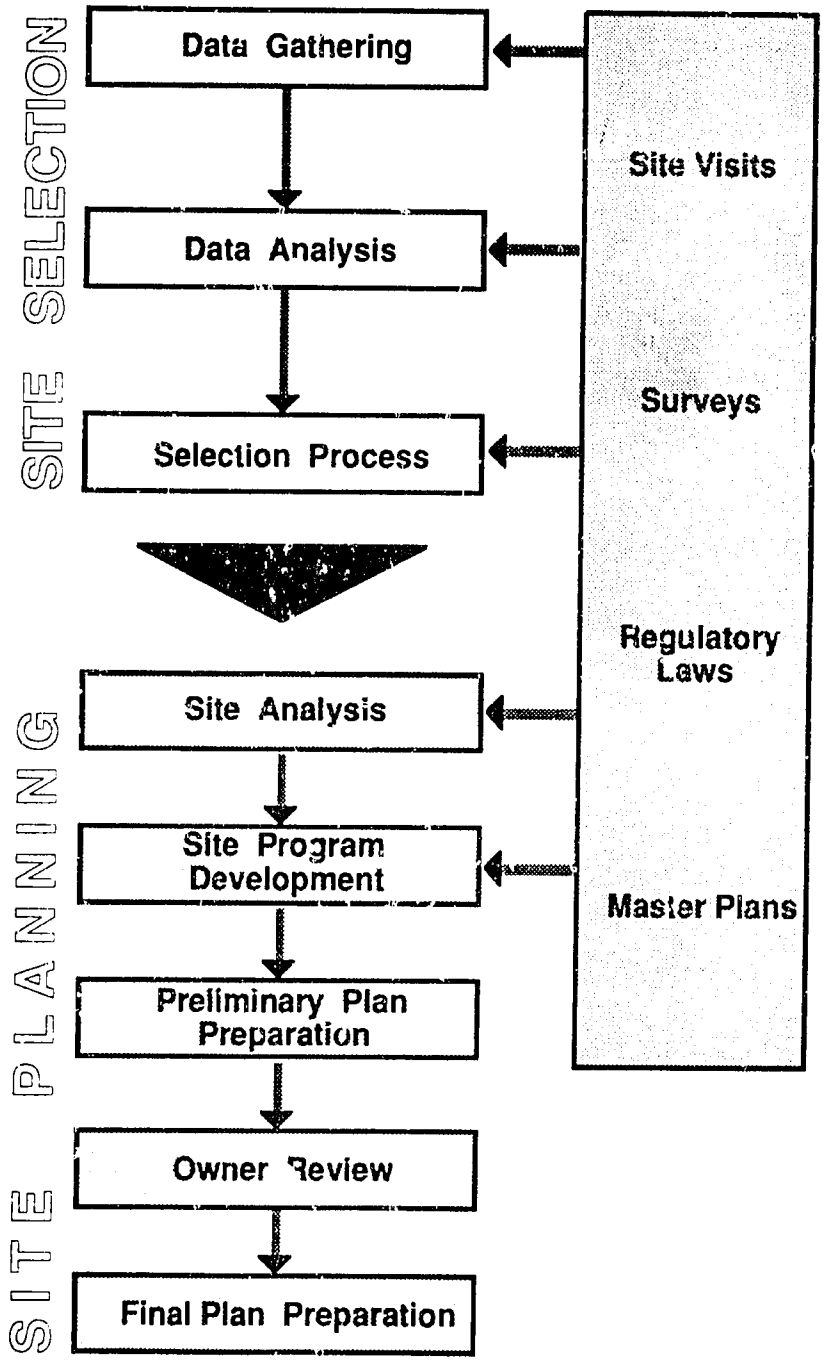

Figure 3. Site Selection and Planning Phases

Data analysis

The information gathered must then be analyzed. The analyses conducted at this stage are based on five main categories of considerations: 1) legal, 2) regional and 3) neighborhood issues, 4) community services and utilities, and 5) site characteristics. A detailed description of the technical processes involved is presented in the section on Considerations for Site Selection and Planning, included in the workbook. This section also includes special considerations for large-scale/housing projects.

During the site selection stage, the first three categories (i.e. legal, regional and neighborhood issues) should be thoroughly investigated, while the other categories need to be only briefly considered.

Selection process

Once all the sites have been evaluated, a site is selected. An evaluation matrix often helps in the selection process. (A sample matrix is presented in the workbook)

SITE PLANNING STAGE

During this stage, the site selected is further analyzed, the site program is developed, and the preliminary plan is prepared. This is then reviewed by the owner before preparation the final site plan.

Site Analysis

Once the site is selected, or if only one is available, a more thorough site analysis than the one conducted during site selection is made. Detailed data and information gathering is critical to the site analysis activity. Field methods include site visits aimed at thoroughly documenting physical features, and social surveys, based on field interviews and questionnaires. These are particularly useful for housing projects, where a feel for the needs of prospective users and neighbors is important.

In the site planning stage, the considerations for community services, utilities and site characteristics (presented in the section on Considerations for Site Selection and Planning included in the workbook) should be thoroughly investigated, and the legal, regional and neighborhood considerations briefly examined. Figures 4. and 5. show a suggested site and its graphical analysis.

Site Program Development

The site program is a comprehensive listing of users' requirements, both short and long-term. It should be

prepared by the planner/architect, under the supervision of the project manager. The client and, if possible, potential users and maintenance personnel should all be involved in preparing the program.

Preliminary Plan Preparation

All information gathered in the site analysis stage is used in the preparation of a preliminary plan which should address all the owner's needs, identified in the site program; respond to site conditions and constraints; and ensure the most efficient site-use possible.

The plan (sometimes called a schematic plan or site structure) identifies access to the site, location of various functions, building location (to scale), building orientation, site features to be conserved (natural or man-made), and site modifications needed, including improvements to existing utilities. Figure 6 illustrates an example of site plan alternatives.

Owner Review

The preliminary plan is then delivered to the owner for review. The owner should appraise the preliminary plan, preferably with the involvement of the prospective users, and should forward his comments to the project manager.

Final Plan Preparation

When all the owner's feedback has been reviewed and incorporated in the preliminary plan, a final plan is prepared for implementation. Figure 7 illustrates an example of a final site plan.

This site plan forms the basis of the building design stage. At this stage building location, orientation, and approach should be established. Alterations to the site plan can, however, be made during the building design phase, if necessary.

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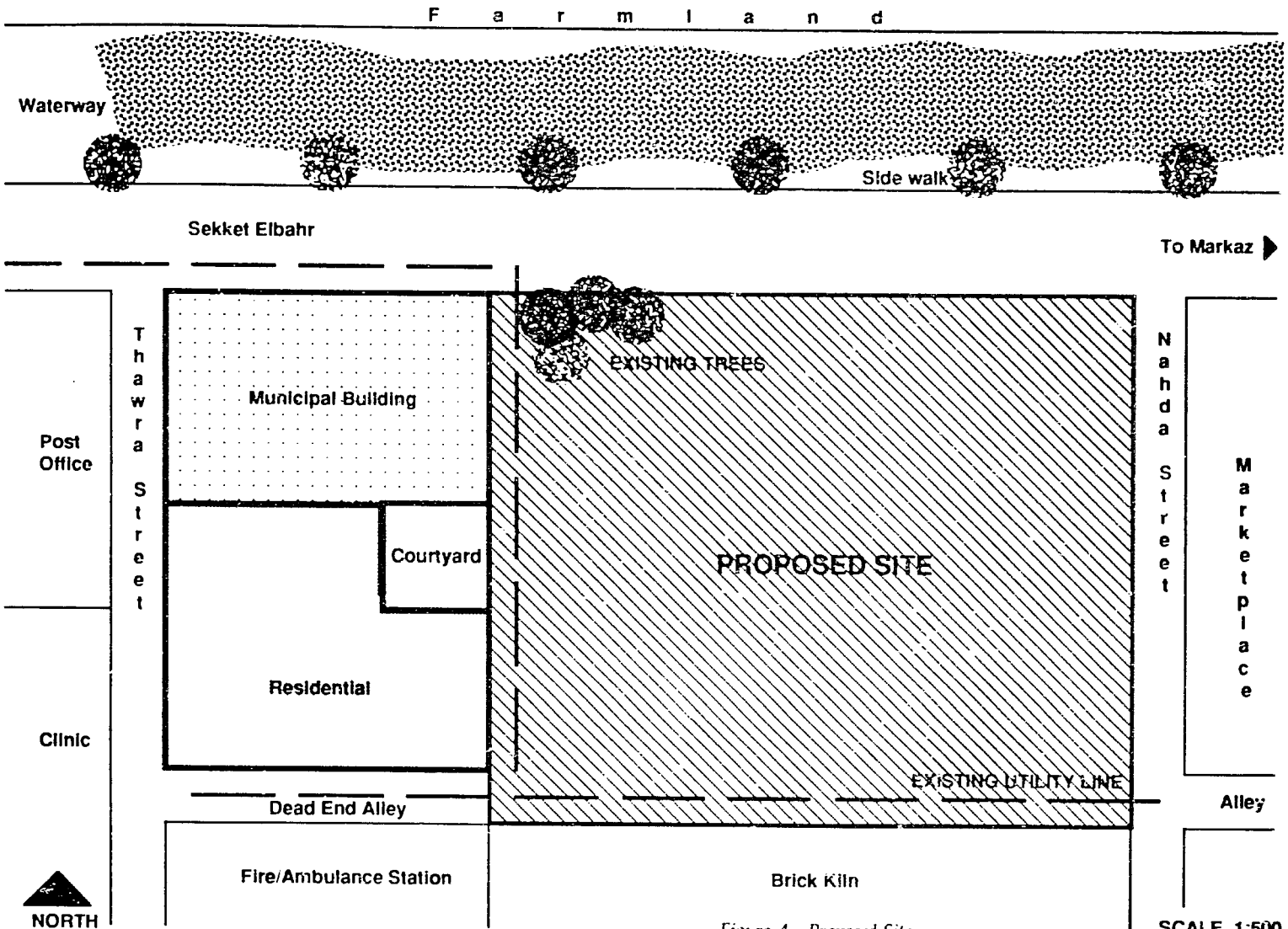

Figure 4 Proposed Site

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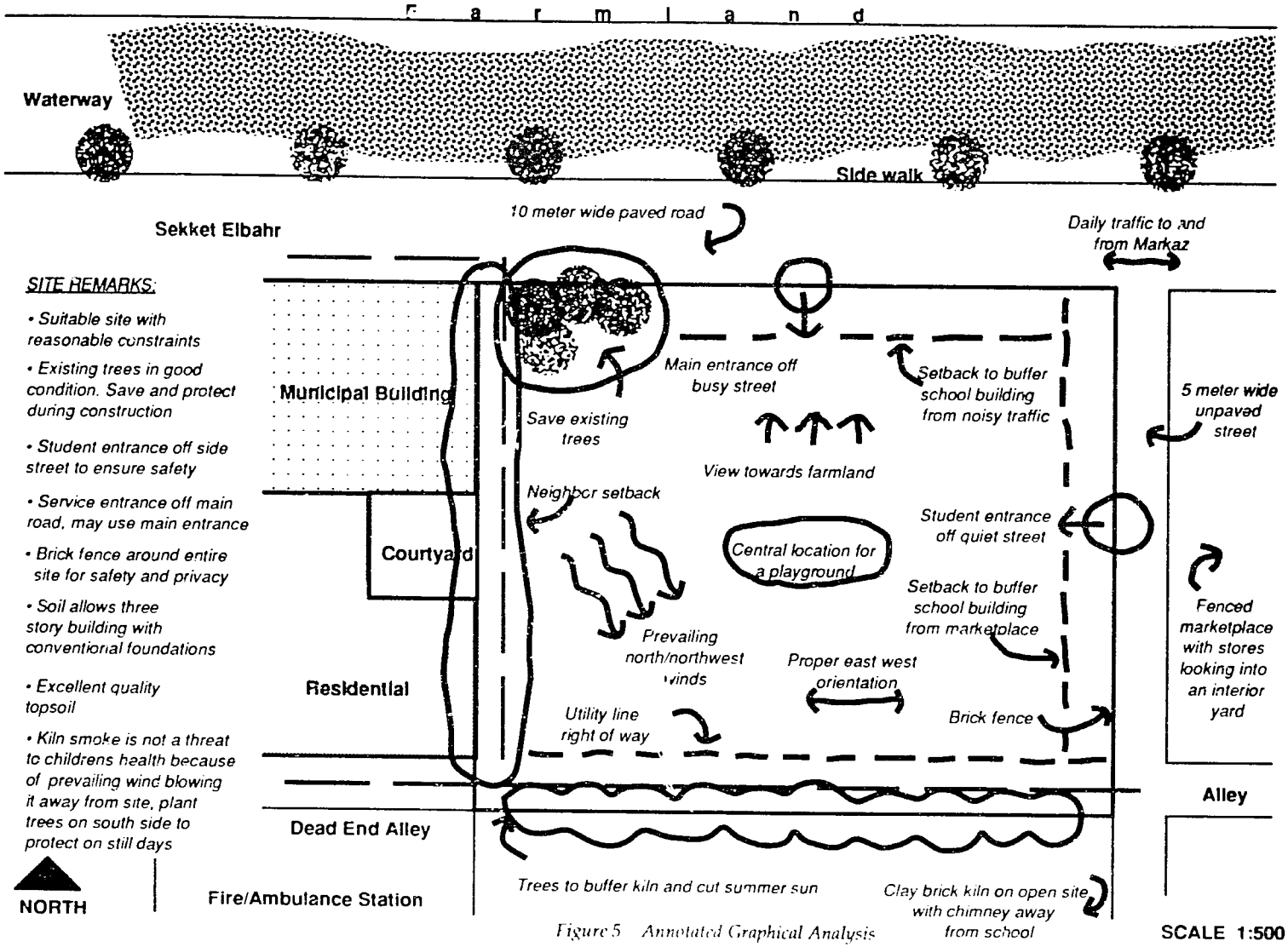

Figure 5 Annotated Graphical Analysis

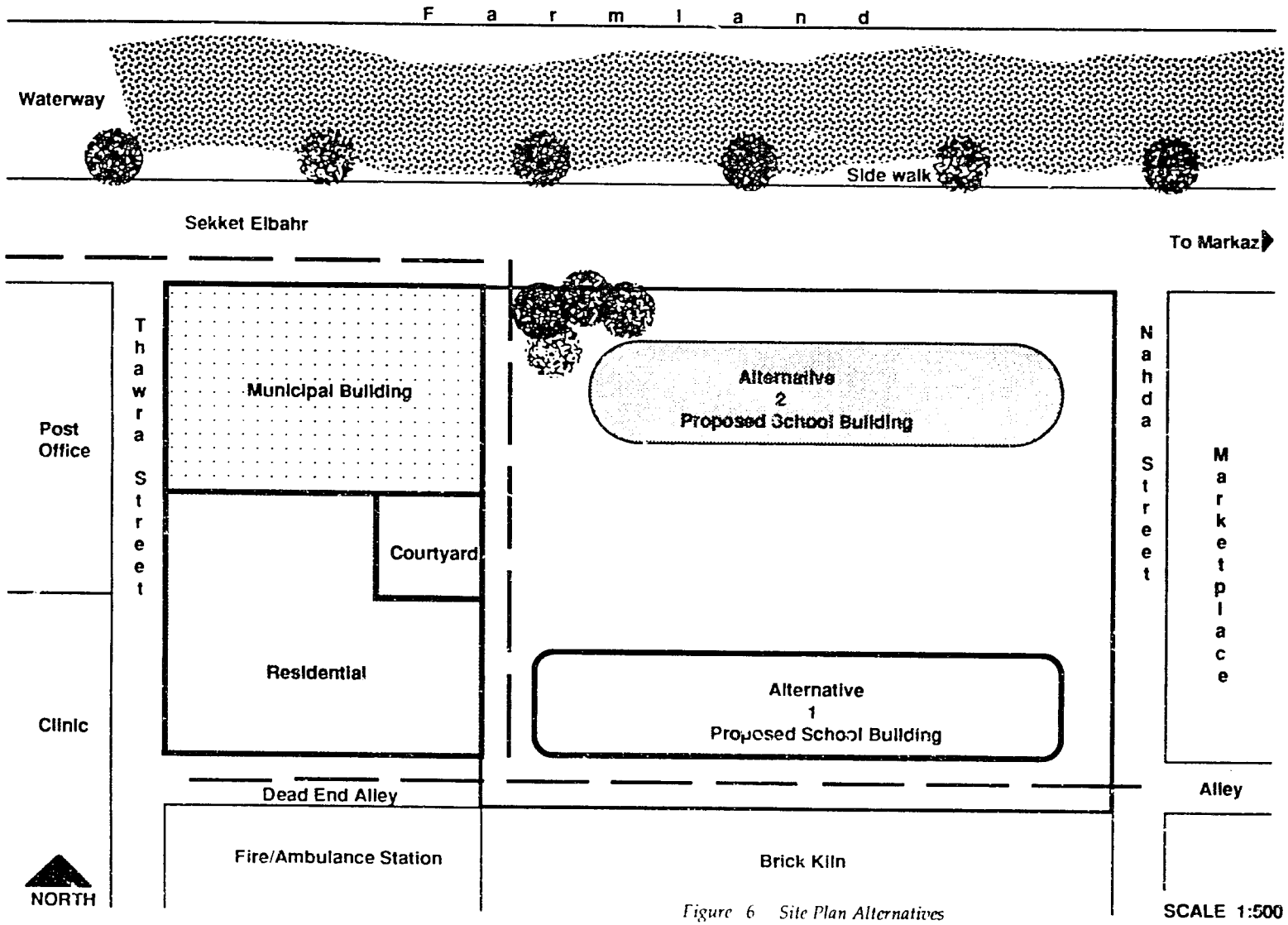

Figure 6 Site Plan Alternatives

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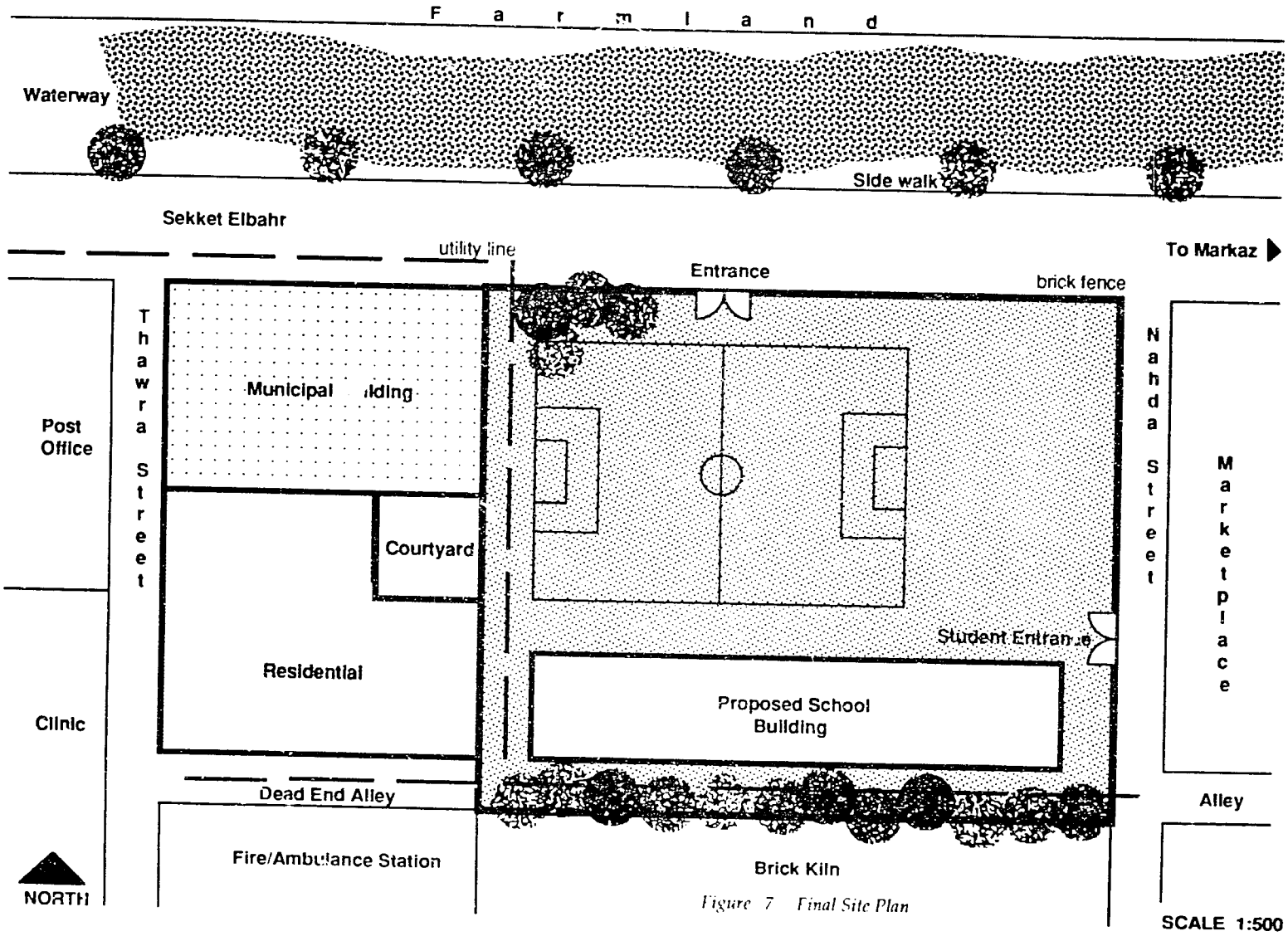

Figure 7 Final Site Plan

THIRD LECTURE

BUILDING DESIGN

The building design phase deals with the building, from its conception to its construction. It relies heavily on the site selection and planning phases, particularly on the final site plan, which sets the context for the design of the building. Design synthesizes needs and ideas into actual physical form.

The process and product are equally satisfying to the owner and the design team. While the owner sees needs being fulfilled, the design team sees its creativity put to use. This gratification is one reason why building design is often carried out with pride.

ALLOCATING ADEQUATE TIME

Despite the importance of the building design phase and its major impact on the function and aesthetics of the building, the amount of time allotted to this phase is usually short. However, a faulty decision resulting from hastiness or lack of research will have long-lasting effects throughout the life of the building. For example, a poorly oriented building would need special treatment after construction to be acceptable. Not only would this require additional costs but it often does not achieve comfort. Users are then compelled to remedy the situation by adding costly fans and air conditioners. To avoid these problems, project staff must ensure that sufficient time is given to building design.

SELECTING THE DESIGN TEAM

The architect is considered the leader of the design team. Either the architect or the project manager is responsible for selecting the design team. Choice of members is based on their skills and relevant qualifications, and on their ability to work together as a team. Structural, electrical and mechanical engineers/technicians are usually considered core members. Other specialists might also be needed according to the type of the project. A hospital, for example, might need the input of a health care planner, and a factory project might require an economic consultant.

BUILDING DESIGN STAGES

The building design phase consists of four stages briefly explained in the first lecture: pre-design, schematic design, design development and construction documents. See Figure 8.

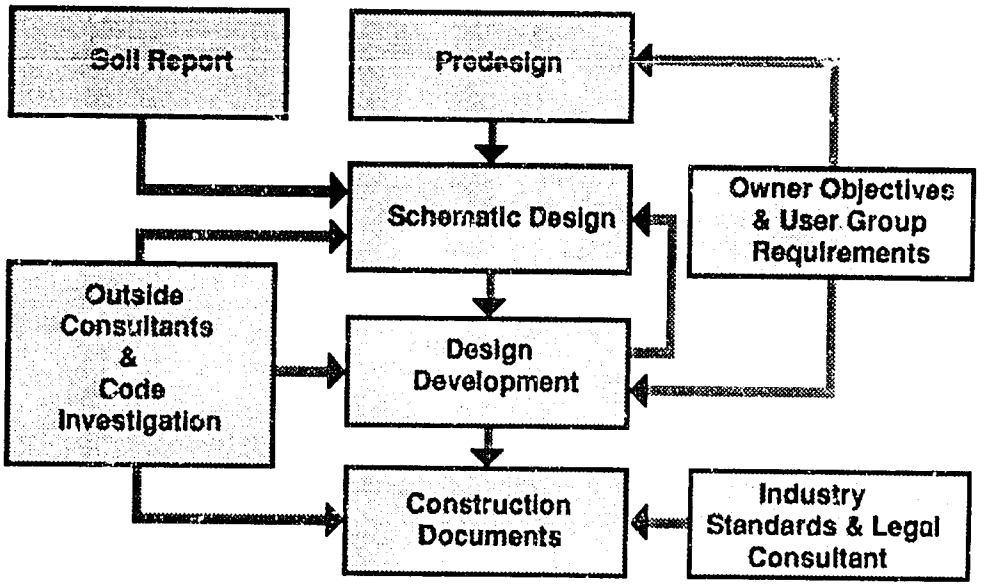

Figure 8. Building Design Stages

Pre-design

In the pre-design stage the owner, project manager and architect define building requirements, formulate the building program, and decide on its phasing based on the construction sequence and on the availability of finances.

Identifying requirements

The owner plays an important role in this activity, determining the function of the building and identifying its functional requirements with project staff. (See Figure 9.) With the help of the architect, the owner decides whether it would be more appropriate to renovate an existing building, design an addition to an existing structure or construct an entirely new building. The owner and the architect should also decide on the phasing of the project based on its size, construction sequence and the availability of finances.

Formulating the building program

During this activity, the architect assigns areas to each of the functional elements of the project, previously identified with the owner. This is also

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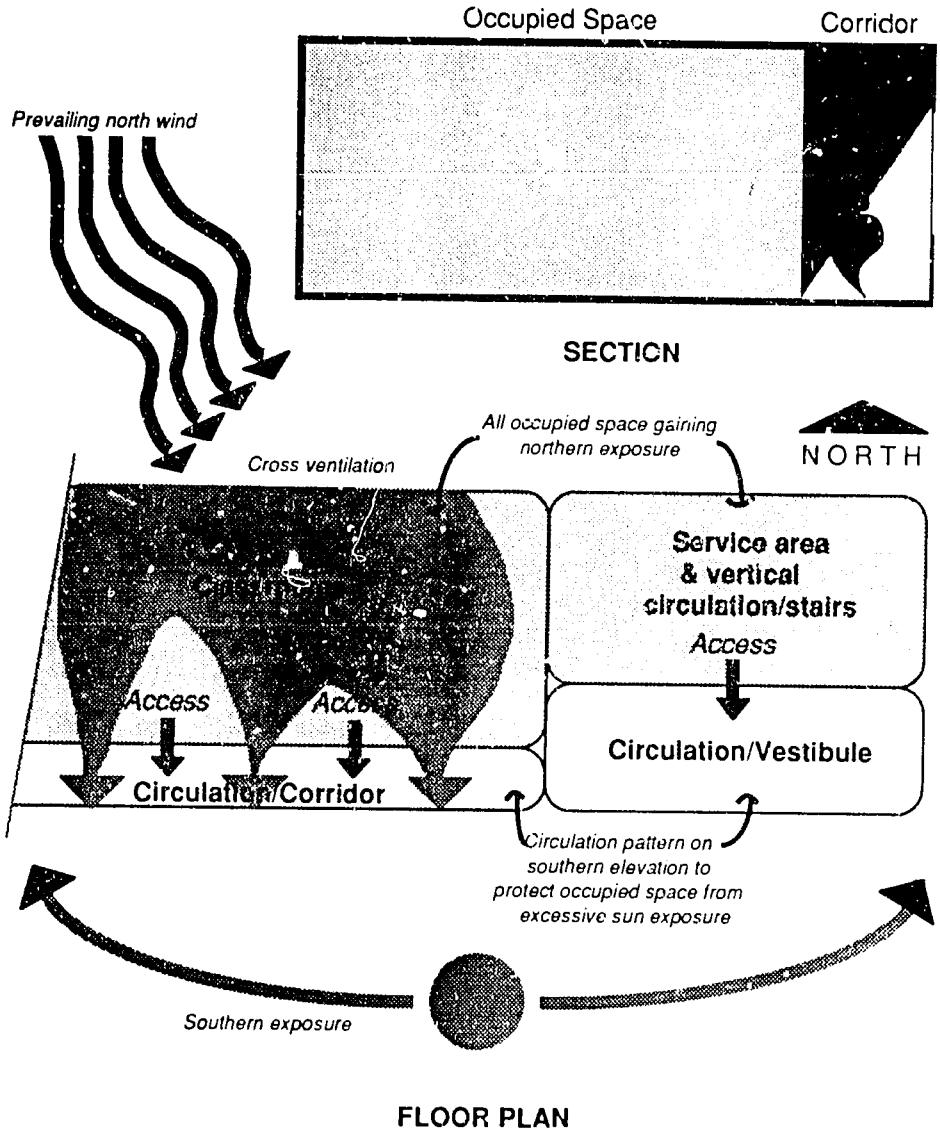


Figure 9 Identifying Requirements in Pre-Design Stage

done in close coordination with the owner and users. A programmer might also be needed for large-scale or complicated projects.

The architect then identifies the relationships between the different spatial functions so as to organize the spaces horizontally and vertically within the building as efficiently as possible.

The functional elements and their assigned areas are tabulated to form the building program, which is used as a primary tool throughout the building design phase.

During the pre-design stage, the code investigation process starts with a brief code search made to ensure that the building meets all regulatory requirements. The architect also requests a soil investigation report from the owner in order to decide on a suitable structure for the building, based on the soil characteristics.

Schematic Design

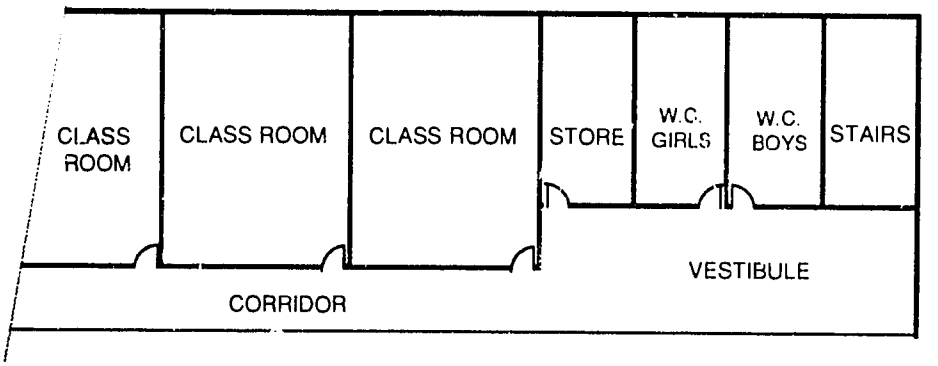
Schematic designs are conceptual in character and are based on the needs developed, and approved by the owner, in the pre-design stage. In the schematic design stage, the team, under the supervision of the architect, prepares a number of design alternatives, each of which adequately solves the design problem. Each alternative consists of drawings and other documents illustrating the general scope and scale of the project, the relationship between different project components, and the overall concept of design. These are then presented to the owner for review. (See Figure 10).

Documentation also covers the soil investigation, code research, and future expansion.

Preparation of alternatives

The project master plan, which was developed during the site selection and planning phase, along with the building program, are the basis of the schematic (or conceptual) design of the building. During this activity, the building program is translated back from numbers into spaces, and is then analyzed to form the conceptual design.

The conceptual designs should respond to the functional and aesthetic requirements, as well as the budgetary limitations of the project. The design style should also address social, cultural and climatic conditions. Often, various design alternatives are developed so that different possibilities can be explored. These alternatives are generally the outcome of a good design process. Usually two or three valid alternatives are then chosen to be further developed during the design development stage.



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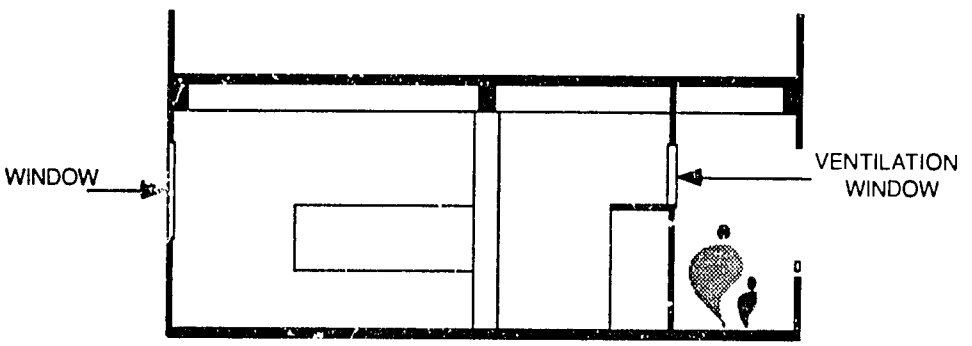


SECTION

Figure 10 Schematic Design Example

Elements of the process

In the schematic design drawings, areas are developed into usable spaces on the basis of the functional requirements identified in the building program, and bearing in mind the relationships between different spatial functions. The floor plans, on a scale of 1:200, should show circulation patterns including doors, entrances, exits, corridors, stairs, elevators and ramps. Walls should be shown as single lines. Building elevations on a scale of 1:200 should show window locations, sizes, and sill heights.

Preparing engineering drawings

Drawings of the structural, mechanical and electrical systems should be produced to accompany the architectural drawings for each design alternative. These are all presented as a single package to be compared with the other design alternatives.

Coordinating requirements

During development of the design alternatives, the architect consults with the various engineers on the design team: with the structural engineer to select the most suitable structural system; with the electrical engineer to establish the building's power requirements; with the mechanical engineer to evaluate ventilation systems (whether natural ventilation is adequate and, if not, which type of artificial ventilation would be most appropriate); with the plumbing technician to discuss the building's plumbing requirements, e.g. plumbing chases, dropped slabs or dropped ceilings to accommodate pipes; with the civil engineer to design site approaches, site entrances, and set grade elevations; and with the landscape architect to design outdoor spaces. Specialty design experts such as health planners (for hospitals) and acoustic engineers (for auditoriums) should also be consulted at this stage so that any special requirements can be accommodated.

Planning for future expansion

The issue of future expansion is raised with the owner and the user group. Expansion must be planned for at this stage. For horizontal expansion, a corridor should be stretched to the exterior wall where the expansion is required. For vertical expansion column bars should be extended beyond the roof slab and bent and embedded in the roof slab for weather protection.

Choosing materials

Building materials appropriate to the function of the building and within the project's budgetary limitations are selected at this stage.

Assessing alternatives

The soil report obtained in the pre-design stage is reviewed and each design alternative is assessed in relation to the soil characteristics. In addition, governmental and municipal agencies should be contacted and meetings held with local officials to ensure that each alternative complies with all regulatory requirements, and to prevent any misinterpretations of the building code.

All the design alternative packages produced are then given to the cost estimator to calculate an independent cost estimate for each alternative. The estimate along with the drawings, a project brief and a time schedule (explaining the various tasks and the time required to execute them) are then presented to the owner for review.

Design Development

With the help of the architect, the owner selects the design alternative that is most responsive to the needs of the building. This could either be one or a combination of the alternatives presented, reformulated into one new alternative. After selection, the architect receives the owner's official approval and notice to proceed with the project.

Before proceeding, the architect again consults with the user group to refine the building requirements.

At this stage, details complementary to the design style are selected for the building. Stalactites, arches and domes, for example, would complement an Islamic architectural style; similar and repeated openings would be appropriate for housing buildings.

Producing the drawings

During design development all drawings are produced on a larger scale than those prepared during the schematic design stage. Floor plans, for example, should be prepared on a scale of 1:100 and should show all walls as double lines, resolved toilets, calculated stairs, corridors clear widths, and number and widths of exits. Enlarged plans for typical rooms (e.g. classrooms, patient rooms, toilets) are drawn on a scale of 1:50. (See Figure 11).

Finalizing the engineering systems

With the help of the structural engineer, the structural system is finalized, and columns, beams and slabs are sized. Based on the required clear height and the size of the beams, the floor to floor height is defined. The mechanical and electrical systems are also finalized at this stage.

Developing the building interior and exterior, and selecting materials.

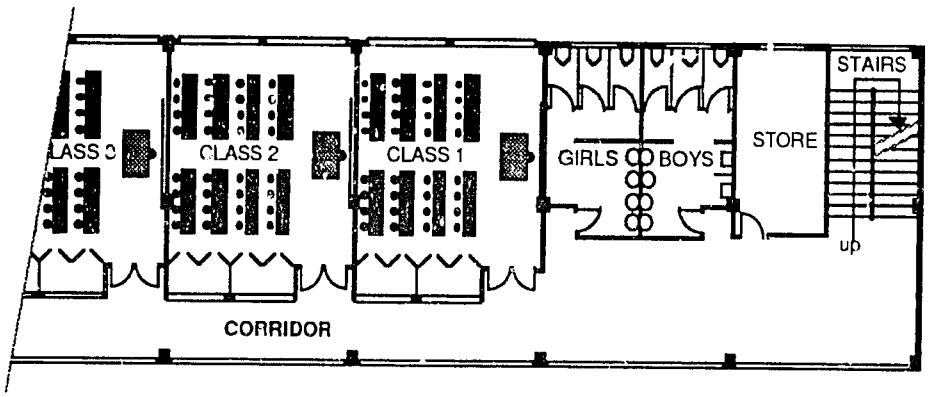
Wall sections are developed and cladding materials and exterior finishes are selected. Building interiors are developed and major interior finish materials are selected. A list is made of the type of doors required in each functional area and the type of finishes required for each wall, floor and ceiling. This list, together with explanations of how the various materials should be used, forms the basis of the building specifications, which are further refined during the construction documents stage.

Complying with code

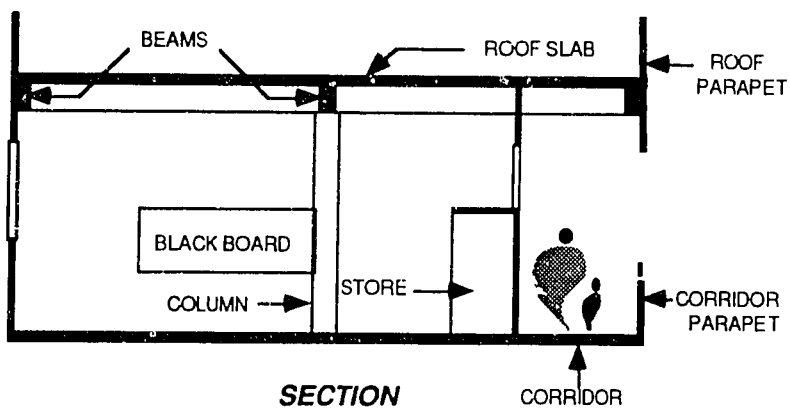
At this stage the architect should ensure that the building fully complies with all code issues such as setbacks, building height, number of stairs necessary for exiting, number of toilets for each sex, minimum height of interior space, etc.

Owner Review

If required by the owner, the drawings, along with the specifications, are then presented to a cost estimator, before being delivered to the owner for review.



PLAN



SECTION

Figure 11 Design Development Example

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Construction Documents

The construction documents - which consist of the drawings, the building specifications, bill of quantities and contractual agreement - are the final documents used to construct the building. While preparing the drawings, the architect should remember that he/she is not going to be constantly on site during construction and that they must therefore be comprehensive enough for the construction worker to be able to construct the building from them. (See Figure 12).

All details shown on the drawings should be physically possible to construct. The architect must think about the logistics of construction i.e., whether there is enough equipment for the job, and whether the site is accessible by conventional means.

He/she should also remember that a logical sequence needs to be followed during construction. A door, for example, cannot be installed before the partition is constructed, and most work performed is dependent on completion of other work.

The drawings

The architectural drawings should fully explain the building, by means of floor plans, roof plans, enlarged plans. exterior elevations, interior elevations, building sections and wall sections.

The floor plans, for example, should show all exterior and interior dimensions, column center lines, types of interior openings, equipment, location of fire hoses/extinguishers, wall types, toilet fixtures and accessories, and door swings.

The building elevations should show all exterior building materials required, types of exterior openings, entrances and exits, floor elevations, column center lines, and grade elevations.

Details for window and door heads, jambs and sills/thresholds, and for water proofing, thermal insulation, parapets, roofs, stairs, etc. should also be drawn.

A longitudinal building section and exterior wall sections at all special conditions such as entrances, windows and doors, should also be included in the construction documents.

Choosing building materials

In order to select appropriate building materials, the architect should research industry standards and product data, and meet with manufacturer representatives. Choices should be based on previous experience with particular materials and their proven properties.

The bill of quantities

This should list all the building materials needed for construction and indicate the quantities of each type required.

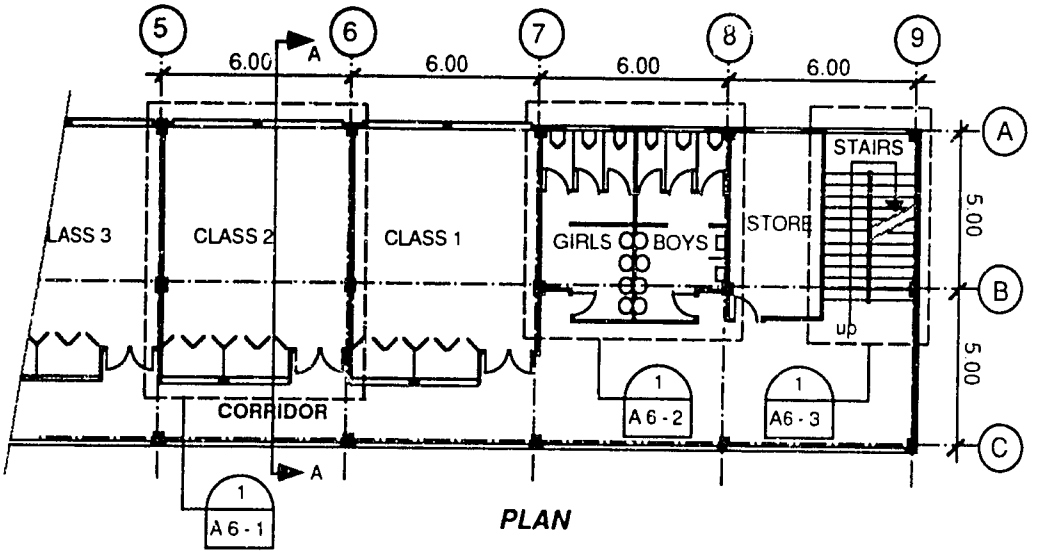
The building specifications

These classify all the building materials required by type. The carpentry listing, for example, would include all building materials requiring the work of a carpenter, such as cabinets, doors and door frames, windows and window frames, wall bases, flooring, and interior wall cladding. They should also explain the properties of the building materials, the methods of application, how the materials relate to one another (e.g. windows and exterior finishes), and tests required.

The contract

With the help of the legal department the architect is then responsible for preparing the contractual agreement between the owner, architect and contractor. To ensure construction quality, he/she should make sure that performance bonds and final payments are retained until the work has been satisfactorily completed.

The architect is responsible for finishing the construction documents on time. Once the documents are prepared, the project goes out for bids.



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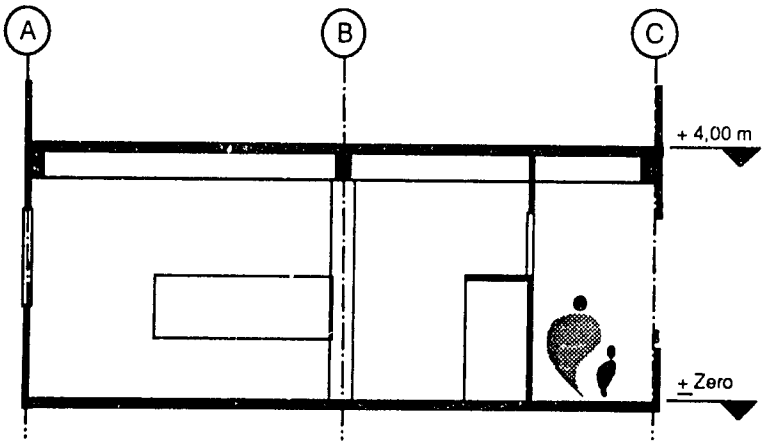

SECTON A-A

Figure 12 Construction Documents Example

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FIRST: CONSIDERATIONS FOR SITE SELECTION AND PLANNING

The analyses conducted during the site selection and planning phase should be based on various technical considerations, grouped here under five main categories:

- legal issues
- regional issues
- neighborhood issues
- community services and utilities
- site characteristics

Special considerations for large-scale housing projects are also included in this section.

This material should be used by technical staff when selecting and planning a site and is intended to help identify design constraints that should be taken into consideration during the selection and planning process. Notes should be recorded on the checklist which follows this section.

Each consideration is first briefly introduced. This is followed by a description of the research task required to fully investigate the consideration. Sources of information useful for performing the task are then given. Finally, rules of thumb summarize the specific recommendations for each consideration.

The first three categories (legal, regional and neighborhood issues) should be thoroughly considered during site selection, while the community services and utilities and site characteristics categories should be investigated during the site planning stage.

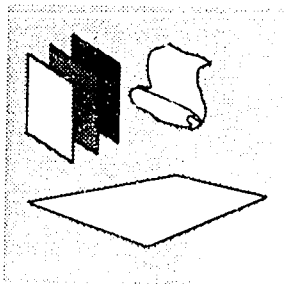
If the site has been pre-selected, a quick review of the first three categories should be made to ensure that the site is appropriate for the proposed project.

For large-scale housing projects, the last set of considerations should also be used in the site planning process.

1	LEGAL ISSUES

LAND TENURE

Land tenure is regarded as the most important issue to be clarified during the site selection process, particularly if consolidation of several properties is required. Many large scale projects have been completely designed and then had to be abandoned due to land tenure problems.

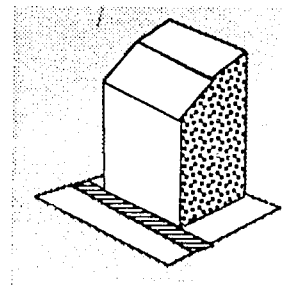


Research : Determine who holds tenure of the land before making plans to develop it. For each land parcel within the site, identify the number, names and addresses of owners/lessors, and the type of tenure held i.e., ownership or tenancy. Assess the practicality of land assembly, if it is necessary to build one project.

Source : Locality/site maps, legal land tenure documents, site visit to assess the situation.

Rule : SELECT LAND WITH CLEAR LAND TENURE.

GOVERNMENT/MUNICIPAL REGULATIONS



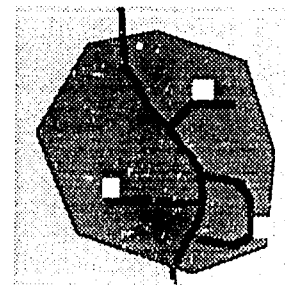
Compliance with governmental/ municipal regulations ensures the legality of the project. These regulations cover such issues as land use and zoning. Zoning ordinances, for example, could prohibit or restrict certain types of land use in the area where the site is located, thus either preventing implementation of the entire project or limiting the building's function. Agricultural land protection laws are probably among the most important laws to be considered.

Research : Check documents on government/municipal regulations that could affect the project (on land use, recommended areas, setbacks, building heights). Determine the effect of these requirements/constraints on the proposed project.

Source : Governorate, city or village master plans; zoning ordinances; subdivision regulations; building codes.

Rule : ENSURE THAT ALL GOVERNMENTAL AND MUNICIPAL REGULATIONS ARE FULFILLED.

LOCATION



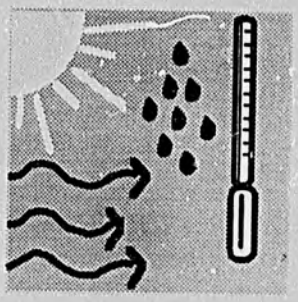
The location of the site needs to be carefully selected to suit the project function. A school, for example, should be located in a quiet zone, within walking distance of the pupils and away from heavy traffic. However, in the case of selecting a site for a vehicle maintenance workshop, ease of access and vehicular maneuverability should be considered. Equipment maintenance centers and repair shops should be close to the roads used by such equipment. Health facilities, on the other hand, should be located in quiet areas, while health facilities that treat contagious or epidemic diseases should be located in isolated sites away from residential areas.

Research : Determine the suitability of the site by investigating land utilization around the site area, land value, population density, and availability of utilities, services and employment.

Source : Urban area plans, land use maps, utility maps, census data and site visits.

Rule : SELECT SITE IN AREA COMPATIBLE WITH PROJECT FUNCTION.

CLIMATE



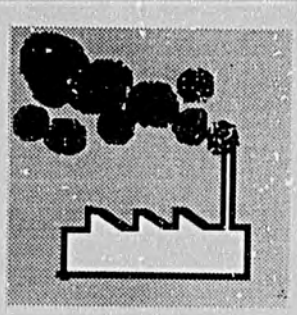
Climate is a crucial factor in site development since it has a considerable impact on the comfort of project users. Sun provides winter warmth and summer heat, and can cause glare; storm winds can destroy lightweight structures. Site and building layout, therefore, should always reflect climatic conditions. Buildings should not obstruct summer breezes, sun shading should be provided on the south and west elevations, leaving the north elevation open. Trees and shade structures also make outside public spaces enjoyable and useful in hot seasons. Buildings should be oriented to avoid direct solar gain in summer; orientation of facades to the north should be maximized while western orientation should be minimized. Classrooms, laboratories and libraries in educational buildings should be oriented towards the north to benefit from the stable glare free daylighting.

Research : Determine the impact of climatic conditions on site orientation and development, and on buildings. Identify sun angles, temperature, rainfall, humidity, and prevailing winds.

Source : Meteorological reports, geographical maps, latitude.

Rule : ENSURE THAT SITE PLANNING TAKES INTO ACCOUNT CLIMATIC CONDITIONS.

POLLUTION (DUST, SMOKE, FUMES, AND NOISES)



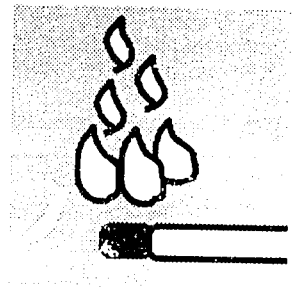
Proximity to pollution-causing factories, quarries, garbage dumps, airports, railroads or expressways makes sites unsuitable for most projects. Buildings should always be located as far as possible from sources of pollution. The direction of prevailing winds should be taken into consideration when evaluating the effect of pollution on a given site. If the sources of pollution are located upwind with respect to the site under investigation, it will probably be affected by pollution. If the case is reversed, the site may be safe from pollution except if there are winds from the opposite direction or in the case of calm winds, if the pollutants are very close to the site.

Research : Assess the degree of the nuisance, and its effect on the function of the project, the health of users, cleanliness of the site and building, and structural safety of the building. Determine the location of the source of pollution, its distance from the site, and the type of pollutant.

Source : Field surveys, land use maps and reports.

Rule: AVOID SITES AFFECTED BY POLLUTANTS.

FIRE/EXPLOSION HAZARDS



Sites exposed to fire/explosion hazards (e.g. close to quarries using explosives or to workshops using open flame processes) are usually dangerous and expensive to develop and are therefore not feasible for building projects. If there is no other choice, protection should be provided on site and in the building.

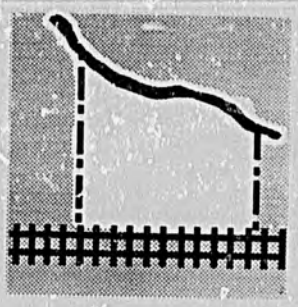
When evaluating fire hazards, wind direction should be considered. If the sources of fire are in the windward direction then there is a high probability that the site might be affected.

Research : Identify neighboring sources of potential fire or explosion. Assess their effect on the feasibility of developing the site, in terms of the well-being and safety of occupants, and protection costs. Determine the location of the source and the degree of risk.

Source : Field surveys, land use maps and code regulations.

Rule : AVOID SITES EXPOSED TO HAZARDS.

BOUNDARIES



Boundaries such as green open spaces might enhance the attractiveness of a site, while garbage dumps would be detrimental to many project functions. A site with boundaries that are barriers to access, such as a rail road or waterway, would be especially unsuitable for certain projects such as schools that need to be accessible to pedestrians from nearby residential areas. While the same site might be more appropriate for a factory to transport raw materials and goods. Land use plans and general master plans - if available - organize the relationships between different uses in terms of grouping homogeneous elements and isolating polluting ones.

Research : Examine the influence of the boundaries on the site — and on view, microclimate, circulation and land use. Consider how the boundaries affect development possibilities and the integration/seclusion of the site. Identify location and type i.e., natural or manmade boundaries .

Source : Locality/site plans, aerial photographs and site visits.

Rule : SELECT SITES WITH BOUNDARIES HAVING A POSITIVE INFLUENCE ON THE PROJECT.

CIRCULATION SYSTEM

A good external circulation system is important for most projects, to ensure easy access for users. A site with a poor external road system would be totally unsuitable for a factory project, for example, which needs to transport materials and goods to and from the site. Vital facilities such as fire, police or ambulance stations should be located along or near main roads to guarantee mobility during emergencies. These facilities and equipment maintenance units should be located along roads that are wide enough to allow easy access and on sites with enough space to accommodate ample maneuverability when entering and leaving the facilities. Pupils' entrances, in schools, should be located on secondary roads away from heavy traffic for the safety of the students.

Research : Examine the circulation system and determine the layout of the network, its capacity, road characteristics and bottleneck locations. Identify type of users and their means of transportation, and the effect of the circulation system on site access.

Source : Detailed locality plans, roads network and site visits.

Rule : SELECT SITES WITH EFFICIENT EXTERIOR CIRCULATION.

FLOODING

Sites that are threatened by floods should be avoided unless they have compensatory features and are intended for an expensive development that would cover the high cost necessary for protection. (A spectacular view might, for example, compensate for the high protection costs). Low-lying areas such as valleys and flood plains should be allocated to open space land use, such as,playgrounds and fields. Valleys should be taken into consideration as constraints while developing a building site.

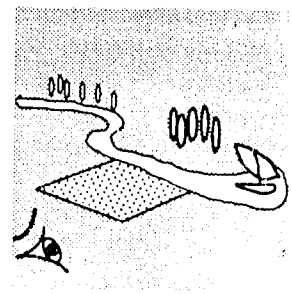
Research : Determine the feasibility of site development in terms of the safety of users and buildings, and protection costs. Locate depressed and elevated spots, evaluate means of protection, and identify areas for site drainage.

Source : Urban area/locality maps and plans, metecrological reports, topographic maps, flood records.

Rule : AVOID SITES SUBJECTED TO FLOODING.

VIEWS

Recreational projects such as clubs or youth centers could be enhanced by being oriented towards attractive views. However, this is not so important for projects, such as factories. Advantage should always be taken of natural features such as pleasent sceneries or sea shores whenever possible.



Research : Identify views that enhance/mar the development, and assess their effect on user enjoyment of the site and building, and on site orientation.

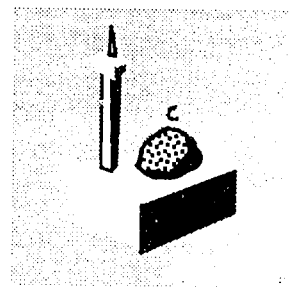
Source : Field surveys, site photographs.

Rule : LAY OUT DEVELOPMENT TO TAKE ADVANTAGE OF VIEWS.

4	COMMUNITY SERVICES AND UTILITIES

COMMUNITY FACILITIES/SERVICES

Most site functions need access to support services, and this should be taken into consideration when the site is selected. For example, a housing complex built in an area far away from community facilities is unattractive for tenants and would be very costly if facilities had to be provided especially for it.



Research : Identify the services required for the project, and the type, capacity, expansion potential and location of available services. Assess adequacy of facilities for both existing and projected populations.

Source : Locality plans and reports, names and addresses of facilities.

Rule : SELECT SITES WITH AVAILABLE COMMUNITY SERVICES.

TRANSPORTATION

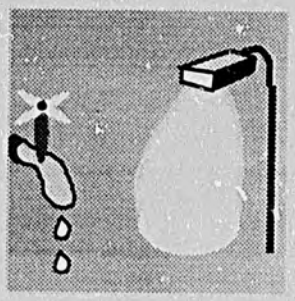
Sites that are isolated from transportation systems are unsuitable for certain projects (e.g. housing and commercial), particularly if designed for low income groups that are unlikely to have their own means of transportation.

Research : Determine the availability of transport facilities. Assess their adequacy in terms of: accessibility of services and employment from the site; users' preferred modes of transportation; distances to be travelled, and travelling times and costs.

Source : Locality plans, public transport authority.

Rule : AVOID SITES WITH POOR TRANSPORTATION TO SERVICES AND EMPLOYMENT.

UTILITIES (Potable Water, Wastewater System, Gas, Electricity, Street Lighting and Telephone)



All sites require utilities, which will need to be installed if they are not already available.

Potable water supply and wastewater disposal for a site can be provided by: a) connection to an existing network, b) development of a new community system, c) development of individual systems (wells, septic tanks).

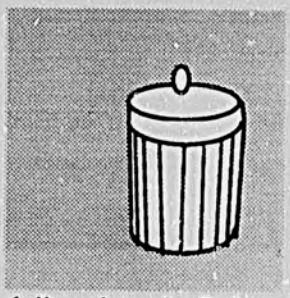
Gas, electricity, street lighting and telephones should be connected to an existing network. Generating electricity by using a generator or renewable energy is usually impractical except as an option for remote sites.

Research : Determine the availability and adequacy of existing utilities, and their effect on site layout and development costs. Identify the type and capacity of the utility, the location of the connection and its distance from the site. Make short connection runs and avoid disturbing existing utilities. Find out addresses of local maintenance agents and authorities.

Source : Utility plans and legal documents.

Rule : SELECT SITES WITH THE REQUIRED UTILITIES ON OR NEAR THE SITE.

REFUSE COLLECTION



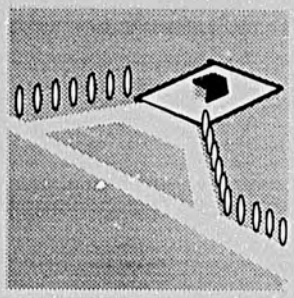
This service is needed for most types of development, but is absolutely vital for housing, hotel and hospital projects, which generate large amounts of refuse and where hygiene is particularly important. Municipal refuse collection and disposal are two important issues that need to be investigated. Refuse disposal sites and methods of disposal should be carefully selected. Refuse disposal sites - garbage dumps - should be located in areas away from residential zonning. Building on landfills should be prohibited until full compaction, settlement and treatment take place.

Research : Ensure that a refuse collection service is available and assess its adequacy in terms of existing and projected populations, quantity of refuse generated, and the quality, cost and frequency of the service.

Source : Municipal authority, private companies for refuse collection.

Rule : SELECT SITES WITH AN ADEQUATE REFUSE COLLECTION SERVICE.

ACCESSES



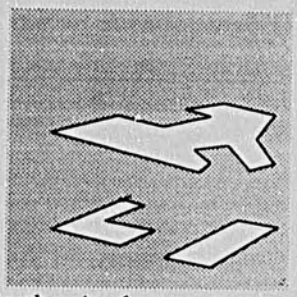
Clearly defined and visible access to a project site from its approach roads is important for many commercial and service projects such as emergency rooms, gas stations, or maintenance workshops. These types of projects need clearly defined entrances with ease of entry and exit with the provision of ample space for maneuvering vehicles without disrupting circulation in the roads surrounding the project site. Appropriate entrances could be provided either off large roads which allow good visibility, or off narrower roads by recessing the building on the site.

Research : Evaluate of access to site and building. Determine adequacy of site access in terms of location and capacity of approach roads, and project requirements.

Source : Locality/site plans, field surveys.

Rule : SELECT SITES WITH GOOD ACCESS.

SIZE AND SHAPE OF SITE



An appropriate site has a size and shape compatible with the requirements of the building project. A small site might mean increased construction costs because a tall building is needed. Irregular sites might need non-traditional site planning solutions. For example, project elements could be divided in several wings or pavilions distributed on the site for maximum site utilization.

Research : Determine shape and size of site, land subdivision, unusable areas (due to topography, soil conditions, easements, rights-of-way and existing structures), and geometry of usable site area. Assess the effect of site size and shape on efficiency of land utilization and feasibility of development.

Source : Site plans and aerial photographs.

Rule : SELECT SIZE AND SHAPE SUITABLE FOR DEVELOPMENT.

TOPOGRAPHY

Topography affects site layout and the feasibility of site development. Steep land slopes, for example, might make economical use of a site impossible, particularly if the function requires a flat site. Utilization of sloped sites should be evaluated, the possibility of cut and fill - too much of which should be avoided - must be compared with a split level architectural solution to address the nature of the site. Often when a selected site lies lower than the access roads as in the case of elevated roads, several alternatives should be investigated: entering the building in an intermediate storey, or entering via a ramp to the level of the site. These alternatives depend on the dimensions of the site and its conditions. The drainage of a steep site is different than the drainage of a flat one. How the sewer lines of the building located below street level will tie to the main sewer line on the access road. All these are questions that need to be addressed.

Research : Determine the advantages and disadvantages of the topography, and identify gradients and the type and location of natural features (e.g. trees). Bear in mind that steep slopes usually limit development possibilities and mean higher costs.

Source : Locality/site plans and topographic maps.

Rule : SELECT SITES TO MINIMIZE NEED FOR CUT AND FILL.

SOIL

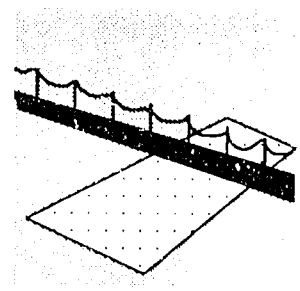
The live/dead load and the height (number of stories) of the building and the bearing capacity of the soil affect the design of the foundation. For example, if the bearing capacity of the soil is low, an elaborate foundation design for the building will be required. Accordingly, the soil on which the foundation rests dramatically affects the design time and construction cost of the building. Gravelly, sandy and rocky soils all have good bearing capacity, while clay and organic soils should be avoided. When evaluating several sites, a preliminary soil investigation should be made to evaluate the cost of foundations. More detailed soil investigations must also be made when a site is selected.

Research : Determine the impact of soil type on the foundation design, site drainage and wastewater disposal facilities. Assess the feasibility of development by considering: cost of soil improvement (if necessary), possibility of soil erosion, types of vegetation soil can sustain. Conduct compaction and bearing capacity tests.

Source : Locality/site plans, field surveys and soil reports.

Rule : SELECT SITES WITH SOILS THAT HAVE GOOD BEARING CAPACITY.

EXISTING STRUCTURES, EASEMENTS, RIGHTS-OF-WAY



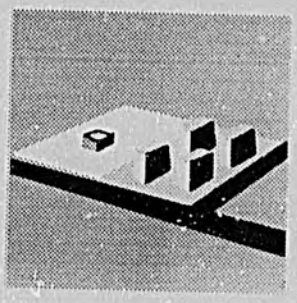
Existing structures, easements and rights-of-way can affect the location and restrict the type and size of development on a site. The cost of removing existing structures and relocating infrastructure may be prohibitive. Future expansion of roads surrounding a site should also be taken into consideration while planning the site.

Research : Assess the effect of existing structures, easements and rights of way on the type, size and location of the development.

Source : Site plans, legal documents, site surveys, building codes, utility maps.

Rule : SELECT SITES WITH NO RESTRICTIONS.

LAND COST



If land costs are too high, a site may not be feasible, particularly for community services and housing projects, where the income of user groups must be taken into account. Although most of the sites under consideration are either public property or have been donated by one of the locals (a fact that might make the site seem to be free of cost). Sometimes there are unanticipated hidden costs resulting from the existence of old structures on the site that need to be removed, the existence of infrastructure that passes through the site, the need for cut and fill (even outside the site), the need for special foundations due to poor soil bearing capacity, or existance of the site on a flood plain. Any of these issues may increase development costs.

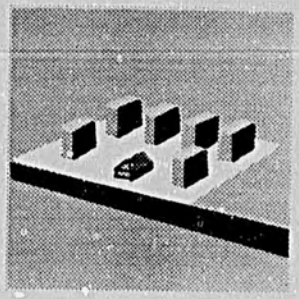
Research : Establish land costs, land development and building costs, and the total investment the developer is prepared to make. Assess suitability of the site in terms of affordability for owner and users.

Source : Urban area/locality plans, legal documents, and previous project costs and profit margins.

Rule : SELECT SITES WITH COSTS APPROPRIATE TO PROPOSED DEVELOPMENT.

INCOME GROUPS

Target income groups affect the choice of site and the way the site program is formulated. A site with poor public transportation or high land costs, for example, is unsuitable for lower income groups. The project program must be tailored to the particular needs of the target income groups.



Research : Determine the income of the target users and identify their requirements for transport facilities and other services.

Source : Surveys, soil reports, demographic data.

Rule : SELECT SITE WITH LAND COSTS AND SERVICES APPROPRIATE FOR TARGET INCOME GROUPS.

POPULATION DENSITY

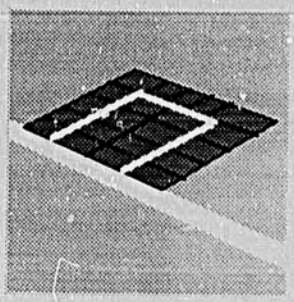
The potential number of users defines the type of housing development required (e.g. a high density high-rise apartment building for a large number of inhabitants on a small site, or low density garden apartments affordable only by high income groups).

Research : Identify the number of people to be housed by the project, and assess the per capita cost of land, buildings, infrastructure and services. Tailor projects to specific densities, bearing in mind that lower densities cost more per capita, but that high densities can cause social problems. Determine reasonable densities for different income groups, avoiding overcrowding.

Source : Master plans, land use maps, census data and reports.

Rule : DETERMINE DENSITIES ACCORDING TO USERS' FINANCIAL MEANS.

LAND SUBDIVISION



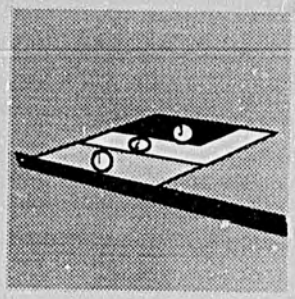
Efficient land subdivision ensures optimum land use without adversely affecting social conditions, land value or infrastructure costs. Lots should be subdivided to have narrow frontages onto roads and utilities, in order to minimize land and infrastructure costs. Lot sizes depend on the income of prospective users. Good land subdivision ensures ease of access and circulation, and minimizes wasted land and odd-shaped parcels.

Research : Evaluate the most efficient way of subdividing the land. Determine lot sizes based on affordability for users and feasibility of building on site.

Source : Land subdivision plans, social surveys.

Rule : SUBDIVIDE LAND TO MINIMIZE DEVELOPMENT COSTS.

PHASING



The implementation of some projects needs to be staged to meet changing needs. Shopping or educational facilities in a residential neighborhood, for example, should develop incrementally to match the increasing number of users, rather than have initial overbuild. Future expansion of the project is considered when selecting and planning a site. Project requirements change with time, therefore, future expansion, whether vertical of horizontal, should be possible with minimal disrupting to the building operation.

Research : Determine staging priorities and time phasing, taking into account costs, availability of financing and future needs. Develop alternative plans to allow for development at different rates.

Source : Demographic data, project phasing reports.

Rule : AVOID LARGE SCALE RAPID DEVELOPMENTS.

SITE SELECTION AND PLANNING CHECKLIST

The following checklist is designed to aid the analyses conducted when selecting or planning a site. The checklist is arranged according to the five main categories of considerations used in the guidelines: 1) legal issues, 2) regional issues, 3) neighborhood issues, 4) community services and utilities, and 5) site characteristics. Special considerations for large-scale housing projects are also included in the checklist.

The checklist is designed in a table format, and key issues that need to be addressed during site selection and planning are posed in the form of questions. The response to the questions should be entered in the appropriate box. Ideally all questions would receive a positive response.

Space has been included in the table for any explanatory comments to be recorded. These are particularly important when a question has received a negative response. In this case, the comments should attempt to show how any constraints or problems might be overcome. The completed checklist thus serves as documentation for both the site selection and planning processes.

Copies of the checklist can be made for distribution to all those responsible for site selection and planning.

1	LEGAL ISSUES

Considerations	Questions	Answer		Comments
		Yes	No	
Land Tenure	• Is the land available for immediate development?			
Government/ Municipal Regulations	• Do regulations allow the use of the lot for the project?			

2	REGIONAL ISSUES

Considerations	Questions	Answer		Comments
		Yes	No	
Location	• Is the site appropriate for the project function?			
Climate	• Is the region free from adverse weather conditions?			
Pollution (Dust, Smoke, Fumes and Noises)	• Is the site located away from pollutants?			
Fire/ Explosion Hazards	• Is the site located away from sources of hazards?			

3	NEIGHBORHOOD ISSUES

Considerations	Questions	Answer		Comments
		Yes	No	
Boundaries	• Is the project compatible with neighboring uses?			
Circulation System	• Is there a good road network around the site?			
Flooding	• Is the site free from the risk of flooding?			
Views	• Does the site have an attractive view?			

4	COMMUNITY SERVICES AND UTILITIES

Considerations	Questions	Answer		Comments
		Yes	No	
Community Facilities/ Services	• Are community services within walking distance?			
Transportation	• Is the site served by public transport?			
Utilities (Potable water, Wastewater System, Gas, Electricity, Street Lighting and Telephone)	• Can the site be adequately serviced by these utilities?			
Refuse Collection	• Is there an adequate refuse collection service?			

5	SITE CHARACTARISTICS

Considerations	Questions	Answer		Comments
		Yes	No	
Accesses	• Does the site have direct access from approaches?			
Size and Shape of Site	• Is the site size and shape suitable for the project?			
Topography	• Is the site topography suitable for construction?			
Soil	• Is the site soil suitable for project loads?			
Existing Structures, Easements, Rights-of-way	• Is site development unaffected by existing structures, easements and rights of way?			
Land Cost	• Is the land cost suitable for the proposed development?			

6	SPECIAL CONSIDERATIONS

Considerations	Questions	Answer		Comments
		Yes	No	
Income Groups	• Are proposed lot costs affordable to target groups?			
Population Density	• Are the proposed densities reasonable?			
Land Subdivision	• Do lot sizes meet users' needs and are costs compatible with their means?			
Phasing	• Has project staging been properly considered?			

SITE SELECTION CASE STUDY

Kafr Salam Village needs an elementary school. The four sites shown in Figure 13 are available for selection. The typical school building and the four sites - scale 1:1000 - are shown in Figure 14. Please select the most appropriate site for the project. Site data is provided below:

Site Nº1

Boundaries: The north boundary abuts a secondary road, while to the east, south and west are residential plots. On the north side of the road, and towards the north west, there are two small industrial plants with chimneys.

Land Tenure: The land belongs to the local council.

Zoning Regulations: Services.

Site Nº2

Boundaries The site is located in the middle of agricultural land.

Land Tenure: The land has been donated by the owner for the construction of the school.

Zoning Regulations: Agricultural land use.

Site №3

Boundaries: The southern boundary abuts a secondary road, and to the north, east and west are residential plots.

Land Tenure: The land belongs to the local council.

Zoning Regulations: Not specified.

Site №4

Boundaries: The east boundary abuts a main road. To the north, south and west boundaries are residential plots.

Land Tenure: The land has recently been purchased by the governorate to be used for local community projects.

Zoning Regulations: Buildable land without a specified type of land use.

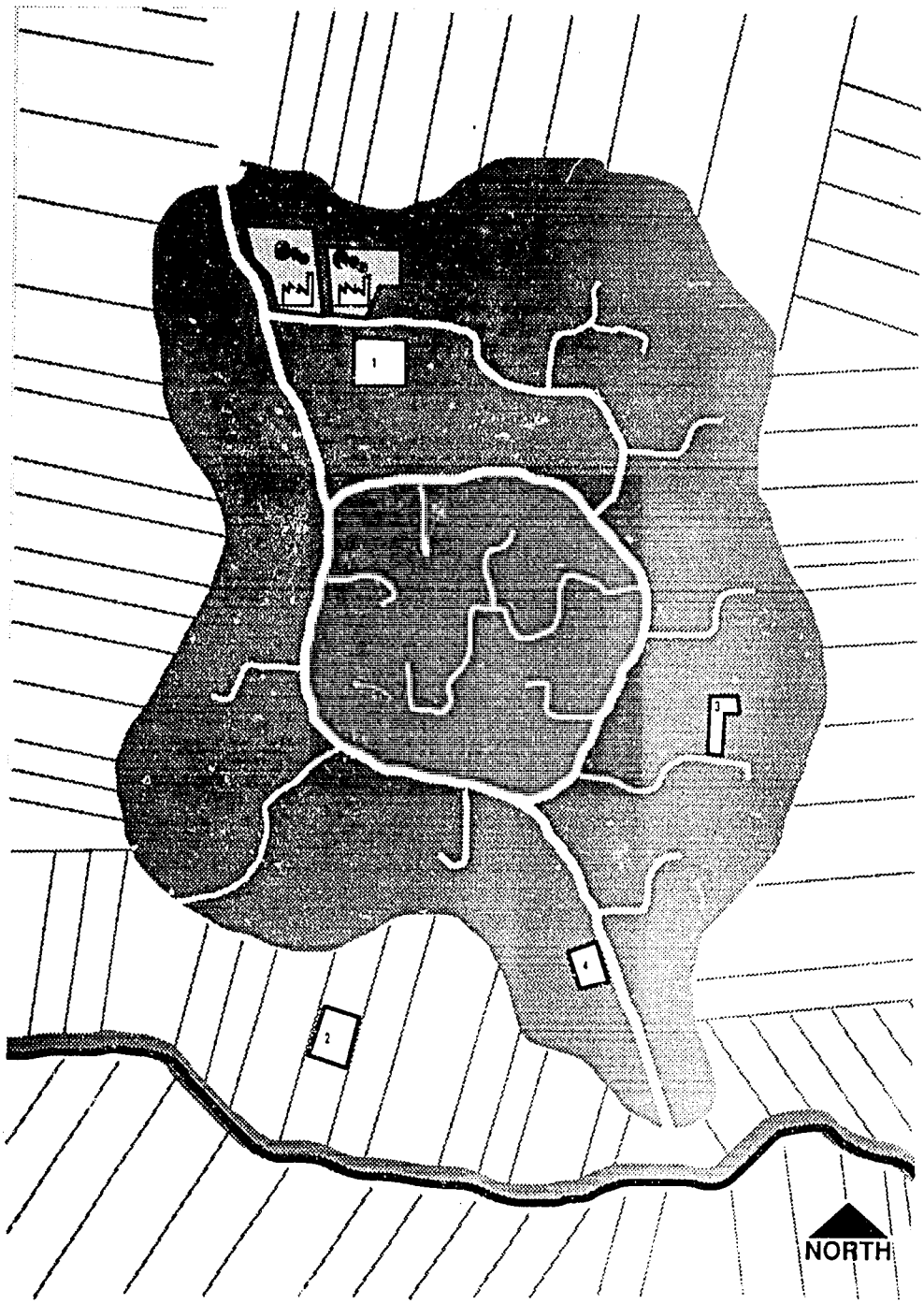


Figure 13 Sites Available for Selection

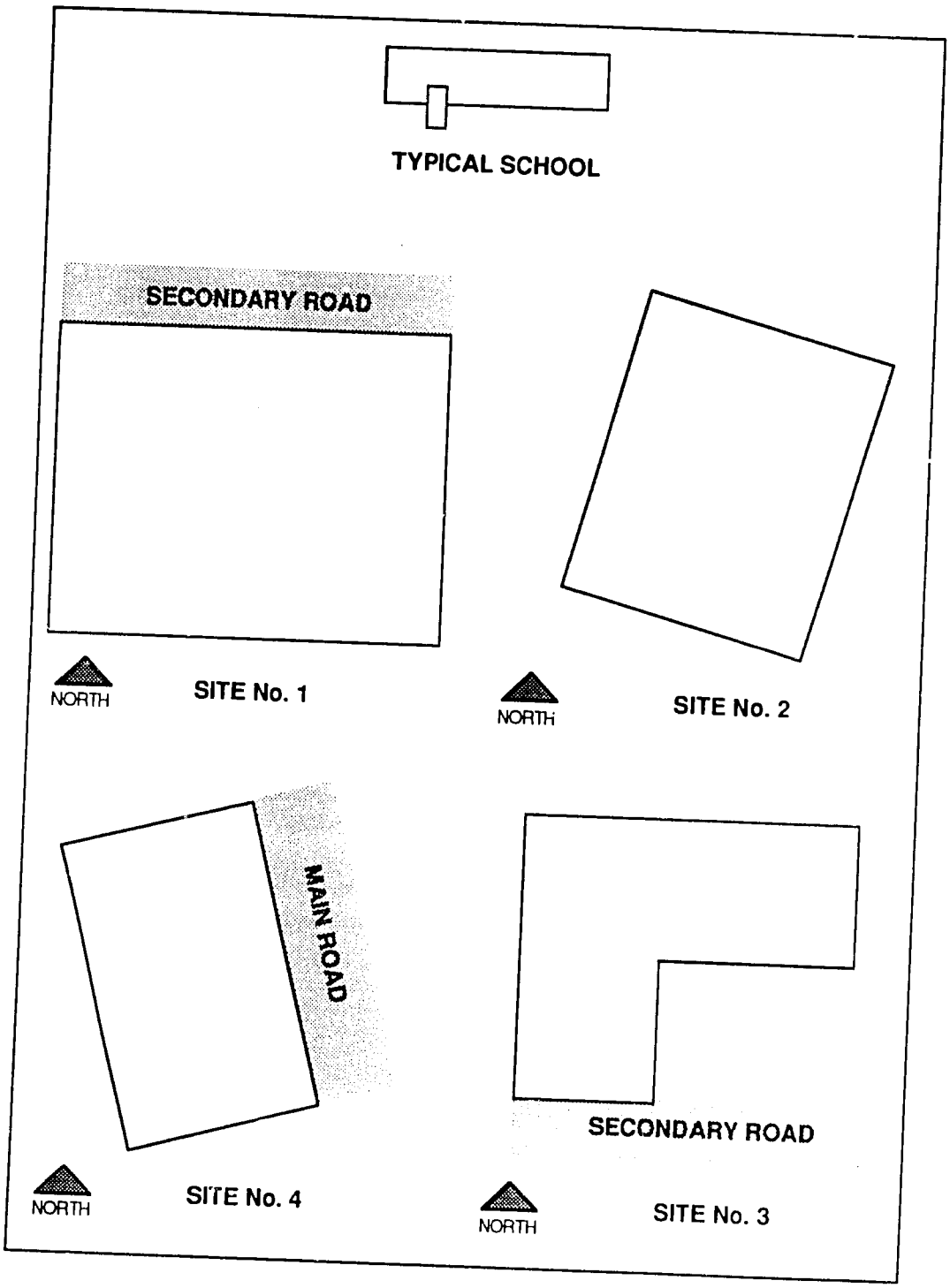


Figure 14 Typical School and Enlarged Sites

SITE SELECTION MATRIX

The following is an example of a simple site selection matrix prepared to assess three site alternatives, A, B and C. The alternatives are assessed in relation to each of the considerations listed, and graded from 1-10 for each.

A site with a very efficient external circulation system, for example, would be given 9 or 10 points in that category, while if the land cost appeared high for that type of project, the site would be given a low score. If government/municipal regulations prohibited the use of the site for the type of use required by the project, the site alternative would be given a score of 0. If a site was located fairly close to a fire hazard but the risk was deemed low to medium and adequate protection could be provided, the site might receive a middle-range score of perhaps 5 points.

When all site alternatives have been examined in the light of the considerations, the alternative with the highest total score is selected as being the most suitable for the project.

SAMPLE MATRIX

Considerations	Alternative A	Alternative B	Alternative C
LEGAL ISSUES			
Land Tenure			
Government/ Municipal Regulations			
REGIONAL ISSUES			
Location			
Climate			
Pollution			
Fire/explosion hazards			
NEIGHBORHOOD ISSUES			
Boundaries			
Circulation system			
Flooding			
Views			
COMMUNITY SERVICES/UTILITIES			
Community Facilities/Services			
Transportation			
Utilities			
Refuse collection			
SITE CHARACTERISTICS			
Accesses			
Size and shape of site			
Topography			
Soil			
Existing structures, easements, rights-of-way			
Land cost			
SPECIAL CONSIDERATIONS			
Income groups			
Population density			
Land subdivision			
Phasing			
TOTAL			

SITE PLANNING CASE STUDY

The site shown in Figure 15 has been allotted for building Al-Nasr elementary school in Kafr Salam Village. A typical design provided by the governorate is shown in Figure 16. Figure 17 is a topographical map.

Please plan the site provided in Figure 15 taking into consideration building location, orientation, provisions for playgrounds, approaches and accesses. Site data is provided below:

1 LEGAL ISSUES:	Land tenure:	The site belongs to the governorate.
	Regulations:	The site is zoned for educational use.
2 REGIONAL ISSUES:	Location:	The site is in a residential area.
	Climate:	Moderate inland climate. (Facility would need usual provisions to cut summer heat and winter cold).
	Pollution:	This is an average residential site located away from pollution. Noise: Fairly quiet, but some traffic on the west road. (Recommend to build 50m away from site boundary.)
	Fire/Explosion:	No potential hazards.
3 NEIGHBORHOOD ISSUES	Boundaries:	A 15 m. wide secondary road with a 30m right-of-way bounds the site to the west. No access to the site is allowed along this road. A 10 m. wide service road bounds the site to the south. Access to the site is allowed along this road at least 50m away from the center line of the secondary road. Two pedestrian paths (4m wide) bound the site to the north and the east.

	Circulation:	Vehicular circulation on the west secondary road and south service road.
	Flooding:	There is a valley in the north east corner of the site (see topographical map).
	Views:	No particularly pleasant views, and none to be especially avoided.
4 COMMUNITY SERVICES AND UTILITIES	Facilities/Services:	This project is considered one of the required community services.
	Transportation:	There is a public bus stop on the secondary road in front of the site.
	Utilities:	A potable water network services the site under both roads, but the site is allowed to connect to the network only along the service road. A wastewater system network running along the service road services the site. Electric cables run along both roads. The project is allowed to connect to the mains along the service road. A telephone service is available off the service road.
	Refuse Collection:	Refuse is collected regularly, and dumped and incinerated away from the site.
5 SITE CHARACTARISTICS	Accesses:	Access is allowed along the service road and pedestrian paths.
	Size and Shape:	The overall area of the site is about 3 feddans (140m x 90m). (This is sufficient for constructing an elementary school.)
	Topography:	See attached topographical map. (Contour line every 0.25 m.)

Soil:	Could support a three-story construction.
Structures:	No existing structures.
Easements:	None
Rights-of-way:	See under "boundaries" above.
Land cost:	Reasonable for a school building.

6 SPECIAL CONSIDERATIONS

Income Groups:	NA
Population Density:	NA
Land Subdivision:	NA
Phasing:	The project should be built in stages because the facility needed by the existing population requires only half the site, but the population of the village is expected to increase in the near future. The rest of the residential area will develop simultaneously and as a result the school will be required to take more students.

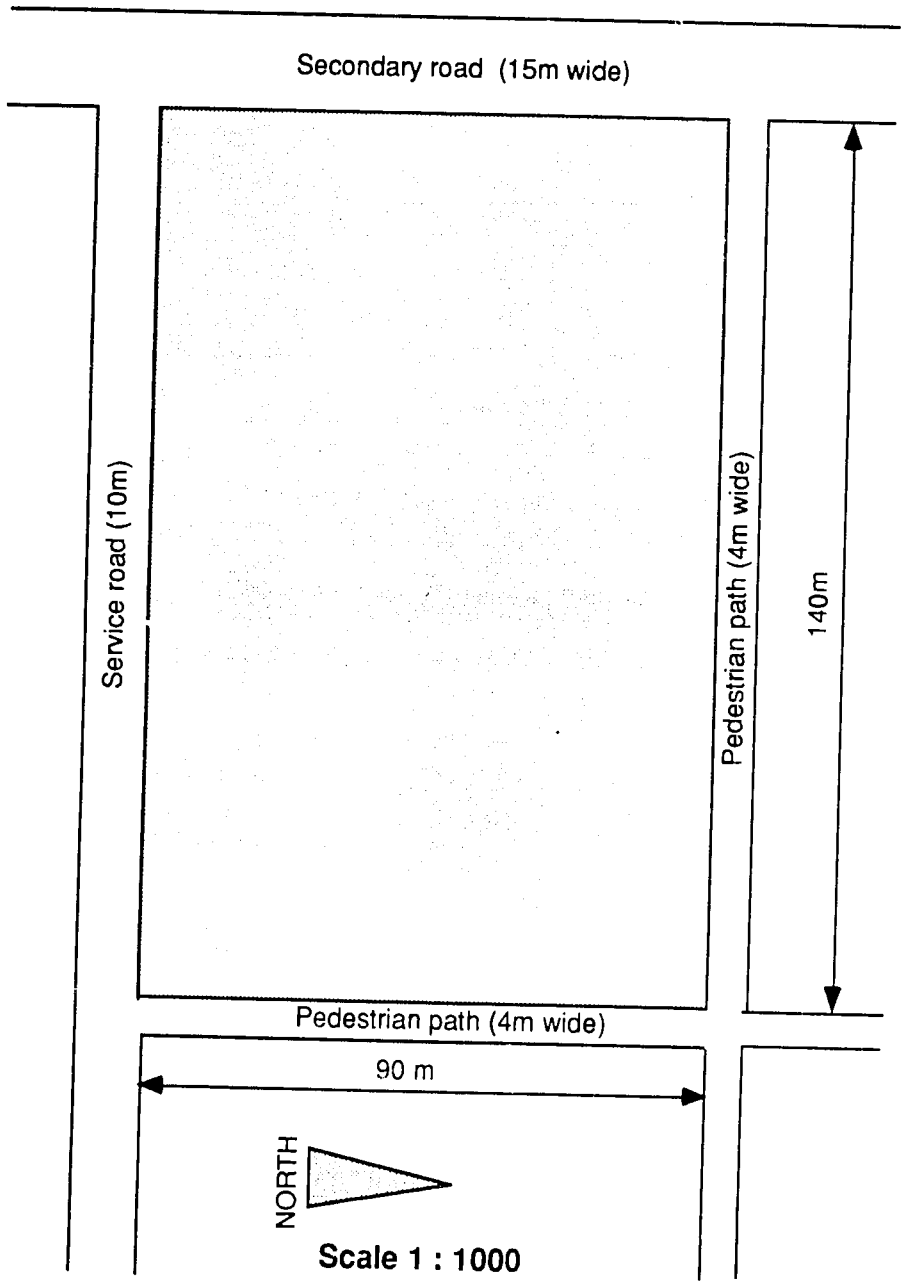
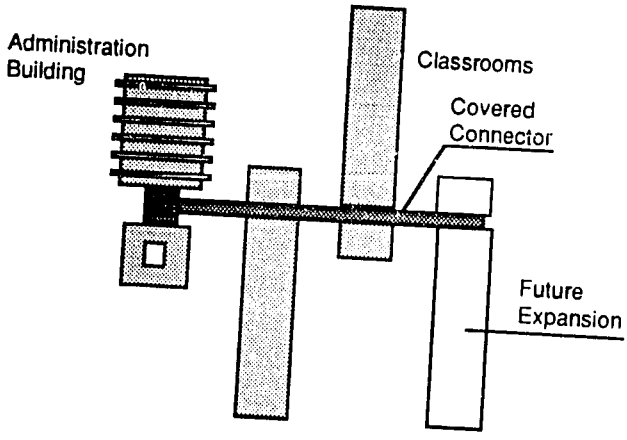
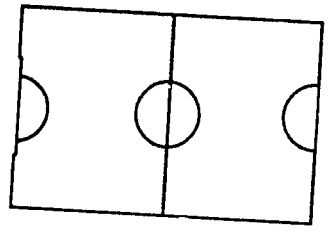


Figure 15 Project Site



Typical School Plan



Football Field

Scale 1 : 1000

Figure 16 Typical School Building Design and Standard Football Field

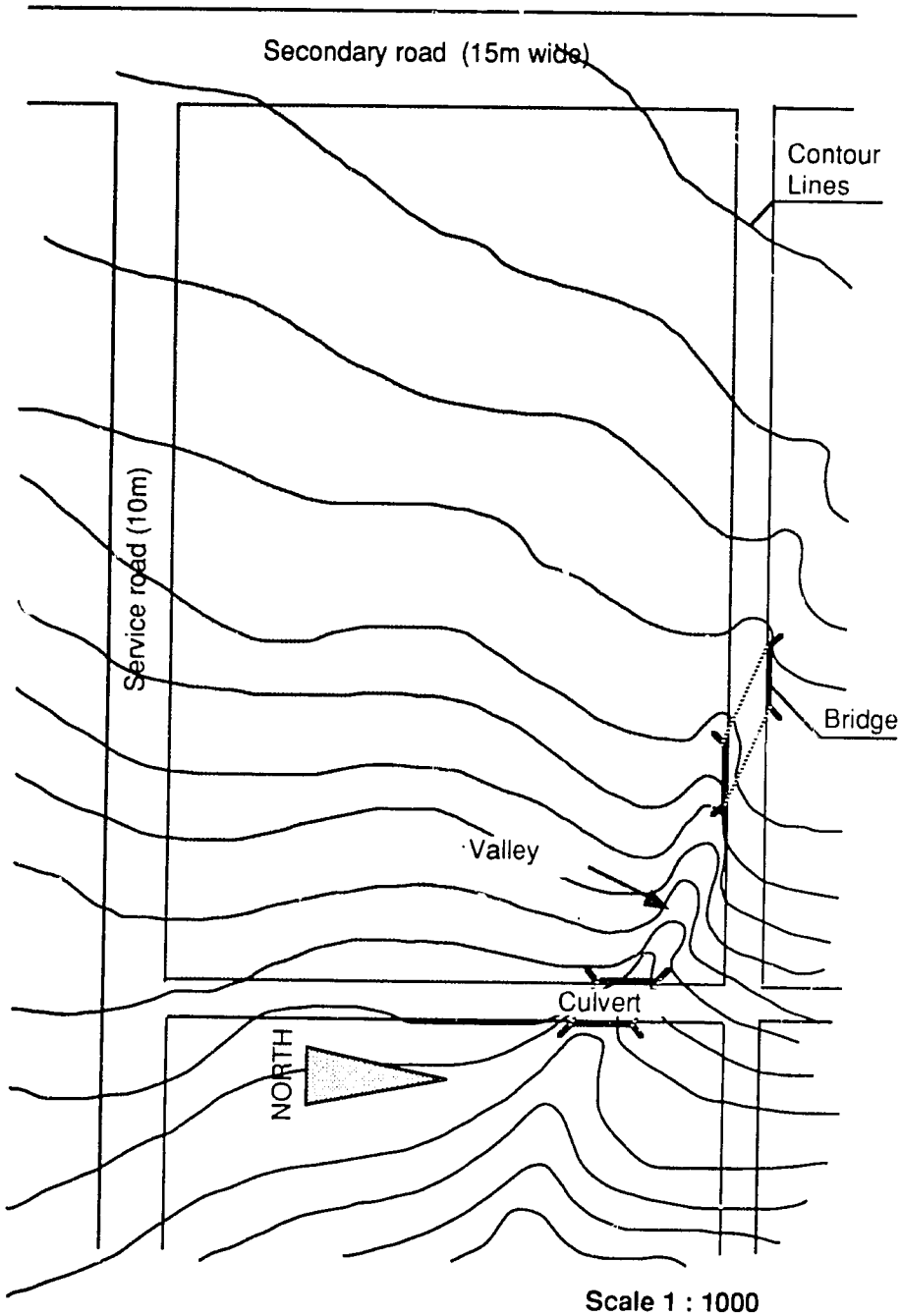


Figure 17 Topographical Map

SECOND: CONSIDERATIONS FOR BUILDING DESIGN

This section presents the major considerations that should be taken into account during the building design process: site design; building design; doors, windows and finishes; regulations; and engineering systems.

It addresses the main technical issues encountered during building design, and should be used by technical staff when designing buildings.

Each consideration is first introduced and then followed by a description of the research task required to fully investigate the consideration. Sources of information useful for performing the task are then given. The section concludes with rules of thumb and general recommendations for each consideration.

1	SITE DESIGN

BUILDING LOCATION

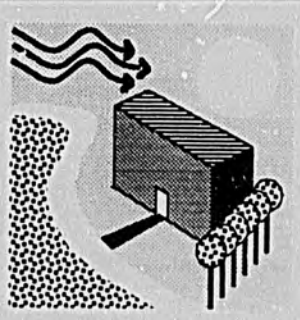
A proper building location on site should adequately orient its users, visitors and services to the building's functions. The most important considerations to be taken into account when locating a building on site are: location of access, approach, entrances and exits to ensure user safety; location of parking facilities and existing utilities; view and provisions for future expansion. For example, if the building is to be constructed as a local council building, its location should be selected to face a public square, if possible. It should also be accessible from that square. The building may be adjacent to other buildings that serve the local people, such as an agricultural co-op, or on the site of the central unit.

Research : Determine the different functions required by users, visitors and services, and evaluate their relative importance. In a hospital, for example, an emergency entrance is more important than the staff or visitors' entrance. Then locate the accesses, entrances and exits, ensuring safe and efficient circulation. Locate utilities and size parking facilities, if necessary. Take into account requirements for, and possible direction of future expansion (vertical versus horizontal).

Source : Utility maps, site program, site plan and site surveys.

Rule : LOCATE THE BUILDING TO ENSURE PROPER ACCESS, MINIMIZE UTILITY RUNS AND ALLOW FOR FUTURE EXPANSION

BUILDING ORIENTATION



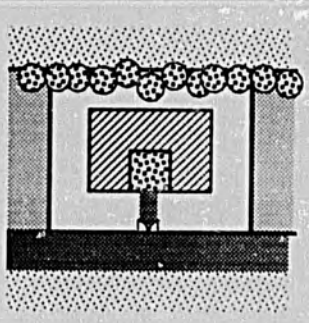
Climate, topography and site features are the three main features that influence building orientation. A pleasant view, for example, might set the orientation of the building (a governorate building, which is an office-building, might be oriented to a waterway or to an open land to benefit from a view), while slopes could make proper orientation difficult, i.e. a northward slope is preferred over a southward one with regard to catching prevailing winds. The direction of the wind should also be taken into account when orienting the building, to ensure proper ventilation. Buildings should be oriented northwards to catch the summer breeze, and to promote cross ventilation. North-facing courtyards also moderate the building temperature during hot hours. A site visit is essential to determine the factors affecting orientation.

Research : Determine latitude, in order to calculate sun angles, and test wind direction. Investigate site characteristics.

Source : Meteorological charts, topographical maps and site visits.

Rule : ORIENT BUILDING EAST-WEST WITH LARGE WINDOWS FACING PREVAILING NORTH WIND

EXTERIOR SPACE



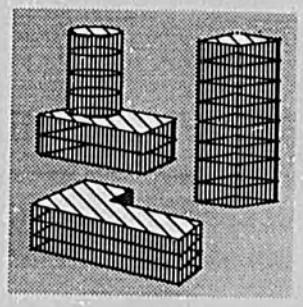
When the building has been located and the functional elements set on site, the rest of the site is left for outdoor space use such as courtyards and landscaped areas. Efficient planning of outside space will maximize site use, extending the functional area of the facility at minimal cost. Exterior space is particularly useful when covered with light structures, to provide sun and rain protection. The use of such space is essential to the building's function, particularly in our countryside's moderate weather. For schools, these spaces can be used for setting outdoor classrooms as an extension to the overcrowded indoor ones, to allow students to enjoy the weather, natural light, and free movement.

Research : Determine the type of outdoor space use suitable for the function of the project (i.e. playgrounds for schools, balconies/patios for residential projects, open courts for maintenance centers).

Source : Site plan, building program and floor plans.

Rule : ENSURE THAT OUTDOOR SPACE USE IS APPROPRIATE FOR THE PROJECT FUNCTION

ARCHITECTURAL FORM



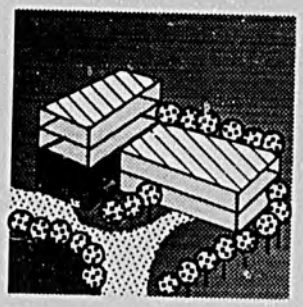
Architectural design is a creative process, where the architect thinks first of the building's elements and their function as defined by the owner. We should remember that not only does the architect have to satisfy the owner's wishes and the building's function requirements, but also has to investigate the aesthetic aspects. Therefore, when the building's concept is laid-out and the general form is defined, whether linear, central, radiant, or organic, the architect should start to place the building elements in a way that satisfies the building functional requirements and be aesthetically pleasing. For example, the cost of a downtown site overlooking the Nile river would encourage the architect to look for a multi-storey solution. On the other hand, in a new housing development, which requires low housing density, the architect resorts to a simple architectural solution involving one or two-storey structures. In both cases, the building form is affected by the architectural solution: the multi-storey building is governed by the building code that often requires setbacks at different heights according to the street width, hence, affecting the shape of the building. However, the one or two-storey building has various architectural solutions, e.g. detached units, each on a separate lot or attached units sharing one entrance and one stairway, whether they are one or two-storey units, or semi-attached units.

Research: Consider the functional relationships between the building's various spaces to govern their vertical and horizontal, distribution bearing the aesthetic appearance of the building in mind. Identify the other factors that might affect the building form, such as land price, site characteristics, and building code.

Source: The owner, user groups, site visits, municipal council, or markaz.

Rule: REMEMBER THE AESTHETIC APPEARANCE AND MANAGE ITS REALIZATION THROUGH THE ARCHITECTURAL FORM OF THE BUILDING.

FUTURE EXPANSION



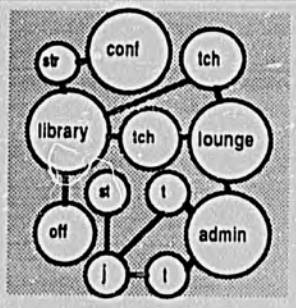
The Egyptian village's need for public buildings has been increasing as a result of high population growth that requires additional services and utilities. Therefore, planning should be based on the prospective population size. Otherwise, the short planned services and utilities would be subjected to unforeseen burdens that could eventually lead to low performance levels. For example, the classroom that is designed to accommodate 30 students is overcrowded now by 50 and sometimes 80 students. Therefore, when we think of building a new school, we should consider the project cycle duration, starting from the design and official approvals stage, until the construction and handing-over stage; the building design should be based on the requirements expected when the building is handed over. Future expansion should also be considered, either vertical or horizontal: the latter requires a site plan that could accommodate additional buildings, whereas the former necessitates foundation design that allows for future stories.

Research: Use the latest census and annual increase rate to calculate the prospective increase in population. Locate the building on site to allow for horizontal expansion, whether connected or separated. Jointly with the structural engineer, design the building foundation to accommodate future additional storeys.

Source: Central Agency for General Mobilization and Statistics, site visits, building program, and the structural engineer.

Rule: IDENTIFY FUTURE EXPANSION NEEDS AND HOW TO REALIZE THEM.

SPATIAL LAYOUT



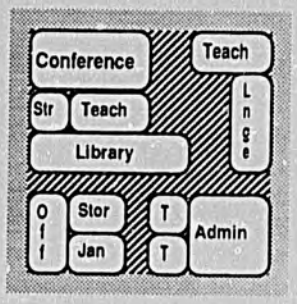
Interior spaces should be arranged according to their functions (i.e. in a house, a bathroom should be close to a bedroom). The arrangement should ensure easy access and circulation between different spatial functions and should function in plan (horizontally) as well as in section (vertically). Kitchens and bathrooms should be stacked vertically to facilitate plumbing. When designing a markaz health facility the architect should put into consideration the direct relationship between the emergency room and the room of the doctor on call. Similar to the relationship between the out-patient main reception hall and the internal medicine exam room that receives most of the patients. It is necessary that spatial relationships in various buildings and in the same building be evaluated.

Research : Determine the relationships between different spatial functions and prioritize to establish the most workable and efficient layout. Make bubble diagrams, representing each space by a labelled circle and each functional relationship by a line.

Source : Building program, discussions with user groups and owner.

Rule : ACCOMMODATE HORIZONTAL AND VERTICAL FUNCTIONAL RELATIONSHIPS.

INTERNAL CIRCULATION



Corridors, vestibules, stairs, ramps, and elevators are all means of circulation. The type of circulation path required is determined by the relationship between the spatial functions it is linking. In a maintenance center, for example, the path between the main entrance and the workshop should be unobstructed and wide enough to allow easy passage of vehicles. Distances between spaces should be short, and complicated circulation paths should be avoided. The internal circulation system must ensure that speedy exit is possible in case of emergency. (Wide paths prevent bottlenecks.) In multi-storey schools, the stairway is the vertical circulation element that links the various stories, and often serves as an emergency exit in case of fire or other emergencies. It is advisable to design a school with stairways at both ends of circulation passageways to give the pupils a chance in case of emergencies, to select the least dangerous exit.

Research : Examine the relationship between different spatial functions and then determine the most suitable means of circulation. Promote direct access between spaces.

Source : Building program, code regulations on emergency exiting requirements.

Rule : ESTABLISH STRAIGHT PATHS WITH MINIMAL INTERSECTIONS IN CIRCULATION PATTERNS.

DOORS

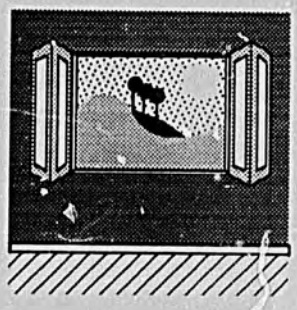
Doors provide access, control, security and privacy, as well as fulfilling exiting requirements. Doors need to swing in the direction of exiting. Each door opening requires a lintel to carry the load of the wall above it and to allow the door to operate freely. The frame is anchored in the wall with imbeds. Door curbs are used to prevent water flooding, and thresholds to cut drafts. The doors are of various kinds and usage. A door of a public toilet building, for example, differs in use and purpose from the door of a village maintenance workshop building. Each has its own specifications to fit the way it is used. In the same building as well, door specifications differ according to the spatial function. The main door of a public toilet building needs a key and lock, whereas the toilet rooms need a bolt without key, this affects the number of needed hardware and accordingly the building bill of quantities and spesifications.

Research : Determine the location and number of doors required. For each door, determine its size, type (single or double), and means of operation (swinging or rolling), and the material (wood, metal, etc.) and hardware (locks, etc.) required.

Source : Building program, discussions with owner and user group, building code.

Rule : PROVIDE ADEQUATELY SIZED DOORS AT APPROPRIATE LOCATIONS.

WINDOWS



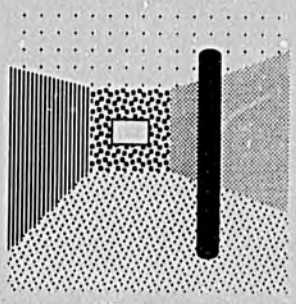
Windows provide natural lighting, ventilation and access to views. Larger windows should be used to take advantage of pleasant views. Windows should open to the north, to catch summer breezes. To reduce direct sunlight and cut out glare, vertical louvers should be used on east and west elevations, and horizontal ones on south elevations. Each window frame needs a lintel and should be anchored to the wall properly. Window types differ according to their uses: a classroom window should be at a proper height and fills the full width of the wall, to allow as much natural light as possible, whereas a window in a grain store should be high and small to provide more space for storage. The function of a window also differs in the same building: office windows in post offices or a telephone building differ from those of the toiletrooms.

Research : Determine location and number of windows required and, for each window, the size, type (e.g. shutters, metal security bars), means of operation (swinging, sliding), and material (e.g. wood, metal) needed. Also determine sill heights, and coordinate these in elevations. Consider the location of partitions with respect to window locations.

Source : Site layout map, building program, code regulations and building floor plans.

Rule : OPEN WINDOWS ON NORTH RATHER THAN SOUTH ELEVATION.

FINISHES



Exterior finishes should be chosen to withstand the elements as well as to be aesthetically pleasing. Interior finishes, meanwhile, are selected to conform to the space function i.e. normal (office, living), wet (bathroom, kitchen), or special (maintenance center, slaughter house). Walls and ceilings in spaces performing different functions have the same finish, while floors always have different finishes according to their space function. Even in two similar office rooms, walls and ceilings might be identically finished, whereas mosaic is used for one floor and vinyl for the other. Finish materials have been widely elaborated, with a lot of options in the Egyptian market; this helps the architect in selecting the material that matches the nature of the building and the space to be finished: Some of these materials are too expensive to be included in the budgets of many localities. Nevertheless, we have to remember that expensive finish materials have two advantages: they provide an aesthetic value, and are more durable (e.g. the difference between lime and oil paint which is considered a better investment).

Research : Specify appropriate finishes for each spatial function. Select finishes on aesthetic grounds as well as for durability.

Source : Building program, product data, owner and user group discussions.

Rule : SELECT FINISHES APPROPRIATE TO SPACE FUNCTION AND COORDINATE COLOR AND TEXTURE.

BUILDING CODE

The building code includes regulations on fire hazards, exiting requirements, ventilation, plumbing and electricity. The code is designed to ensure public health and welfare. Compliance is vital to protect life and property during both the construction and occupancy of buildings. Before starting construction, the owner should obtain a building license from the authority whose jurisdiction governs the land to be used for the building. The license requirements are:

- application
- A full package of all architectural and engineering drawings, including site plan and three copies of construction documents, structural, sanitary, and electrical drawings
- approval of the concerned authority

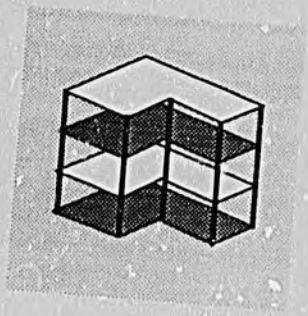
As for the governmental agencies that are often the owners of public building projects in localities, they do not need building licenses, since the engineering department that designs and supervises the construction of the building is itself the authority that issues the licenses.

Research : Research relevant regulations, and ensure that the building meets all requirements (number of exits, corridor widths, direction of door swing, etc.). Bear in mind that conforming to the code is a minimum requirement, and that violating the code could entail fines.

Source : Building code, code officials, site plan, building design and site visits.

Rule : ENSURE FULL COMPLIANCE WITH CODE.

STRUCTURE



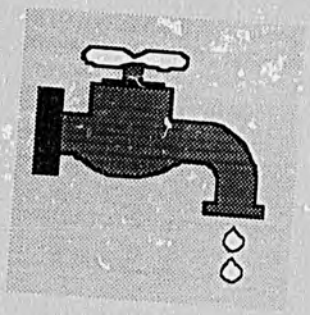
The structural design of the building is the design of its foundations, columns, beams, bearing walls, roofs and floors, and is based on the dead and live loads, and function of the building. A workshop, for example, would need a long span structure while an office requires a short span structure. Although reinforced concrete is the most widely used structural material, it is not always the most appropriate. A maintenance center shed, for example, should use a lighter structure such as steel. The building structure consists of two parts: one on the ground (above-mentioned) and another under the ground, which is no less important, which includes the foundations, column bases, and ground beams. The latter is often reinforced or ordinary concrete while the former might be steel, wood, etc. The underground structure directly transfers the building loads to the earth and should be treated, in all cases, by a proper layer of water proofing to resist ground water and soluble soil salts.

Research : Investigate and select the most appropriate structural system for the function of the building. Determine soil characteristics (from soil report) and dead and live loads to establish the type and size of foundations. Estimate rainfall, provide waterproofing on roofs to protect structures, and slope roofs slightly downwards towards drains or downpouts.

Source : Soil engineer, structural engineer, building code and building program.

Rule : SELECT A STRUCTURAL SYSTEM APPROPRIATE TO THE BUILDING FUNCTION.

PLUMBING



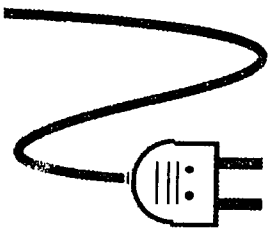
The plumbing system includes all the pipes, fittings and valves supplying water to the building and site and draining it. Water is first supplied on site for use during construction, and later for consumption cleaning purposes and for watering plants. Inside the building, water is supplied to kitchens, bathrooms and to rooms containing special equipment requiring water for operation. Site drainage involves collecting and disposing of surface water and sometimes, at sites with high water table, subsoil water especially during construction. Building drainage involves collecting and disposing of wastewater from sinks, lavatories, bath tubs, and equipment.

Research : Determine the location of bathrooms and kitchens, and try to stack them vertically or back-to-back to reduce the length of pipe runs. Evaluate the possibility of using a plumbing chase to run risers in multi-story buildings, rather than running plumbing pipes along building elevations. Use a dropped slab in kitchens and bathrooms to allow pipes to run horizontally in the floor. Locate fixtures and fittings, bearing in mind the higher cost of plumbing each fixture separately.

Source : Code regulations, floor plans, discussions with owner and users, recommendations of fixture and equipment manufacturers.

Rule : DESIGN SYSTEM TO PREVENT LEAKAGE, AND INSTALL WATERPROOFING IN WET AREAS.

ELECTRICITY



Electric current is used for lighting, communications and for operating machines, equipment and appliances. It is transmitted through cables and wires usually protected inside the building by conduits. The type of light (e.g. incandescent, fluorescent) and its intensity should be chosen according to the space function in which it is to be used. Electric current is one of the most important requirements of a public building. It differs according to the building function: a village rescue and fire station need a 2-phase current, whereas a vehicular maintenance garage needs a 3-phase current.

Research : Anticipate consumption rates and determine the amount of current required. Select an appropriate size of cable/wire and a suitable backup (generator) if necessary.

Source : Electrical engineer, utility maps, and electrical authority guidelines.

Rule : SUPPLY THE RIGHT CURRENT FOR EACH EQUIPMENT AND FIXTURE.

BUILDING DESIGN CHECKLIST

The following checklist is intended for use as a quick reference during the architectural design process. It is based on the issues discussed in the previous section on Considerations for the Building Design Process, and is designed in the form of questions. Each question has a yes/no answer column. Ideally, each question would receive a positive response. Space has also been included in the table for any explanatory comments to be recorded. These are particularly important when a question has received a negative response. In this case, the comments column should be used in identifying any obstacles and suggest how they might be overcome.

1 SITE DESIGN

Considerations	Questions	Answer		Comments
		Yes	No	
Building Location	• Is the building close to utilities and roads? • Does the building location allow for future expansion?			
Building Orientation	• Is the building oriented east /west?			
Exterior Space	• Is outdoor space use appropriate to the project function?			
Architectural Form	• Has the aesthetic appearance been realized?			
Future Expansion	• Has future expansion been taken into consideration?			

2 BUILDING DESIGN

Considerations	Questions	Answer		Comments
		Yes	No	
Spatial Layout	• Are the spaces adequately arranged according to their functional interrelationships?			
Internal Circulation	• Is the circulation pattern adequate and easy to follow?			

3 DOORS, WINDOWS AND FINISHES

Considerations	Questions	Answer		Comments
		Yes	No	
Doors	• Do doors provide adequate means of access and egress?			
Windows	• Are windows properly located with respect to orientation?			
Finishes	• Are finish materials appropriate to space function?			

4	REGULATIONS

Considerations	Questions	Answer		Comments
		Yes	No	
Building Codes	• Does the building comply with codes?			

5	ENGINEERING SYSTEMS

Considerations	Questions	Answer		Comments
		Yes	No	
Structure	• Is the structural system adequate to support the building?			
Plumbing	• Is the system designed to prevent leakage?			
Electricity	• Can the right current be supplied to the building?			

BUILDING DESIGN CASE STUDY

Kafr Salam Village is building Al-Nasr elementary school. A site was selected for the project and the planning process is now underway.

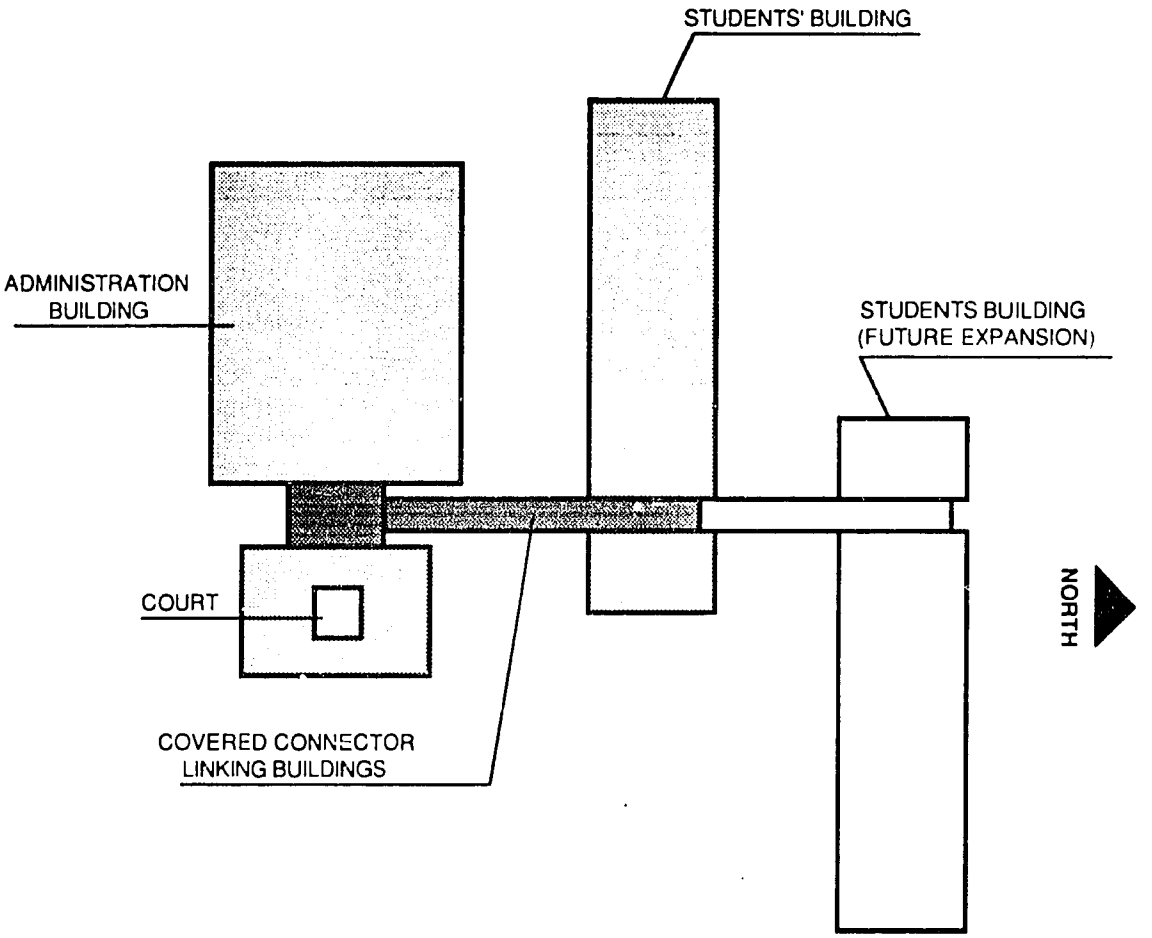
The project consists of two buildings: an administration building to house all teachers, offices and common spaces (library, multi-purpose room, etc.) and a typical two story building housing the students.

A constant population increase in Kafr Salam necessitates provisions for future expansion, especially in the student building. Therefore, the structural system and architectural design of the student building should allow for vertical and horizontal expansion. Vertical expansion can be accommodated by adding one more floor on top of the building. Horizontal expansion can be accommodated by building an identical construction to the north of the student building. A connector on the first floor is required to tie the buildings together (see figure 18.)

The architectural design for the administration building has been taken from the floor plan of an elementary school recently built in a neighboring village. The facility operated successfully during the last school year with only minor problems in the student building.

As a result the student building needs a new design and the necessary preparations in order to start construction as soon as possible, since the village is in great need for the school.

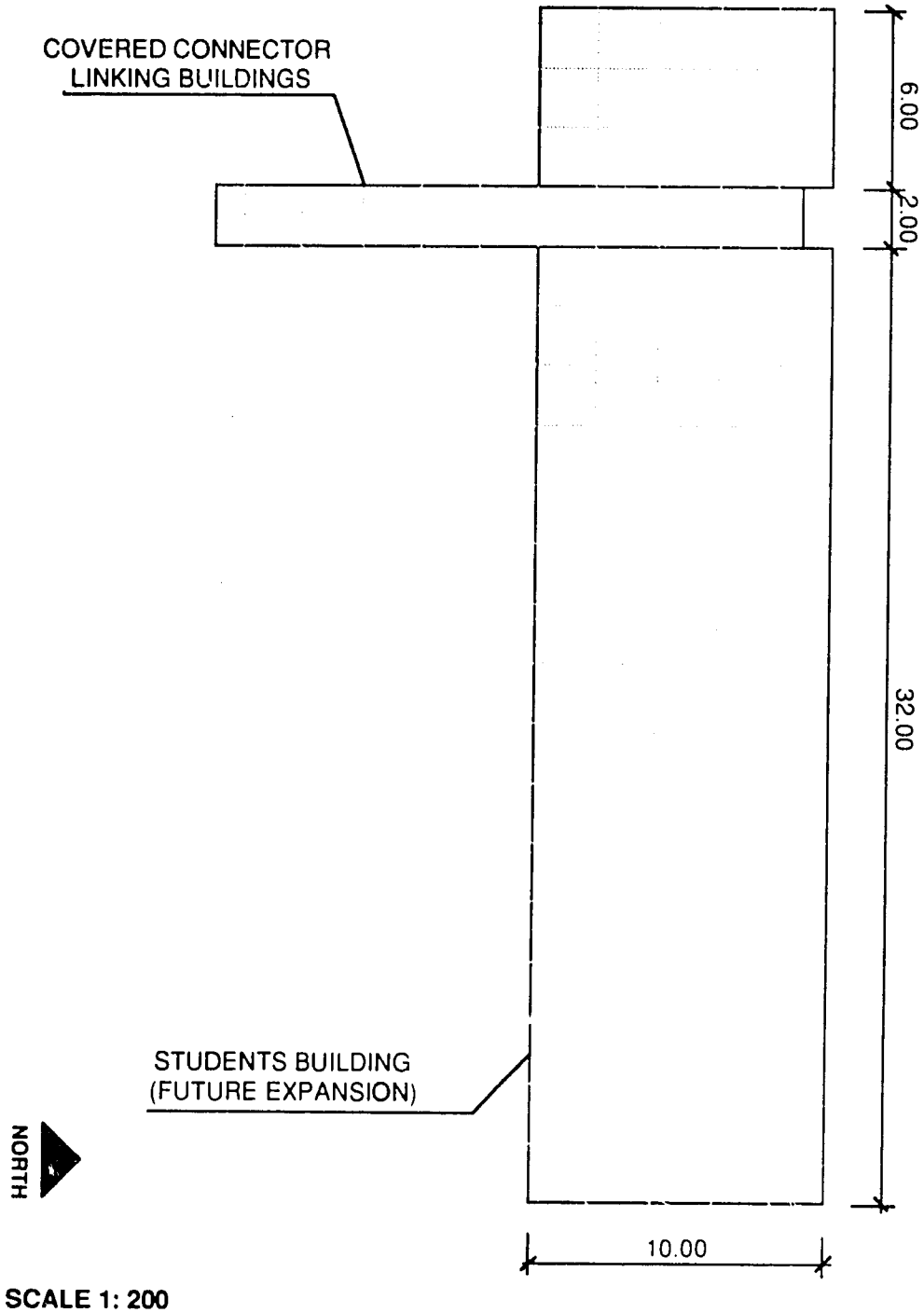
Please develop the building program, by using the following table, and the architectural design for the students building by using the plan shown in figure 19. The linear network in the plan is intended to help you in the designing process (each square represents 2 x 2 m).



SCALE 1 : 500 **TYPICAL SCHOOL PLAN**

Figure 18 Al Nasr Primary School Site Plan

PRIMARY SPACES	SPACE CHARACTARISTICS	AREA
CIRCULATION	SPACE CHARACTARISTICS	AREA
SERVICES	SPACE CHARACTARISTICS	AREA



SCALE 1: 200

Figure 19 Students' Building Plan