

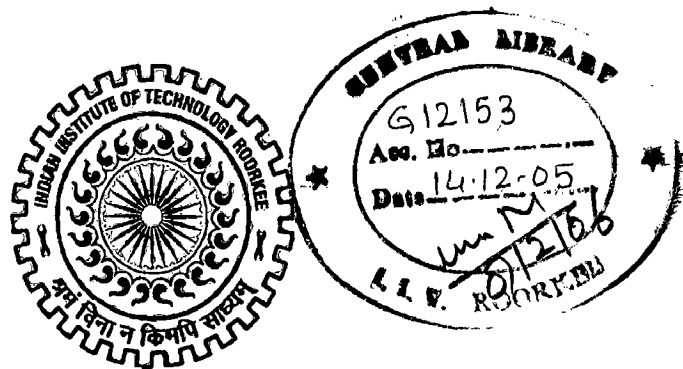
DESIGN GUIDELINES FOR SAFE & SECURE ENVIRONMENT IN SCHOOL

A DISSERTATION

*Submitted in partial fulfillment of the
requirements for the award of the degree
of*
MASTER OF ARCHITECTURE

By

RACHIT SAXENA



**DEPARTMENT OF ARCHITECTURE & PLANNING
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE
ROORKEE - 247 667 (INDIA)
JUNE, 2005**

CANDIDATE'S DECLARATION

I hereby certify that the work, which is being presented in the dissertation, entitled **DESIGN GUIDELINES FOR SAFE AND SECURE ENVIRONMENT IN SCHOOL** in partial fulfillment of the requirement for the award of the Degree of **MASTER OF ARCHITECTURE** submitted in the **Department of Architecture & Planning** of the Indian Institute of Technology, Roorkee is an authentic record of my own work carried out during the period from August 2004 to June 2005 under the supervision of **Prof. Rita Ahuja**.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree.

Place: Roorkee

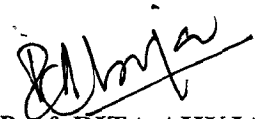
Dated: June, 20²⁰ 2005


(RACHIT SAXENA)

CERTIFICATE

This is to certify that the above statement made by the candidate **RACHIT SAXENA** is correct to the best of my knowledge.

Dated: June, 20²⁰ 2005


Prof. RITA AHUJA (Guide)
Dept. of Architecture & Planning
Indian Institute of Technology,
Roorkee - 247667

ABSTRACT

Creating safe schools are the responsibility of the entire community in which a school or school system resides. Yet, the day-to-day operation is primarily the responsibility of the teachers, the school administrators, and school security or law enforcement officers. But, before the first student walks the halls, an architect draws on paper or computer the design of the school and what will be the subsequent relationships of people and their buildings. The success or failure of that school is predisposed to the quality of design and the limitations of budget. Through the effective use and space of the built environment, there can be a reduction in the accidents and opportunity of crime, result in the improvement in the quality of environment.

Making Schools Safer is a powerful concept that may be used to improve the productive use of space. Architectural features and structural enhancements and spatial definition can deter, detect, and delay potential violent offenders from entering school campuses and buildings.

Incidence of accidents and crime are on increase in school campus, and safety and security are of increasing concern to school administrator, teachers and parents. Designing a safe and secure built environment, a set of guidelines is included in this thesis. An attempted ^Qhas been made because there are no specified guidelines and ^{codes} are not stringent enough regarding accidents and crime in school campus.

Thesis addresses the perception and reality of increased safety and security concerns in school campus, examines the literature available on school safety and security and presents a survey of different school, examining incidences of safety and security problem and steps taken to prevent such incidences.

In the end it proposes a set of design guidelines to Architects, planners for designing a safe and secure built environment in school by addressing accidents and crime prevention issues in the design, planning and details of buildings of school campus with special emphasis on senior secondary (co-educated) school so that better integration between accidents, crime prevention and architectural design results.

ACKNOWLEDGEMENT

It is difficult to put into a few words the gratitude I feel for the assistance rendered by many individuals and sources for the completion of this dissertation. However I take this opportunity to acknowledge those who have given their valuable suggestions in shaping this study into a cogent form.

I would like to express my deepest gratitude to my **guide Prof. Rita Ahuja**, for her guidance and my sincere thanks to **Ar. B. K. Tyagi**, for shaping the outcome of this thesis, which he did taking a lot of time from his busy schedule.

My sincere thanks also go to Prof. P.K.Patel, Coordinator, M.Arch., Prof. S.Y.Kulkarni, Chairman DRC, Prof. R.Shankar, Head of the Department, **Prof. Najamuddin**, Ex. Head of the Department, **Prof. Pushplata** and all the faculty of Deptt. of Arch. & Planning for all the encouragement, help and assistance given to me during my tenure in Roorkee.

I am exceptionally grateful to Ar. Rajeev Garg, **Ar. T.R.Warsi**, and Ar. Gurcharan Singh for their expert comments and technical support. I would like to express my thanks also to my seniors, friends and juniors exceptionally Arif sir, Gaurabh Raheja sir, Hitesh sir, Rahul Bhargava, Ashok Mishra, Ramakrishnan D., Naresh Patel, Manish Gupta, Arafat Hussain & Sumit Gupta for their cooperation and for making my stay at IIT, Roorkee a pleasurable and memorable experience.

The acknowledgements will not be completed till I express my regards and thanks to my Parents & brother for their blessings and prayers for their encouragement and support.

Dated: June , 2005

(RACHIT SAXENA)

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Source Self Photographed
Self made
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Source Primary survey

LIST OF ABBREVIATIONS

CPTED	Crime Prevention Through Environmental Design
SBD	Secured By Design
Adm.	Administrative
D.P.S.	Delhi Public School
G	Ground Floor
mm	Millimeter
Sq.m	Square meter
m	Meter
cm	Centimeter
Sr.	Senior
Sec.	Secondary
No.	Number
w.r.t.	With respect to
Ent.	Entrance

The term security derives from the Latin word “secures” meaning safe or free from danger. Our buildings on certain extent provide security from natural or environmental hazards; structural hazards etc., but generally fail to provide safety and security against accidents and crime.

1.1 INTRODUCTION

Safety and security are always being the one of the major concern of architecture from ages, even when the first dwelling was developed, to provide safety and security from wild animals, natural disaster and invaders. The classical examples are moat around the castle, fortification and watch towers for surveillance and also site defense.

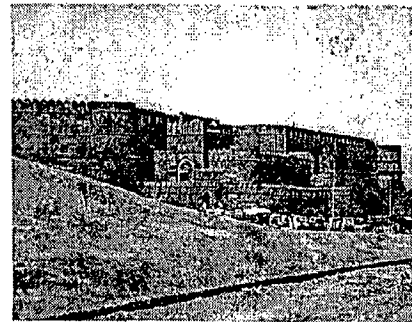


Fig 1.1 View of fort

School by nature of their occupancy and use require higher standard of safety and security than other type of building. School is the first place of learning; it is the first time when child puts his small feet's to outside environment away from his parents. So, creating safe schools are the responsibility of entire community in which school reside. But before the first student walk the hall, an Architect draws on paper first it is his responsibility to design safe and secure environment in school,

Through the effective use of planning, designing and detailing there can be successive reduction in accidents and crime in school. In school generally the safety and security of the users i.e. children, teacher, parent and school building itself so that children concentrate on studies, teachers can teach well and parents can be assured that their child is safe and secure in school so that they can have a psychological satisfaction.

In present context due to increase of accidents and crime, as an architect it is the duty to give emphasis on safety and security in terms of planning, building design and detailing and should recognize safety and security as fourth element of architecture.

So, with three element of architecture function, Structure, Aesthetic and SAFETY & SECURITY needed to be added as fourth element of architecture.

detailing
“Aesthetics + Function + Structure + Safety & Security = ARCHITECTURE”

1.2 PROBLEM IDENTIFICATION

1.2.1 Increase in number of ~~Crimes~~ *accidents within the buildings.*

Every day there are lots of reports about accidents and crime like thefts, burglaries, kidnapping, roof fall, stair case fall, railing fall in school campus. Perhaps lot many such instances go unreported, the crime graph in our built environment is rapidly growing day by day.

1.2.2 Building Codes

Building codes does not specify any guidelines about safety and security in school against accidents and crime. It is therefore important that to work out ways for making school ‘safe and secure by architectural design’ as far as possible.

1.2.3 Negligence

Safety and security has been quite low on priority list of Architect, Designers, Planners and Builders. Very less has been talked about safe and secure environment in school in the process of architectural designing.

1.2.4 Status of India

There has been tremendous development in every field in India, but no concrete work has been done in the field to make school safe and secure, even no attempted is made in this direction.

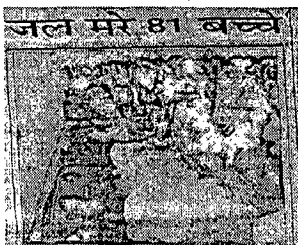
1.2.5 Building Detailing

In most of the school, no attention has been given to building detailing like designing of staircase, ramp and hand rail.

1.2.6 International status

Some of the organization at international level provided that environment of the school can be made safe and secure through architectural design. So it is required that something that can be attempted in this regards.

1.3 WHY SAFETY AND SECURITY IN SCHOOLS?



School by nature of their occupancy and use, require higher standard of safety and security. Due to day by day increase in the accidents and crime in school, there is a need of making school a safer place.

Fig 1.2 Fire accident

1.4 AIM & OBJECTIVES

1.4.1 AIM

The aim of this study is to frame design guidelines, which provide safe and secure environment in school against accidents and crimes through planning, designing, and detailing, which is a crucial.

1.4.2 OBJECTIVES

Keeping above aim in view following sets of objectives have been identify for study

- To study the accidents and crime that is common in school.
- To study how inappropriate architectural design, planning and detailing of school building result in accident and crime in school.
- To evaluate the existing school building against safety and security.
- To frame design guidelines, provide safe and secure environment in school against accidents and crime.

1.5 SCOPE & LIMITATION

Looking into the vastness of the present research, the scope of dissertation focuses on the study of senior secondary school, (co- educated) to achieve safe and secure environment against accidents and crime.

How to provide safe and secure environment in terms of planning, designing and detailing.

1.6 RESEARCH METHODOLOGY

Methodology is divided into four stages:

FIRST STAGE: Formulation of Aim & objectives based on

- General reading and observation.

SECOND STAGE: Collection of Data through Literature study and case studies

Literature study/survey includes understanding:

- Types of accidents.
- Types of crimes.
- Favorable factor responsible for accidents and crime.

- Finding out the areas more susceptible to accidents and crime.
- Study of Building Codes and guidelines
- Study of emerging security gadgets and surveillance system.
- Literature based case study.
- Based on above, preparation of checklist and questionnaire for survey.

Case studies will be done keeping in mind:

- Site planning.
- Designing.
- Detailing.
- User response through questionnaire.
- Evaluation of case study against checklist.

THIRD STAGE: Analysis and Synthesis of findings

- Identification of problems and issues.
- Analyzing and drawing inferences based on case studies and literature study.

FOURTH STAGE: Final draft

After synthesizing findings

- Formulation of strategies and guidelines for safe and secure environment in school against accidents and crime.
- Final report.

repeatedly accident & crime is mentioned, ?

1.6.1 FLOW CHART OF METHODOLOGY

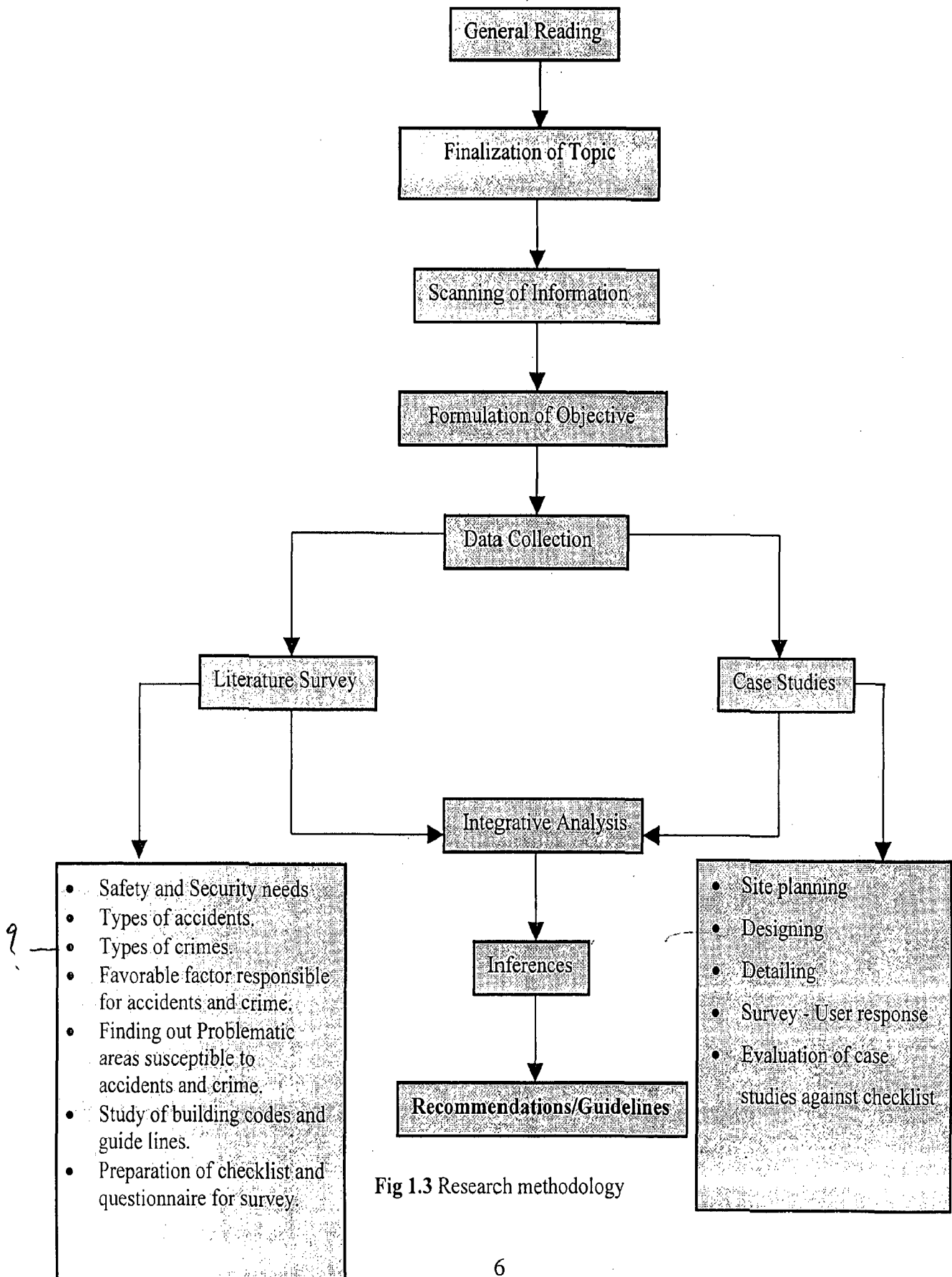


Fig 1.3 Research methodology

1.7 RESEARCH TECHNIQUE

Looking into the Aim and Objective of the Dissertation, the following research methodology will be utilized for study:

CORRELATIONAL RESEARCH METHOD

CASE STUDIES AND COMBINED STRATEGIES

CORRELATIONAL RESEARCH METHOD

Correlation research is a technique in which one establishes a relationship between variables by analyzing them at different locations and based on the relationship established, one can make a prediction about one variable based on what we know about another variable. So, it's a research method related to predictions and relationships.

The prediction power of this research will be used for my dissertation

Tools of method to be utilized

- **Survey questionnaire**
- **Observation**
- **Mapping**
- **Archive**

The information collected will be important, as it provides the various view points of the user about the accidents crime and their opinion about the design, which help me to frame the guidelines.

CASE STUDIES AND COMBINED STRATEGIES

This will be used for study how inappropriate architectural design and planning of school campus ^{is} responsible for increasing incidents of accidents and crime.

It helps to understand the existing problems in the design and helps in suggesting alternatives.

2.1 SAFETY & SECURITY AS ONE OF THE BASIC HUMAN NEED

In 1954 Abraham Maslow proposed a hypothetical model of human behavior in his book **Motivation and Personality**. Maslow identifies five sets of basic needs from the most fundamental to the most esoteric in a hierarchy of prepotency. Maslow's model describes the best comprehensive view of basic human needs. Indeed, in thinking about design issues, planners and architects who are concerned with a user needs, got the approach to design in terms of **Maslow's hierarchy of human needs**.

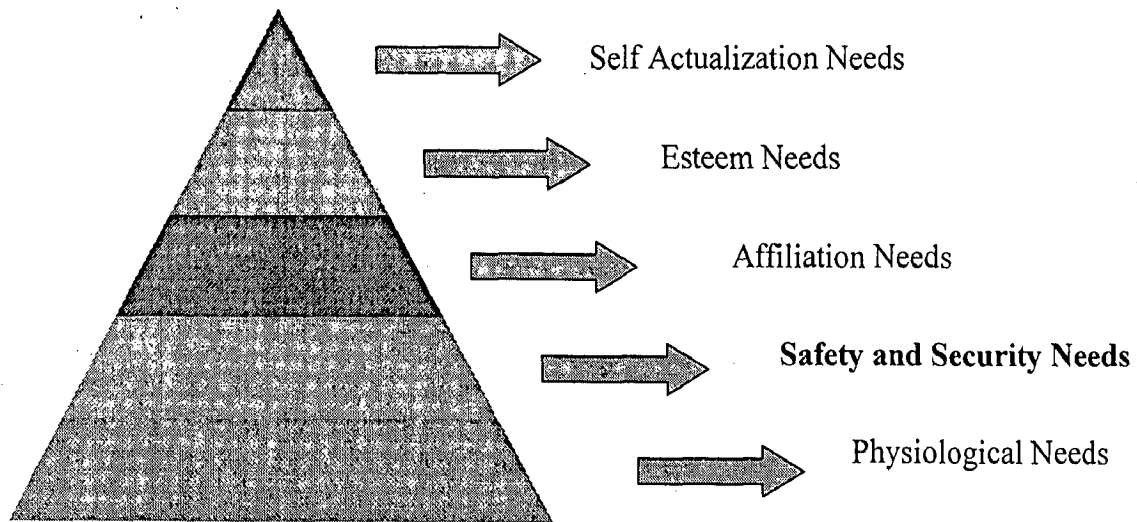


Fig 2.1 Maslow hierarchy of human needs

1. PHYSIOLOGICAL NEEDS: The fundamental human need is for survival. In order to survive, the physiological need for water, food, air, and sufficient warmth is to be fulfilled.

2. SAFETY AND SECURITY NEEDS: This need has both a physiological and psychological component to it. Physiological safety stems from avoiding harm inflicted, directly or indirectly, by other people and from the biogenic environment; psychological safety and a feeling of security stem from being oriented in space and time, geographically and socially, and being confident of maintaining one's place there.

3. AFFILIATION NEEDS: People need to feel loved and to feel a member of a group.

4. **ESTEEM NEEDS:** The need to be held in esteem by oneself and by others.

5. **SELF-ACTUALIZATION NEEDS:** Maslow identifies it as the need to be helpful to others as much as the need to achieve one's own potential on one's own.

2.1.1 Safety and security needs

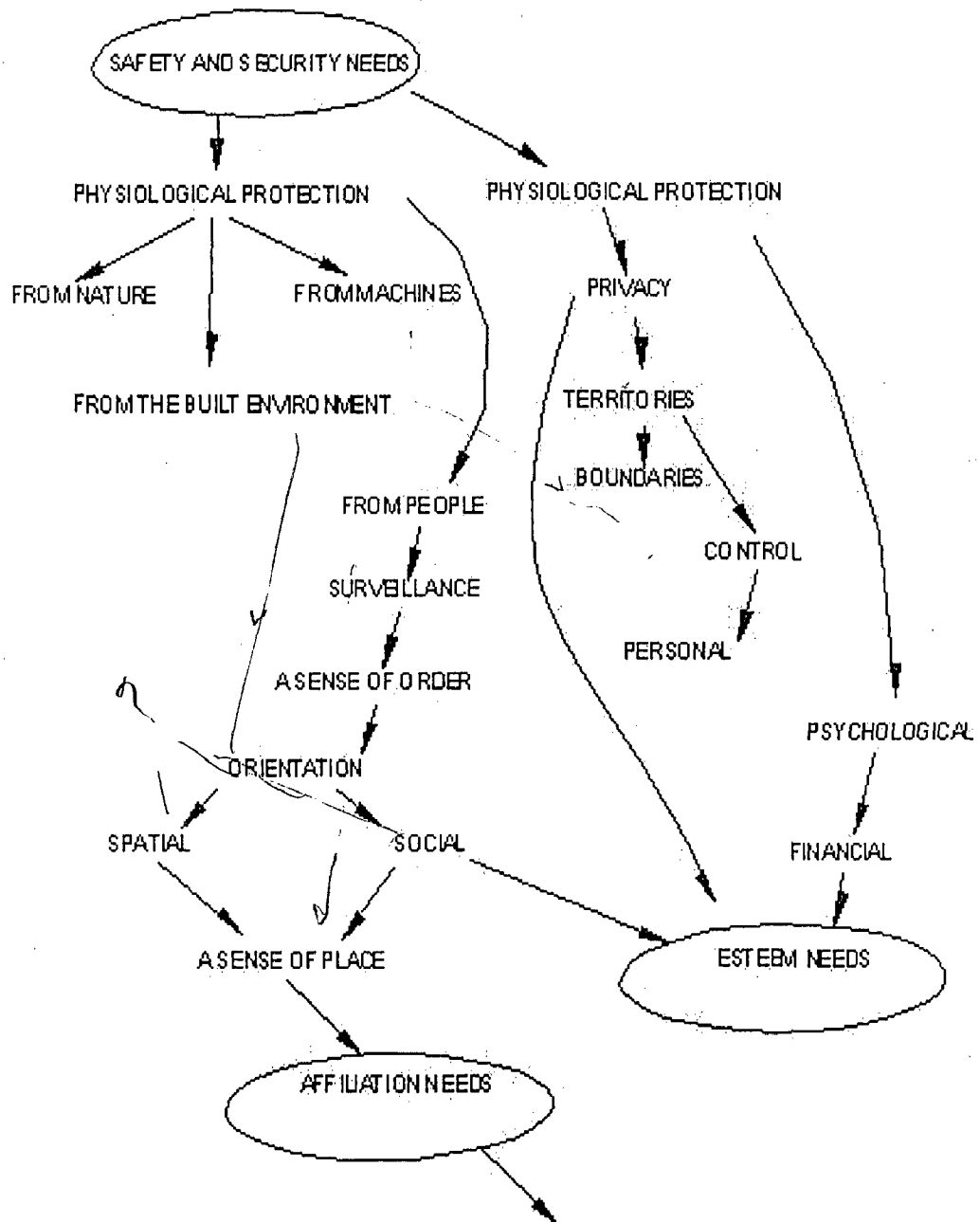


Fig 2.2 Safety and security

Once the survival needs and basic comfort requirements are reasonably well satisfied, people's concerns shift up the scale to focus on the fulfillment of other ends, particularly

safety and security needs. The fear of antisocial behavior (criminals) results in safety and security issues taking precedence over many others in urban design.

There are two basic types of safety and security needs that have an impact on the work of the urban designer/Architect

(1) Physiological-to have freedom from bodily harm, crime etc and

(2) Psychological-to have a sense of place, geographically and socially in a society.

To achieve the former, people need to feel safe from wild animals, criminal assault, and various types of accidents: household, vehicular, and so on. To achieve the latter, there is a desire to avoid the unexpected, to be in *control*, to know where one is in one's social and physical surroundings, and not to be afraid of other people and social situations.

2.1.2 Sources of Insecurity

Sources of people's insecure feelings vary considerably. There is still a fear of nuclear disasters and the effects of the continuing pollution of the earth in many minds, particularly those of the young, many of whom have a highly pessimistic view of the future. *The most is a fear of antisocial behavior, criminals even when walking around one's own neighborhood in much of urban India, which is affecting the life of common man.* Dealing with many of these issues falls outside the scope of concern of designers as professionals. They are considered as social problems. But it is possible to design layouts of the environment that provide security from antisocial elements.

2.1.3 Physiological Insecurity

There are four basic sources of danger to one's physiological condition in the environment:

- 1) Harmful bacteria and pollutants,
- 2) Natural events of the biogenic world,
- 3) Elements of the artificial environment-the built environment and the machines we use,
- 4) The antisocial behavior (criminal behavior) of segments of the population.

THOUGHTS

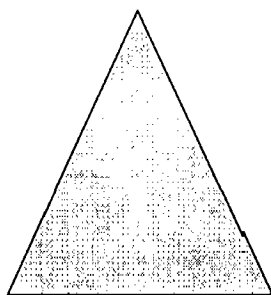
- Jane Jacob's (1961) "The death & life of great American city"-suggested that active street life could cut down the opportunities of crime (surveillance).
- C. Ray Jaffery (1971) CPTED – suggested that urban design, including the design of street could prevent crime.
- Oscar Newman(1972) – "Defensive space"-suggested that crime can be prevented

Natural surveillance

Territoriality

- John eck's "three basic ELEMENTS necessary for person to commit a crime"

MOTIVE



OPPORTUNITY

ABILITY

Fig 2.3 John Eck's simple model of the components for a crime

The three sides of this triangle are the three things that need to be present for a crime to occur. Eliminate any single side, and the triangle disappears

2.2 SAFETY AND SECURITY CONCERNS

- Structural Safety
- Health Safety
- Fire Safety
- Accident protection
- Handicapped Provisions
- Crime Prevention

2.3 TYPES OF ACCIDENTS IN SCHOOL CAMPUS

- Falls
- Slips
- Vehicular accident
- Electric shocks
- Heat induced illness — *Dehydration errors*
- Fire accidents

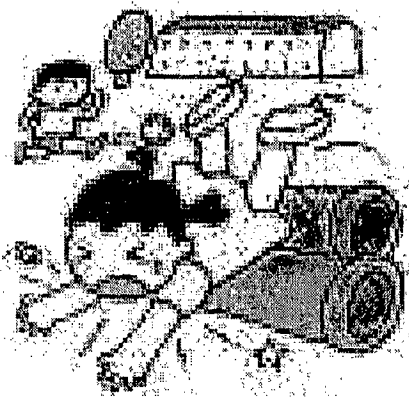


Fig 2.4 Falls/slips

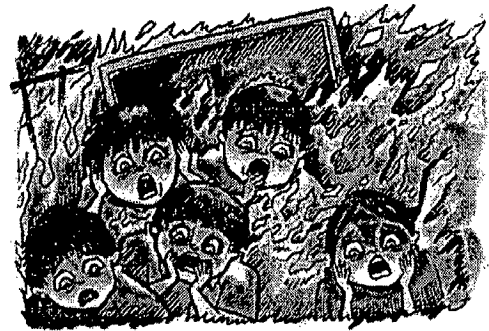


Fig 2.5 Fire accident

2.4 CAUSES OF ACCIDENTS

- Congestion
- Poor Building Detailing
- Poor Maintenance
- Areas of Neglectance in building
- Handicapped provisions are not taken in accounts.
- Unsafe Play Equipments
- Poor landscaping

2.5 TYPES OF CRIME IN SCHOOL CAMPUS

- Kidnapping/Abductions
- Assault/battery
- Theft
- Graffiti
- Fighting
- Sexual Offences

- Weapon Possession
- Arson
- Vandalism
- Alcohol & Drug Possession
- Robbery

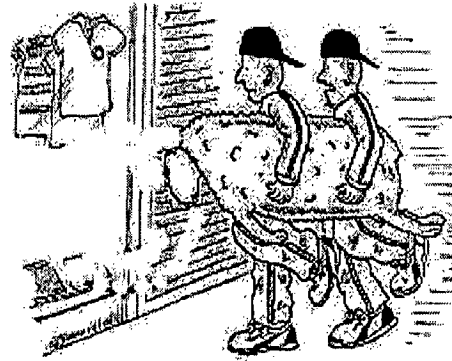


Fig 2.6 Kidnapping/Abduction

2.6 CAUSES OF CRIME

- Lack of visual surveillance
- Undefined enclosure
- Improper landscaping
- Insufficient lighting
- Hide out spaces
- ill maintained area

2.7 AREAS MORE SUSCEPTIBLE TO ACCIDENT AND CRIME

- Environs
- Site Design
- Building Design
- Interior Spaces
- Systems & Equipment

2.7.1 ENVIRONS

- Location
- Edge Conditions
- Connection

2.7.2 SITE DESIGN

- Entry/Exits
- Pedestrian Routes
- Vehicular Routes & Parking Areas
- Landscaping

- Recreational Areas
- Play Grounds
- Site Utilities
- Lighting
- Signage

7.3 BUILDING DESIGN

- Building Organization
- Entry Point to Buildings
- Walk ways
- Court yards
- Windows
- Doors
- Roofs

2.7.4 INTERIOR SPACES

- Lobbies and Reception Areas
- Corridors
- Toilets
- Stairs and Stairwells
- Railings
- Ramps
- Administrative Areas

2.7.5 SYSTEMS & EQUIPMENTS

- Alarm and Surveillance Systems
- Fire Control
- HVAC & Mechanical Equipment
- Water Fountains
- Elevators

2.8 HOW TO REDUCE CRIME

REACTIVE APPROACH: *Wait till the crime occurs and then take action.*

PRO-ACTIVE APPROACH: *Ability and opportunity must be reduced at planning level.*

Reactive approach, results in loss of thousands of millions of rupees per year and valuable life of innocent citizens.

The lesson is clear: it is too expensive to wait till crimes are committed; crime must be prevented at planning level through:

- *Environmental prevention* manipulates building design and the relationship between buildings and their environment to reduce opportunities for crime.
- *Building design and detailing*
- *Mechanical prevention* emphasizes hardware and intelligent system.

2.9 ARCHITECTURAL INTERVENTION IN THE FIELD OF CRIME PREVENTION

Much less or almost nothing has been done in this subject in Indian context, so whatever the study done to prevent crime is belongs to different European and American countries.

CRIME THE ARCHITECTURAL CONCEPT

CONTEMPORARY THEORIES

Although crime has been studied in great detail in relation to the prevalent environmental factors it is only in the last fifty years or so that new concepts and hypothesis have been advocated and to relate the physical-built environment and the Criminal Behavior. This has been done in an architectural context, rather than a deterministic climatic sense.

2.9.1 SOCIAL CONTROL THEORY (By Jane Jacob)

She was the first to put forth the notion that the physical environment and criminal behavior were related in an architectural context.

In his book "**The Death and Life of the Great American Cities**" in 1961, she suggested that the city becomes unsafe with the development of separate activity areas in the form of residential, commercial, industries, financial and recreational. As a result surveillance of streets and other public areas have been greatly reduced consequently reducing the feeling of cohesion, territoriality and responsibility towards domain. She believes that mixture of land uses is needed to achieve greater safety and safer streets are those frequented at all times of the day and night. Such streets have commercial and other activities at the ground level, some of which go on during evening.

Soon after Jacob's study the concept of social control was developed. The study suggests that streets when populated with strangers (diversity of uses) will result in natural or passive surveillance. Business establishment provides people with a proprietary interest in street directly in front on them, and shops give people a reason for using the streets. Jacob's view of the role of commercial facilities reversed the notion that these intensely public areas attracted crime.

2.9.2 DEFENSIBLE SPACE THEORY (By Oscar Newman)

In 1972, he put forward his concept of the **Defensible Space**, a more formal framework to Jacob's ideas. This theory goes on to suggest that potential criminals are more reluctant to commit crimes in those areas, which are perceived to be under technical influences of a surrounding community.

Oscar Newman used the term defensible space to describe the residential environment designed in such a way as to allow households to supervise, to be seen and to be responsible for, the areas in which they live.

Defensible space is where an area is purposefully divided into physically distinct areas defined as private, semi-private, semi-public and public spaces. The purpose is to create definite boundaries between areas which create a sense of transition from public to private space -a buffer space between public space, where users have a right to be, and private space where they do not.

His theory proposed four elements of physical design which act individually and in combination to contribute to the creation of secure environment

1. **Territoriality:** Division of communal spaces in and around residential buildings to promote proprietary attitude among residents.
2. **Natural Surveillance:** The positioning of apartment windows to allow residents to naturally survey the exterior and public areas of their environment as well as the surroundings residences
3. **Image:** The use of building forms and material to avoid the stigma of public housing.
4. **Milieu:** Locating residential projects to face onto areas of the city considered safe (such as institutional areas, government offices).

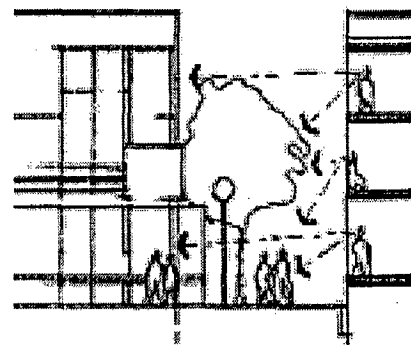


Fig 2.7 Natural surveillance through building

2.9.3 ENCLAVE-ACCESS-CONTROL THEORY

This theory suggests that the environment can be designed to discourage the access of prospective criminals to potential victims or items of value. Airports provide total security with respect to the unauthorized carrying of weapons or dangerous materials. Large suburban shopping plazas employ this approach by performing implicit checks on the behavior of pedestrians prior to entry. While these centers are treated as if they are in the public domain, their physical organization actually limits entrance of undesirable pedestrians and acts as a closed street. Applications of this system are numerous, varying as they do from simple door buzzers and intercom systems to complex alarm and intrusion-detection systems. Once good security is provided at the perimeter of a community, the potential for positive social interaction within the community is multiplied. The problems are (1) that this can only be done effectively within a homogeneous community, otherwise the potential perpetrators of crime would already be inside the community, and (2) the formation of enclaves leaves the streets outside the community devoid of positive activity and social life. For these reasons, enclave approaches are only partial solutions.

2.9.4 CRIMINAL JUSTICE THEORY

This approach focuses on the presence of police as a primary deterrent to crime. It suggests a form of environmental design in which standards of lighting and access are maintained so as to provide optimal conditions for police patrols. In essence the approach focuses on crime prevention through making prospective criminals aware of the presence of public authority.

All entrances to residential buildings are clearly marked and lighted. Streets are simplified and street angles summarized in order to provide clear, unambiguous access. Where possible, emergency lanes do not end in cul-de-sacs; they provide an opportunity for patrol

cars to pass through all areas casually, to maintain informal surveillance over an area as well as responding to actual calls for help. Stair halls and elevators should be well lit and exposed to view from the street, especially from passing patrol cars. The criminal justice model is based on the professional skill of the policeman at briefly yet thoroughly scanning a large area that he passes through very quickly.

2.9.5 SECURED BY DESIGN (SBD)

The concept is developed by the Police in Central Holland with the help of Architects and Planners. This describes the requirements that dwelling and environment must possess to be implemented.

The guidelines developed by SBD relate to low, medium and high-rise developments are:

1. NATURAL SURVEILLANCE

Optimum natural surveillance should be incorporated by design

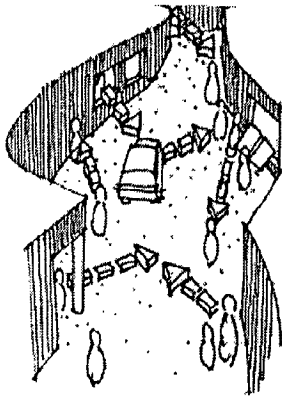


Fig 2.8 Surveillance by surrounding buildings

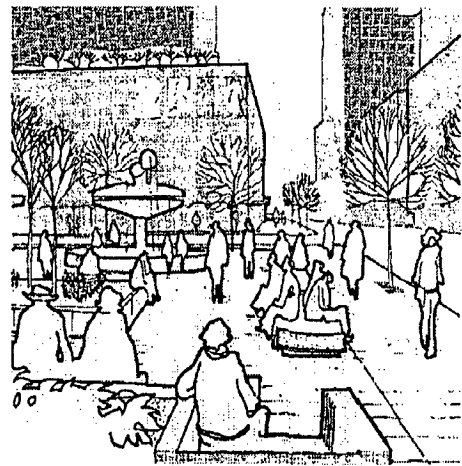


Fig 2.9 Surveillance by people

An unobstructed view from dwellings of the site, its external spaces and neighboring homes, to include external paths, galleries, roadways, communal areas, drying areas, landscaping, garages and parking areas.

2. LIGHTING

Appropriate lighting should be carefully designed to cover potential high risk areas. Good lighting will deter intruders and reduce the fear of crime.

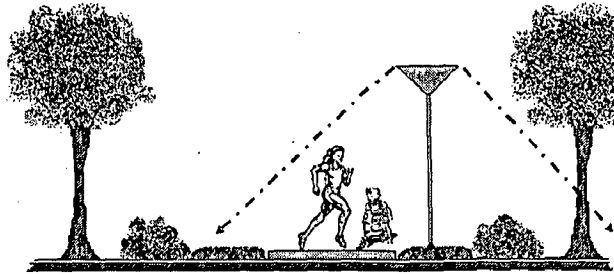


Fig 2.10 Lighting in public areas

The following areas must be lit: Main site access, garages, garage forecourts, car parking areas, all footpaths and associated areas to main building, refuse store, drying areas, secluded areas and similar locations around the site.

3. LANDSCAPING

Landscaping is an important feature of this initiative. Landscaping should not impede natural surveillance and must not create potential hiding places for intruders, especially adjacent to footpaths or close to buildings where it may obscure doors and windows.

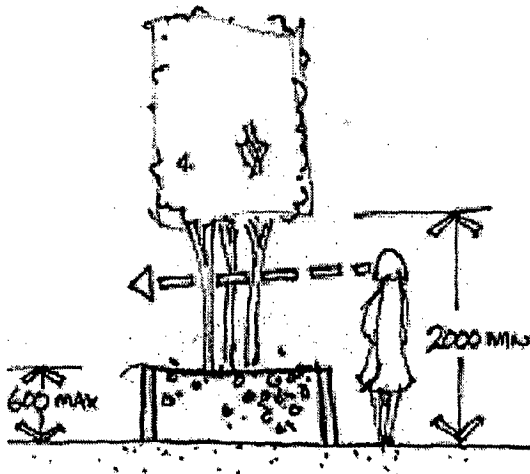


Fig 2.11 Shrubs and tree height

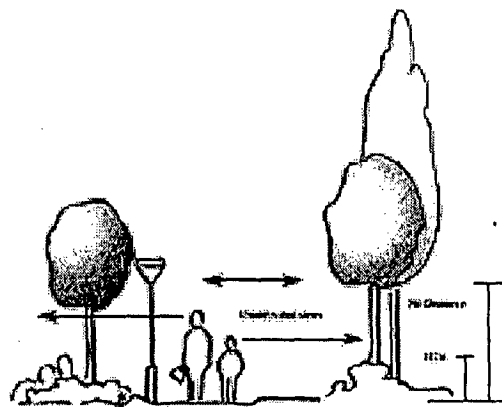


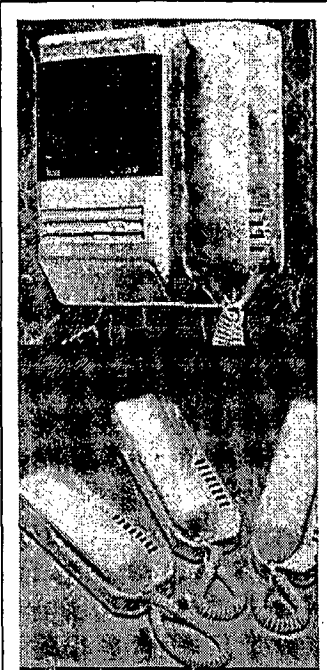

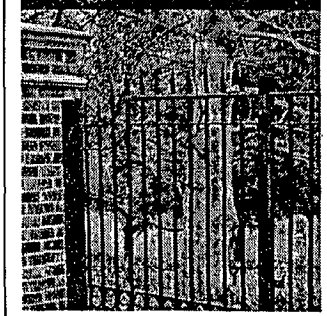
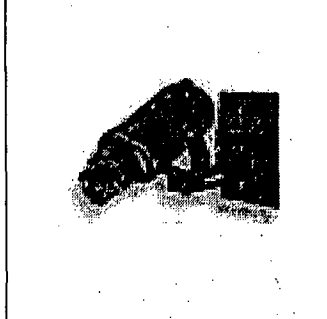
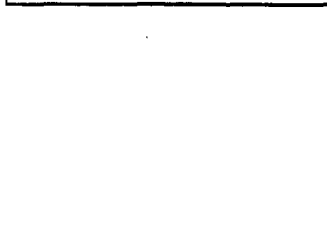

Fig 2.12 Shrubs and tree height

Frontages should be in open view. Ornamental walls and hedges should not exceed one meter in height. The correct use of certain species of plants can help prevent graffiti and loitering, and in addition to fencing may be used to define/reinforce boundaries.

2.10 MECHANICAL PREVENTION

INTELLIGENT SYSTEM FOR SECURITY

Access-control and surveillance can be enhanced into a design through mechanical strategies, such as locks, video cameras, and burglar alarms, and security lights etc.

	<p>Video entry system: See who is at the front door from any TV set or from a video entry camera. An added option is to record who came to the house while the occupiers were out.</p>
	<p>Audio entry system: Speak with visitors calling at the front door or the front gates from handsets located with-in the property.</p>
	<p>Remote access control: Remote controls the drive gates or the garage door from with-in the car, even turn on some house lights remotely.</p>
	<p>Entertainment equipment enclosure: Lock all the valuable stereo and video equipment in a secure cupboard. This cabinet is a specially designed feature that will be discussed in detail at the design team meeting.</p>
	<p>Security lighting: Use landscape lighting as an integral part of the security lighting system.</p>
	<p>Occupancy simulation: Automatic control lighting to give the impression the property is in fact occupied</p> <p>Life security: Panic alarm buttons placed in various rooms, or carry a small panic alarm the size of a wristwatch around the house. This can either call a neighbor, a family member or a doctor's surgery</p>
<p>Close circuit camera: Keep the vigil on an intruder with in a locality.</p> <p>Fig 2.13 Intelligent system for security</p>	

STUDY OF GUIDELINES & CODES

The aim is to study of various code and guidelines given by different organizations for educational buildings, regarding the planning, designing & detailing.

Topics covered in this chapter

- Design guide lines for “ access to all” (source: national building code 1983)
- Design guidelines for fire safety in school buildings (Source: National building code 1983)
- How to make schools safer and secure (Source: Crime prevention through environmental design)

CHAPTER 3

3. STUDY OF CODES AND GUIDELINES

- Design guide lines for “access to all” (source: national building code 1983)
- Design guidelines for fire safety in school buildings (Source: National building code 1983)
- How to make schools safer and secure (Source: Crime prevention through environmental design)

3.1 Design guidelines for “access to all” (source: national building code 1983)

3.1.1 Aim

To provide barrier free design environment that supports the independent functioning of physically handicapped. Access to the handicapped should be improved so that they can also enter in public buildings and participate in public in every day activities with out assistance.

3.1.2 External Design Elements

- Roads and footpaths
- Parking areas
- Kerbs
- Surface finish

3.1.3 Internal Design Elements

- Ramps
- Entrances
- Staircase steps
- Public conveniences
- Toilet fixture
- Electrical Controls
- Visual alarms

EXTERNAL DESIGN ELEMENTS

Road and Footpaths

- Uneven floor and levels differences should be avoided.
- Proper signage should be provided to direct the handicapped person.
- Efforts should be made to improve the pedestrian environment by installing electric wires underground and properly covered manholes.
- Walkways should not have a gradient more than 1:20.
- In lengthy or busy walkways spaces should be provided at some point along the route.
- Walkways should be kept as level as possible and provided with slip resistance materials.
- To allow for the Wheelchair user pavement width should be kept minimum 1.2m.
- Tactile flooring shall be made between side walk and main road.
- Protruding objects shall not be given on footpaths

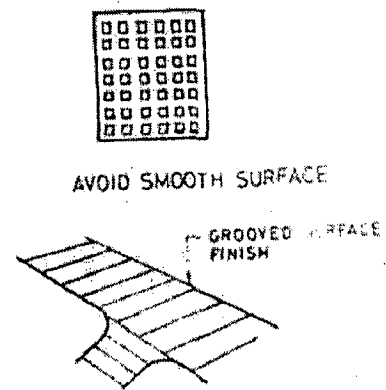


Fig 3.1 Textured Surface finishes

Parking areas

- Accessible parking spaces should be located as close as possible to building entrances.
- Parking spaces for the disabled should never be located at ramped or sloping areas.
- Accessible parking space should have a minimum width of 3.9m.

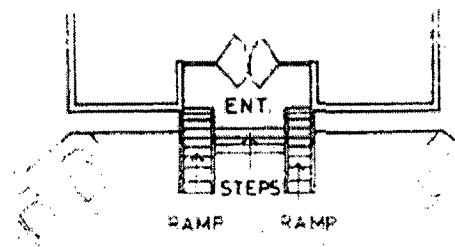


Fig 3.2 Parking for disabled

- Accessible routes of minimum 1m should be given between parking space and buildings.

Kerbs

- For the disabled and particularly for users of wheelchairs it is very difficult to overcome sudden rise or falls in the pavement levels. It is essential that these should be reduced by means of dropped kerbs.

Surface finish

- Should have non slippery surfaces and should be cued by texture and colours contrast.

INTERNAL DESIGN ELEMENTS

Entrances

- Entrances should be accessible from arrival and departure points to the interior lobby.
- Every entrance/exit within the building shall be such that a wheelchair user can use it with ease.
- Entrances width shall be minimum 90 cm or more.

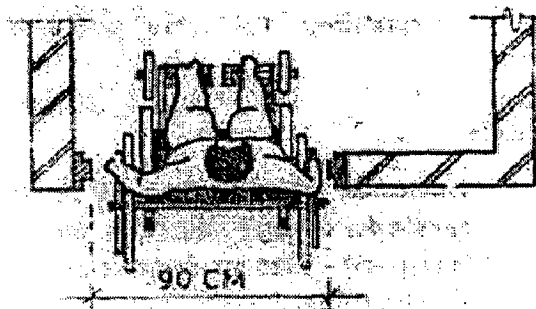


Fig 3.3 Width of door

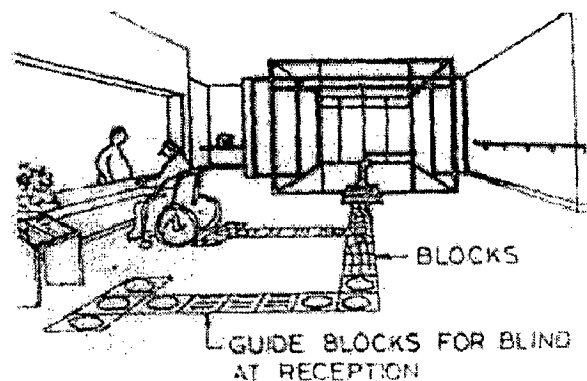


Fig 3.4 Guide for blinds

Ramps

- Handrails should be provided preferably to each side of the ramp.
- A level platform of minimum length 1.5 m should be provided at the top of the ramp.

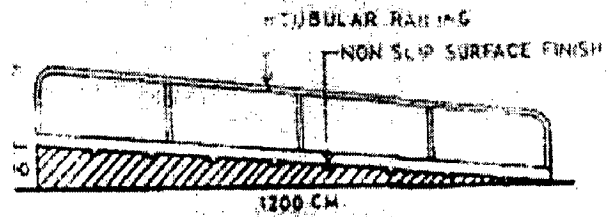


Fig 3.5 Ramp gradient

- Width of the ramp should be at least 1.2m to enable a wheelchair to turn preferably at least 1.5m to allow two wheelchairs to pass.
- Handrail should extend a minimum 45cm beyond top and bottom of ramp.
- The maximum gradient should be 1:12
- The hand rails should have bright contrasting colour to surroundings for convenience of blinds.

Stairs

- Stairs should have handrail on both sides.
- Riser should be reduced to 15 cm and treads should be reduced 30 cm.

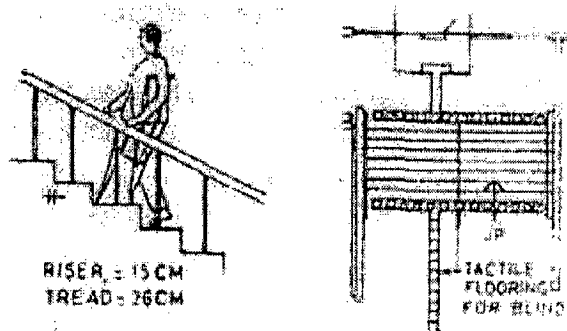


Fig 3.6 Stair case

- Tactile flooring should be provided at the meeting edge of stairs and corridor
- Colour of the tread should be in contrast with the colour of the riser.

Corridors

- Corridors shall have a minimum clear width of 1.2m.
- A space not less than 1.5 sqm shall be provided at every dead end.
- Corridor should have the same level and slip resistant surface.
- Corridors should not have any protruding objects for the convenience of blinds.
- Railing at 90 cm height should be provided in corridors.

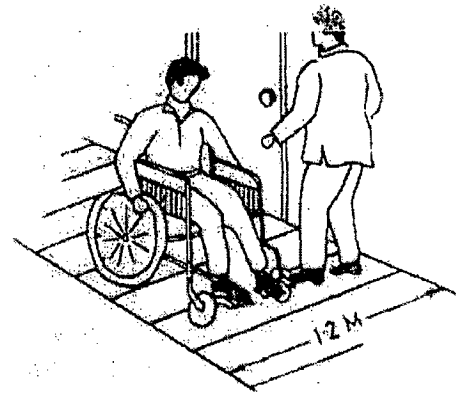
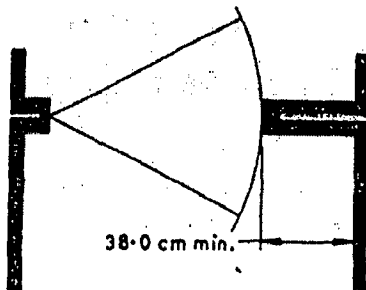
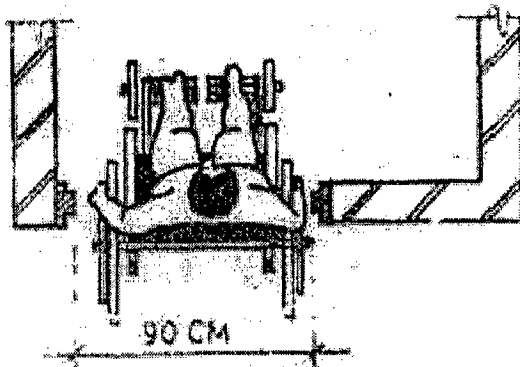


Fig 3.7 Width of corridor

Doors/Opening

- The minimum door should be 90 cm to enable wheelchair user to pass through the door.



- Doors opening out in corridor and in circulation spaces should be avoided.
- Door handles shall not be less than 90cm and more than 100cm.
- Doors along major circulation routes should be provided with kick plates made of durable materials at a height of 30cm to 40 cm.

Fig 3.8 Width of opening

Toilet

- In principal, 2% of toilet stalls on each storey for wheelchair user.
- Hooks for walking sticks should be provided.
- All water supply and drainage lines should be concealed to avoid the accidents.
- The minimum space for disabled with wheelchair is 1.5m x 2.0m in toilet.
- The floor should be non-slippery and there should be no obstacles to prevent turning, or access to the seat.
- A lavatory should be provided with appropriate handrails. The height of the hand rail should be 80cm near water closet.
- The maximum height of water closet should be 45cm, and flush control should have a maximum height of 1.2m.
- The grab bars should not be less than 2.5cm nor more than 5.0 cm and 3.0cm clearance from the wall.

Drinking fountain

- There should be at least one accessible fountain per floor.
- In front of drinking fountain unit minimum clear space should be 75 x 120 cm.

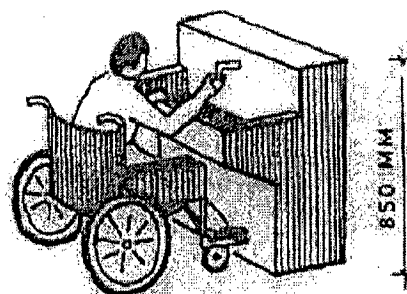


Fig 3.9 Water fountain

- There should be adequate knee space and foot clearance beneath the drinking fountain unit.
- The spout height should be 90 cm high or less.

Controls

- Electric controls should be in the zone 90cm to 120 cm from the floor for convenience of disabled.

- The height of window controls for operation should be maximum 120cm from the floor level.

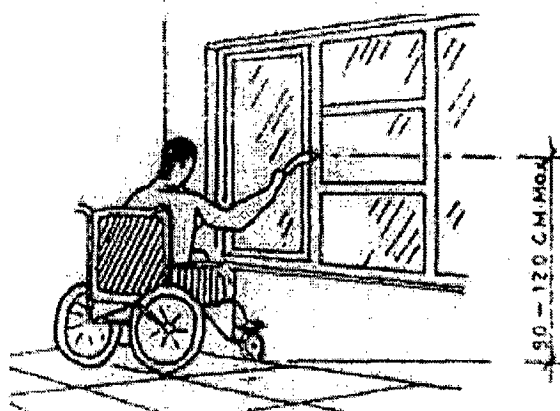


Fig 3.10 Public telephone

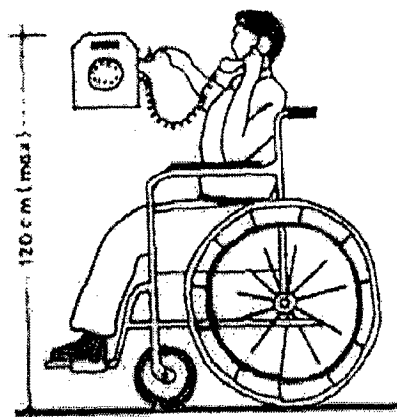


Fig 3.11 Height of window opening

3.2 Design guidelines for fire safety in school buildings (Source: National building code 1983)

3.2.1 Site Planning

- There should be sufficient space all around the building to move fire tender.
- Main entrances to the premises shall be of adequate width to allow easy access to the fire engine and in no case it shall measure less than 5 meters.
- The entrance gate shall fold back against the compound wall of the premises, thus leaving the exterior access way within the plot free for movement of fire service vehicles.
- If archway is provided over the main entrance the height of the archway shall not be at a height less than 4 m,
- The maximum height of building shall not exceed 1.5 times the width of road abutting plus the front open spaces.

3.2.2 Exit Requirements

- School building shall be provided with exits sufficient to permit safe escape of occupants in case of fire or other emergency.
- All exits shall be free of obstructions.
- Exits shall be clearly visible and the routes to reach the exit shall be clearly marked and sign posted to guide the population of floor concerned.
- Each floor shall have minimum two exits.
- Every room with a capacity of over 45 people shall have at least two door ways.

3.2.3 Types of Exits

- Exits shall be either of horizontal or vertical type.
- An exit may be doorway, corridor, and passageways to an internal staircase or external staircase, ramps or to a verandah and/or terraces, which have access to the street or to roof of a building.
- An exit may also include horizontal exit leading to an adjoining building at the same level.
- Lifts and escalators shall not be considered as exits.
- Revolving and sliding doors shall not be considered as a means of exit.
- Exits shall be so located so that the travel distance on the floor shall not exceed 22.50 m. for residential, educational, institutional and hazardous occupancies.

3.2.4 Doorways

- No exit doorway shall be less than 100cm in width and shall be not less than 200cm in height.
- Doorways for bathrooms, w.c., stores etc. shall be not less than 75cm wide.
- Exit doorways shall open outwards, but shall not obstruct the travel along any exit.

- No door, when opened, shall reduce the required width of stairway or landing to less than 90cm, overhead or sliding doors shall not be installed.
- Exit door shall not open immediately upon a flight or stairs; a landing equal to at least the width of the door shall be provided in the stairway at each doorway, level of landing shall be the same as that of the floor which it serves.

3.2.5 Stairways

- The minimum width of internal staircase shall be 1.50 m.
- Stairs shall be constructed of non-combustible materials throughout.
- Minimum tread 300mm and maximum riser 150 mm.
- Handrails shall be provided with a minimum height of 90cm from the center of the tread.
- The minimum headroom in a passage under the lading of a staircase and under the staircase shall be 2.2m.
- External exit door of staircase enclosure at ground level shall open directly to the open spaces.

3.2.6 Ramps

- Ramps with a slope of not more than 1 in 10.
- The minimum width of the ramps in educational building shall be 1.2m.
- Handrails shall be provided on both sides of the ramp.
- Ramps shall lead directly to outside open space at ground level or courtyards or safe place.

3.2.7 Corridors

- The minimum width of a corridor in an educational building shall be 1.50 m.

3.2.8 Basement

- The basement shall not be used for kitchen and dining.
- The minimum height of the ceiling of any basement shall be 0.9 m and maximum of 1.2 m above the average surrounding ground level.
- The access to the basement shall be separate from the main and alternate stair-case providing access and exit from upper floors.
- Kitchen, bathroom and toilet shall not be permitted in the basement.
- For basement ventilation minimum 2.5% of the floor area spread evenly round the perimeter of the basement.

3.2.9 Mechanical/Electrical services

- Located away from building or on the periphery of the building.
- Access segregated from dwelling occupancy.

3.2.10 Fire fighting system

- Over head tanks.
- Static storage tank.
- Fire hydrants.
- Portable fire extinguisher. Hose reel.
- Automatic sprinkler system.

50,000 liters of water if total covered area exceed 1500 sqm. Under ground static water storage tank and 10, 000 in case of hose reel.

3.3 How to make Schools safer and secure

(Source: Crime prevention through environmental design)

CPTED is a powerful concept that may be used to improve the productive use of space. Architectural features and structural enhancements and spatial definition can deter, detect, and delay potential violent offenders from entering school campuses and buildings.

3.3.1 Understanding the Threat

Integrated school security measures include prevention, control, detection, and intervention in order to be comprehensive and effective. The threats to a school are either going to be external (threats from outside influences and persons), or internal (threats from students, faculty, staff, workplace violence).

CPTED can make a direct impact on reducing the outside external threat through use of natural access control, surveillance, territoriality boundary.

Safe School Design involves four key areas that should include security layering/defensible space planning practices: 1) Site design 2) Building Design 3) Interior Spaces 4) Systems & Equipment

- Site Design includes features of Landscaping, Exterior Pedestrian Routes, Vehicular Routes and Parking, Recreational Areas.
- Building design includes features Building organization, Exterior covered corridors, Points of entry, enclosed exterior spaces, Ancillary buildings, Walls, windows, doors, roofs, and Lighting.
- Interior spaces include features of Lobby and reception areas; Corridors; Toilets and bathrooms; Stairs and stairwells; Cafeterias, Auditoriums, Gyms; Libraries and media centers; Classrooms; Locker rooms; Labs, shops, music, computer rooms; and Administrative areas.

- Systems and equipment will include features such as Alarms and surveillance systems; Fire control; HVAC & mechanical equipment; Vending machines; Water fountains; Elevators; Telephone and info systems.

SITE PERIMETER

- Clearly establish and define school property lines or edge.
- Secure the site perimeter and limit access with selected entry points.
- Locate site entry points in areas of high visibility where they can be easily observed and monitored by staff and students.

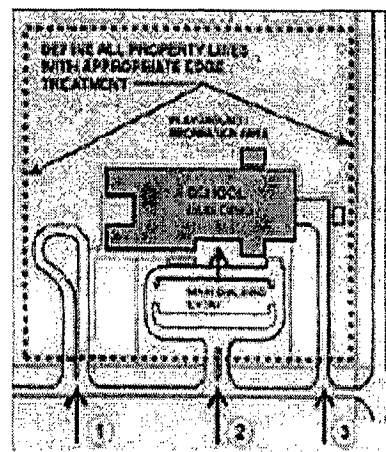


Fig 3.12 Site perimeter

- Segregation of vehicular movement to avoid any accidents.
- Vehicular movements are restricted to certain zones.
- Create boundaries that delineate public, semi-public, semi-private, and private spaces
- Creation of internal boundary controls the access.

EXTERIOR PEDESTRIAN ROUTES

- Design exterior sidewalks to clearly mark routes.
- Direct pedestrian circulation to a few selected entry points.
- Provision of buffer between pedestrian and vehicular movement.

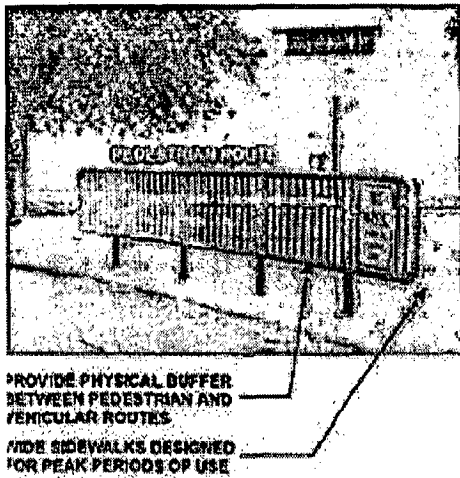


Fig 3.13 Safety buffer

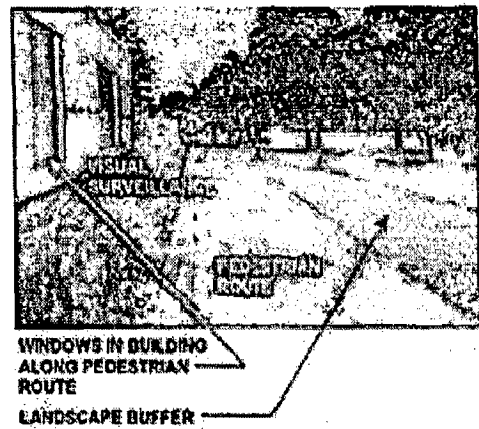


Fig 3.14 Landscape buffer

RECREATIONAL AREAS

- Provide multiple enclosures around recreational areas to achieve greater access control.

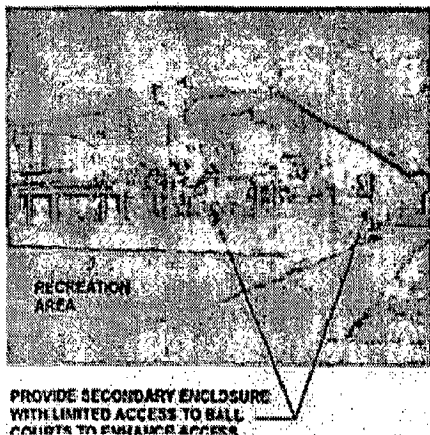


Fig 3.15 Secondary enclosure

- Provide separate facilities related to recreational areas such as restrooms, water fountains, and vending areas when applicable.
- Locate recreational areas in a visible location whenever possible.

ADMINISTRATION AREAS

- Locate administration areas adjacent to the main entry and lobby.
- Incorporating extensive interior glazing in administration areas to provide unobstructed views and natural surveillance.

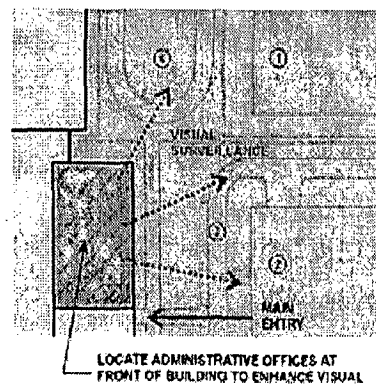
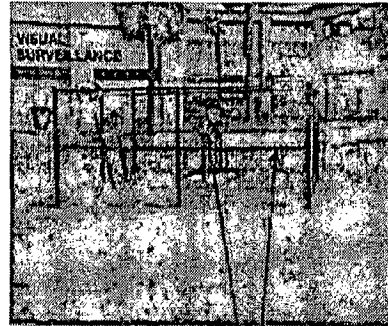


Fig 3.16 location of adm. block

- Design and locate the administration area to reinforce its role as the guardian of school facility.

SITE UTILITIES

- Fence site utilities to limit access.
- Provide unobstructed views to these areas from the school building to enhance monitoring.

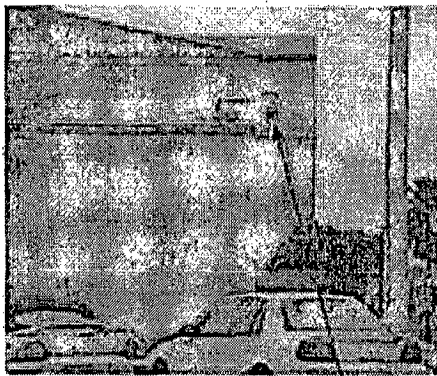


COORDINATE LOCATION OF SITE UTILITIES TO PROMOTE

Fig 3.17 Secure site utilities & limit access

ALARM & SURVEILLANCE SYSTEMS

- The use alarm & Electronic system can greatly increase safety and security of school areas.
- Locate detection devices at critical entry points and in rooms that contain valuable equipment and also



CCTV STRATEGICALLY POSITIONED TO MONITOR VISITOR PARKING AND BUILDING PERIMETER

Fig 3.18 Electronic surveillance

- Locate detection devices at typical locations include parking areas, the lobby and main entrance, enclosed stairwells and blind corners
- Utilize audio and/or motion sensitive detection systems and alarm systems when possible.

3.3.3 General Guidelines

- Perimeter of the school should be defined and fenced.
- Parking lots should be placed in high visibility area or near main entry
- Landscaping should not restrict view of area.
- Main entry into the school is required to be handicapped accessible.
- Nonskid materials should be used.
- All travel ways must be wide enough to permit wheel chairs without disrupting pedestrian traffic.
- Administrative offices should have clear lines of site of the play ground, parking areas and entry road.
- Parking and circulation areas should be placed in view of the classrooms.
- Vehicular and pedestrian movement should be segregated.
- Paths should be large enough to accommodate large volumes of students.
- Signage should be clear, reasonably sized and placed in a way that is easily viewed, also not obstruct the view and provide any hiding place.
- Blind spots and entrapment points must be minimized.
- Covered corridors should be designed so access to the upper floors of a structure is not possible.
- Walls located in high vandalism areas should be constructed of durable material resistant to graffiti and vandalism.
- Decorative materials should be used for aesthetic value, but the walls must be designed in a way in which climbing is not possible.
- CCTV placed strategically at entrances, exits, hallways. Cameras should operate continuously and videotapes analyzed & archived.

- Alarms provide security in isolated areas and it should be located in isolated areas such as rest rooms and locker areas.
- Have self engaging locking mechanisms on all windows.
- Weapon detectors can be integrated within an entry way.

FIELD STUDY (DESIGN ANALYSIS)

The aim of analyzing these case studies for the identification of design parameters, which contribute to the fulfillment of performance criteria, which in turn are prerequisites for the fulfillment of safety and security needs. These performance criteria have been identified in the preceding chapter. Thus, the case studies will be analyzed with respect to these preconditions.

Topics covered in this chapter

- **Design Analysis**
- **Case study 1. Our Lady of Fatima Sr. Secondary school, Aligarh**
- **Case study 2. St. Fedallis Sr. Secondary School, Aligarh**
- **Case study 3. UPRAS Sr. Secondary School, Vasant Vihar, New Delhi**
- **Case study 4. D.P.S., Mathura**
- **Problems Identified**
- **Observations of Case Studies**

4.1 DESIGN ANALYSIS OF CASE STUDIES

From literature study it is clear that accidents and crime in school campus can be prevented by following concepts:

1. NATURAL SURVEILLANCE
2. NATURAL ACCESS CONTROL
3. TERRITORIALITY
4. MAINTENANCE & IMAGE
5. NEIGHBORHOOD CONCEPT.

Architect role is to incorporate the Architectural vocabulary of the above points in design of our buildings.

Architectural Vocabulary of the above concepts

- Site Planning
- Building Organization
- Interior Design
- Equipments/system
- Services
- Material
- Maintenance
- Others

The following case studies will be analyzed for the above said points to frame the design guidelines for the crime free housing:

- Case study 1. Our Lady of Fatima Sr. Secondary School, Aligarh
- Case study 2. St. Fedallis Sr. Secondary School, Aligarh
- Case study 3. UPRAS Sr. Secondary School, Vasant Vihar, New Delhi
- Case study 4. D.P.S., Mathura

4.2 CASE STUDY 1. Our Lady of Fatima Sr. Secondary School, Aligarh

It is Located in the civil lines area of Aligarh and 2.5 km away from the railway station, this school was established in 1968. The site area of the school is about 4.2 acre and building block is three storey high with central court yard. The site for study has been selected to find out the various demerits and merits in planning, designing and detailing of various building components and also to understand the possible design factors responsible for accidents and crime in school campus.

4.2.1 General Information

Site Area = 16996.35sqm

Ground Coverage = 30%

Play Ground area = 7284.15sqm

No. of storey = G+2

No. of Students = 1650

Built Form = U Shape

Primary circulation = singly loaded corridor

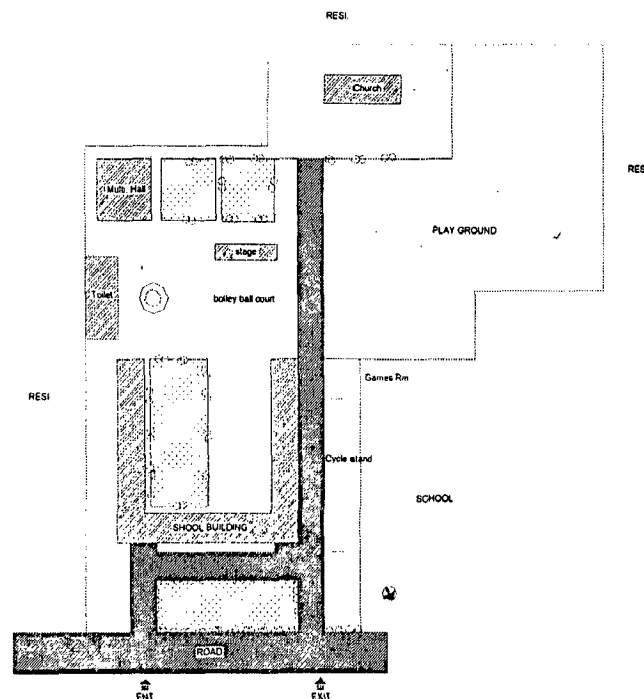


Fig 4.2.1 Site layout

4.2.2 SURROUNDINGS

The school campus is surrounded by residential development on three sides and school on one side. It is located adjacent to heavy traffic road and due to its location, results in many major and minor accidents due to moving traffic in peak hours.

4.2.3 ENTRY/EXITS

Only two entry and exits are provided, well defined and equipped with santry box at both the entrances of the campus.

4.2.4 SCHOOL BOUNDARY AND FENCING

The boundary wall of school abutting the major road is solid and high enough to control access but obscures visual surveillance both from inside and outside the campus.

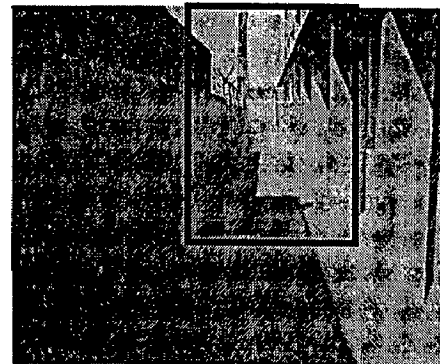
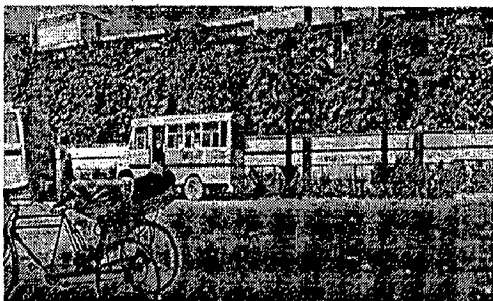
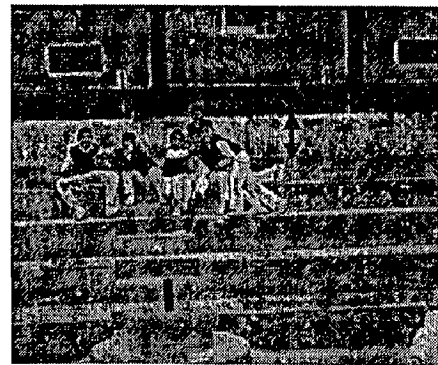


Fig 4.2.2 Design of site perimeter

Faulty detailing of the fencing on north side of the school perimeter provides easy access from nearby school building.

4.2.5 VEHICULAR AND PEDESTRAIN MOVEMENT

Traffic congestion at peak hours resulted in many major and minor accidents on the abutting road because no parking lots for the bus and rickshaw are provided in the campus and also no separate entry for the visitors and service delivery is provided.

There is no segregation between vehicular and pedestrian movement. Parking zones are not defined and segregated. Vehicular traffic is not restricted in school campus.

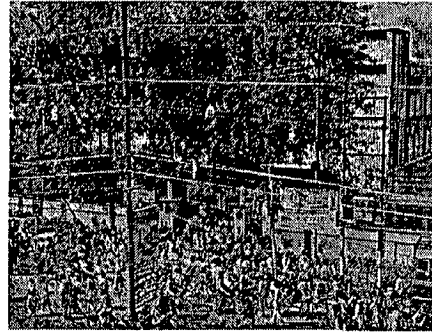


Fig 4.2.3 View of Traffic at peak hours

4.2.6 PLAY GROUNDS

Play grounds are located away from the school building thus obscured visual surveillance and also the vehicular path also bisects playground and basket court.

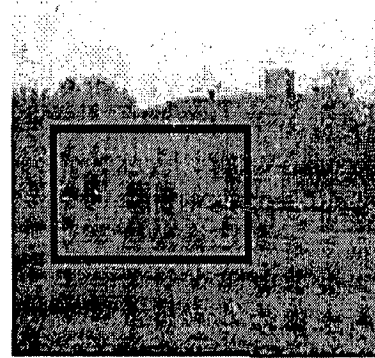
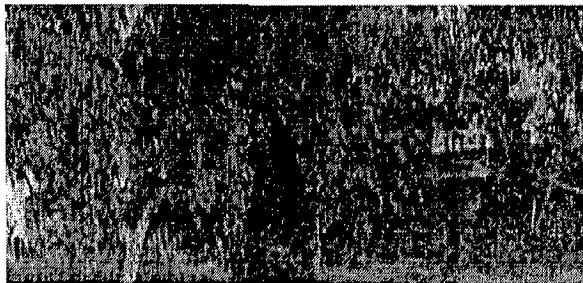


Fig 4.2.4 No specified parking

Volley ball court is not viewed from the upper storey due to presence of dense foliage of trees and playing equipments are not properly maintained.

Lack of maintenance of M.H. covers and surfaces of the playing areas result in accidents.

Trees have grown naturally in the playground, having dense foliage and impede surveillance and shrubs are too high and dense and provide easy space for hiding.



Fig 4.2.5 Trees obstructing the visual surveillance



Fig 4.2.6 Lack of maintenance

4.2.7 BUILT FORM / ENTRY & EXITS TO BUILDING

Building block of the school is U shaped with three storeys and having an enclosed courtyard safe from the three sides and main entrance to the school is located near the administration block and other secondary entrances are secured after hour use.

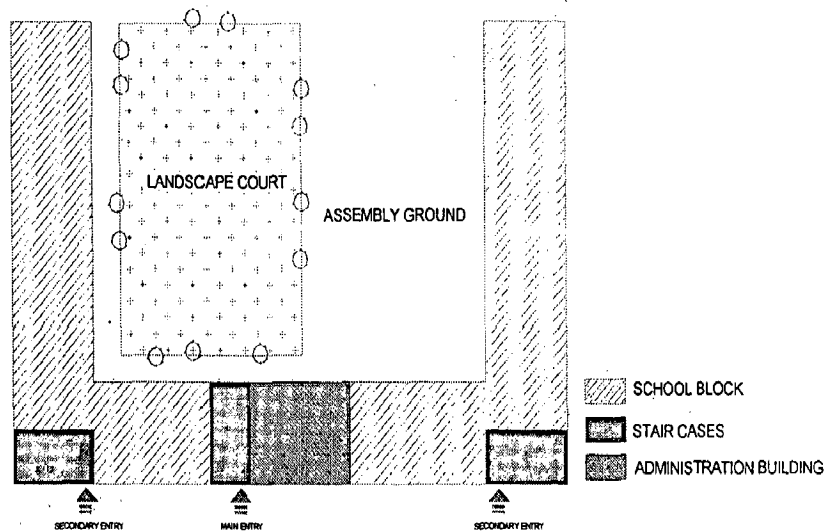


Fig 4.2.7 Built form

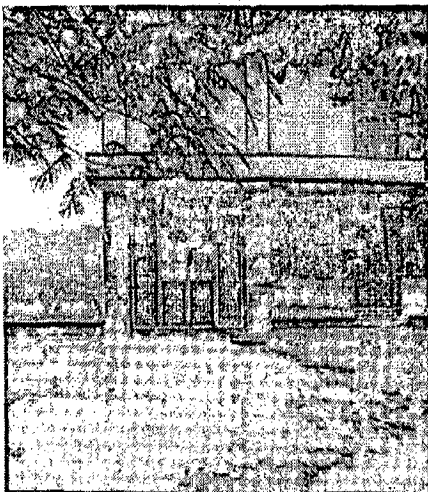


Fig 4.2.8 Width of canopy

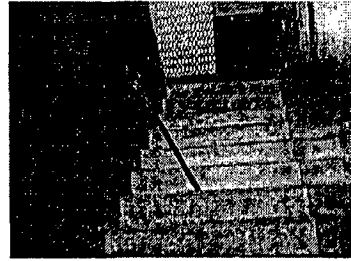
4.2.8 ADMINISTRATIVE BLOCK

From administrative visual surveillance of main entry is not possible due to positioning of windows and blocking line of sight with landscaping. And also natural surveillance of staff parking, cycle stand and playground is not possible from administrative block.

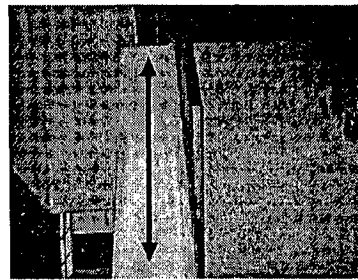
Over hangs over the entries are not sufficient wide enough to provide safety from sun and rain.

4.2.9 STAIR CASE AND STAIR WELL

Stair case are located at the junction and therefore it is not possible to keep a watch on person approaching the stair case and mainly enclosed type of stair cases are used for vertical circulation.



The hand rail design does not provide natural surveillance.



Faulty design of stair case provides sliding activities.

Natural light in the stair case is not sufficient.

All the stair case is directly leading to roof.



Fig 4.2.9 Location and design of stair case

Natural surveillance of the stair case is not possible from class room and administrative block.

The critical junction of stair case and corridor are susceptible to congestion during rush hours.

Access to the underneath of stair case is not restricted.

4.2.10 RAILING AND PARAPETS

Design of railing does not allow surveillance from ground.

Height of the railing and parapet is low as compared to standard.

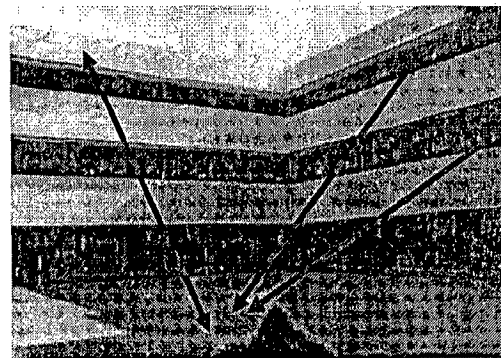
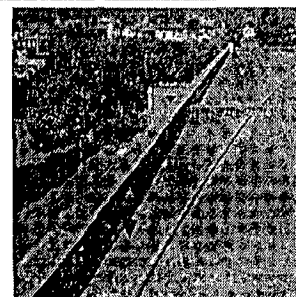


Fig 4.2.10 Design of railing and parapet



4.2.11 CLASS ROOM AND LABS

There is no vestibule is provided at the entrances of class room and labs to accommodate the traffic at peak hours .Every class room having two entries and eighty percent of class room windows no providing surveillance to recreational areas, parking and entry/exits.

Doors of the class room and labs not having sidelites to increase surveillance of corridors and also not having any locking and kick pad system.

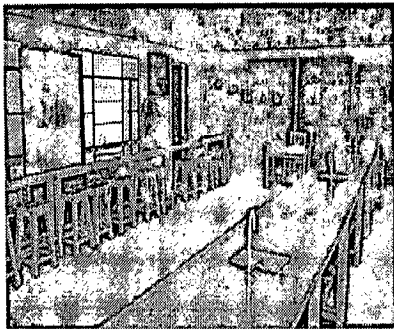


Fig 4.2.11 View of labs

Faculty or staff station in laboratory does not have visual station to work room and entry areas.

No, lockable room for storing costly tool and equipments.

For the safety of the laboratory no fire extinguisher are there.

5.2.12 TOILETS

Toilet block is isolated from the main school building thus result in lack of natural surveillance.

Entrance lobby of toilet provide negative space that may used for hiding purposes.

Drainage and maintenance of toilet is poor result in slipping of the students.

No, provision of toilet for wheel chair user

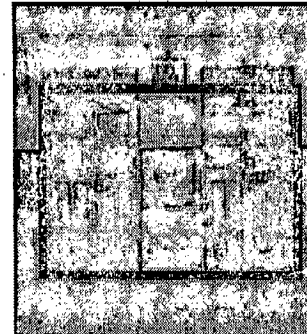


Fig 4.2.12 Door lites are not provided

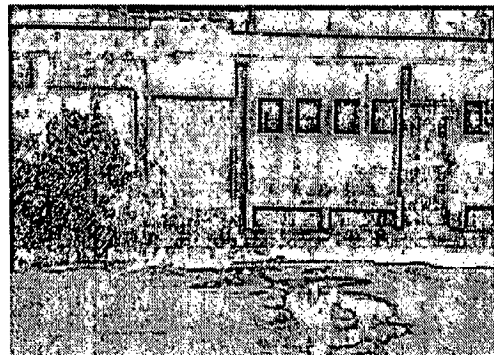


Fig 4.2.13 Toilet block is isolated from main block

4.2.13 HIDE OUTS

Space behind stage is used for hiding because no
Visual access is possible.



Fig 4.2.14 Neglected and hide
outspaces



Column provides the space for hiding.

4.2.14 OTHER ASPECTS

Utilities like A.C., generator room and transformer
access to these are not restricted

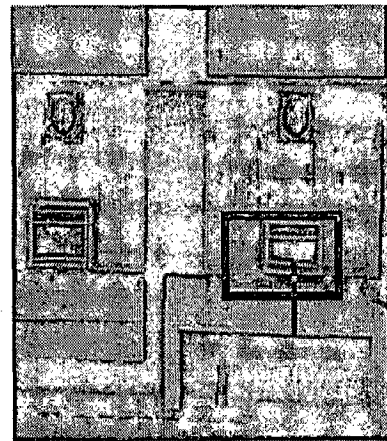


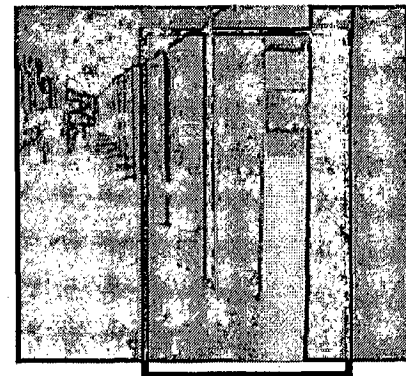
Fig 4.2.15 Access is not
restricted to utilities

Sharp corners of column in the corridors cause injuries
due to hitting in congestion.

Single step in corridor cause falling in peak hours.

Multipurpose hall is constructed on one corner of the site
thus lack natural surveillance.

All the junction of the corridors is bisecting each other at
90 degree.



Sufficient open space not left all around the building for the movement of fire tender in
case of fire break out. Landscape courts are not properly maintained.

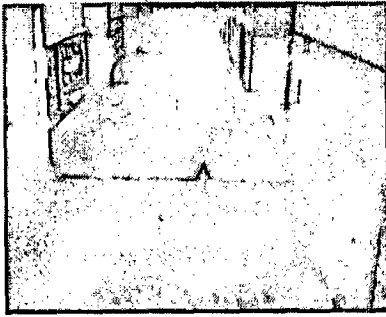


Fig 4.2.16 Improper designing of columns and levels

4.2.15 INFERENCES

- Parking spaces if not provided inside the school campus result in increase of congestion to the abutting road at peak hour and ultimately result into serious accidents and crime.
- Solid and high boundary resist access but at the same time obscure visual surveillance.
- Improper defined routes result in accident and unnecessary quarreling.
- Built form of the school play an important role in prevention of crime.
- Insufficient spaces all around the building block provide easy access from surrounding building and also restrict the movement of fire tender incase of fire accidents.
- Sharp edges of columns and wall result in injuries.
- Blind corner in the corridor obscure surveillance.
- Improper detailing of railing and parapets Obstruct visual surveillance and also result in fall of the student during rush hours.
- Narrow widening at critical junction creates problem in peak hours.
- Dark and narrow spaces provide hiding places.
- Dense foliage obstruct surveillance, lighting and provide potential hiding places.

- Isolated areas are more ill maintained.
- Insufficient over hang does not provide safety from sun and rain.

4.3 CASE STUDY 2. St. Fedallis Sr. Secondary School, Aligarh

It is Located on the outskirts of the city in industrial area of Aligarh and 5.5 km away from the railway station .this school was established in 1996.The site area of the school is about 5.2 acre and building block is three storey high with central court yard. The site for study has been selected to find out the safety and security measures have to be taken in account while designing a school campus on outskirts of the city and also to understand the possible design factors responsible for accidents and crime in school campus.

4.3.1 General Information

Site Area = 21043.74sqm

Ground Coverage = 30%

Play Ground area = 5892.24sqm

No. of storey = G+2

No. of Students = 850

Built Form = C Shape

Primary circulation = singly loaded corridor

4.3.2 SURROUNDINGS:

The school campus is surrounded by vacant land on the three sides and one side abutted by the main road and whole campus lies away from the main city.

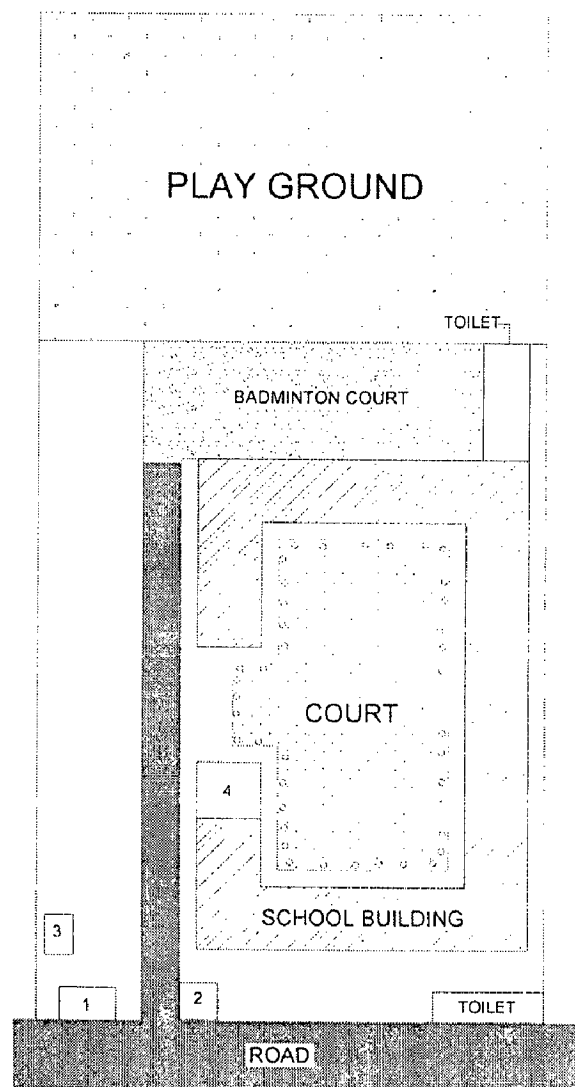


Fig 4.3.1 Site Plan

- 1) Electric/ switch room
- 2) Santry box
- 3) Shop

4.3.3 ENTRY/EXITS

Only one entry and exits are provided, well defined and equipped with santry box at the entrances of the campus.

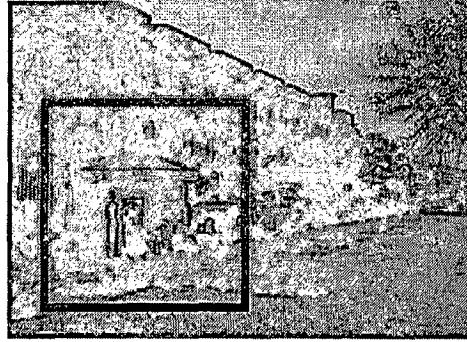


Fig 4.3.2 Single entry

4.3.4 SCHOOL BOUNDARY AND FENCING

The boundary wall of school enclosing the entire campus is not strong, durable and high enough to obscure any access from outside the campus.

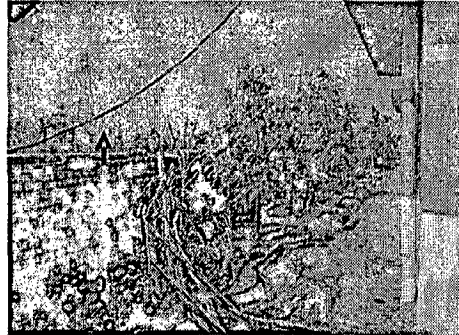
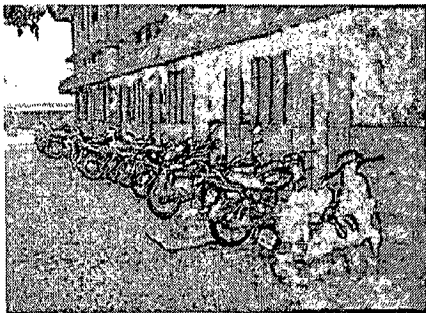
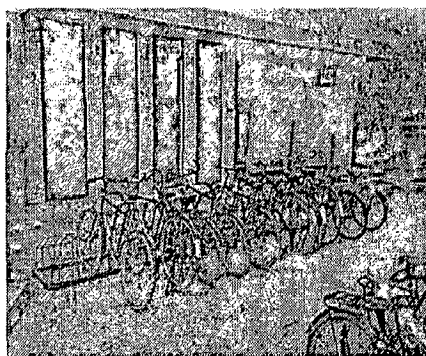


Fig 4.3.3 Site perimeter

4.3.5 VEHICULAR AND PEDESTRAIN MOVEMENT

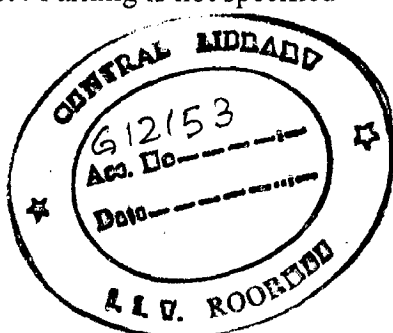
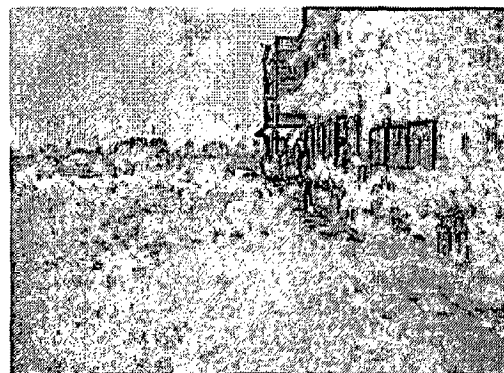


There is no specified parking space for bus, staff and students. All the students park their vehicles in the set back areas not properly defined.



There is also no segregation between the pedestrian and vehicular movement .Main drive way bisect the campus and reaches directly to play ground this may give rise to accidents and crime in school campus.

Fig 4.3.4 Parking is not specified



4.3.6 PLAY GROUNDS



Location of play field is such that it is viewed properly from the class room.

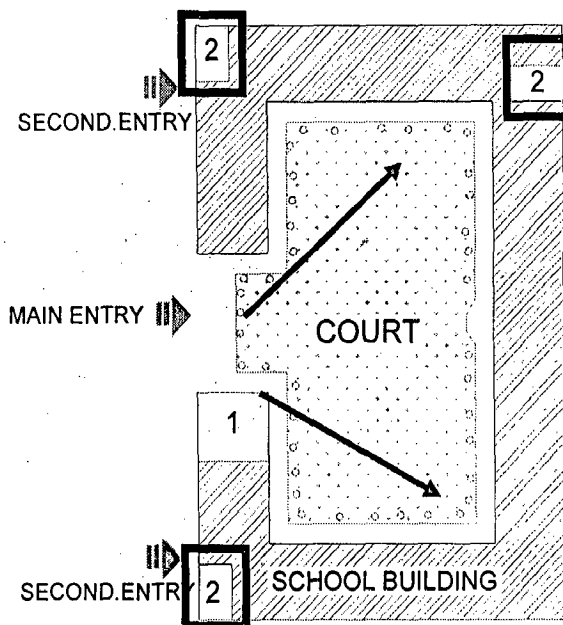
There is no enclosure around the play ground and courts to limit the access.



Play grounds are not properly maintained and landscaped.

Fig 4.3.5 Playground

4.3.7 BUILT FORM / ENTRY & EXITS TO BUILDING



Building block of the school is "C" shaped with three storey and having an enclosed courtyard safe from the three sides and viewed properly from the administrative block as well as from the corridors and there are three entrances to the building.



Fig 4.3.6 Built form

Fig 4.3.7 Canopy design at entrance

Main entrance to the school building is located near the administration block and other secondary entrances do not have natural surveillance from the administrative block and class rooms.

Canopy above the entrances are not wide enough to protect the students from sun and rain.

4.3.8 ADMINISTRATIVE BLOCK

Location of the administrative block is such that natural surveillance of the corridors, inner courts, assembly is not obscured. But the main entrance gate is not viewed from the administrative block.

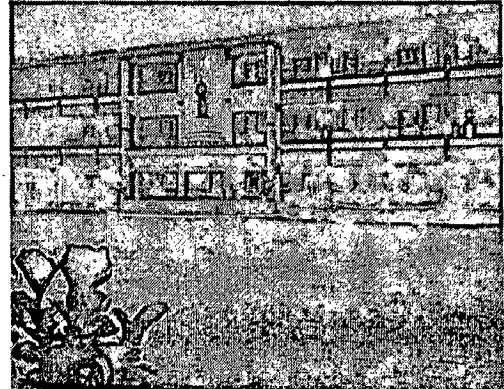
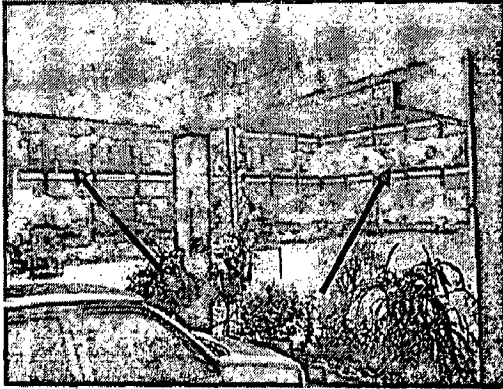


Fig 4.3.8 Natural surveillance from adm. block

4.3.9 STAIR CASE AND STAIR WELL

Stair case is located at the junction and enclosed type, surveillance is not possible from the courts, corridors and administrative block.

The hand rails provide natural surveillance but not impend the sliding activities.

All the stair case is directly leading to roof.

Sufficient landing space is provided to accommodate the traffic in peak hour to reduce congestion.

Access to the underneath of stair case is not restricted.

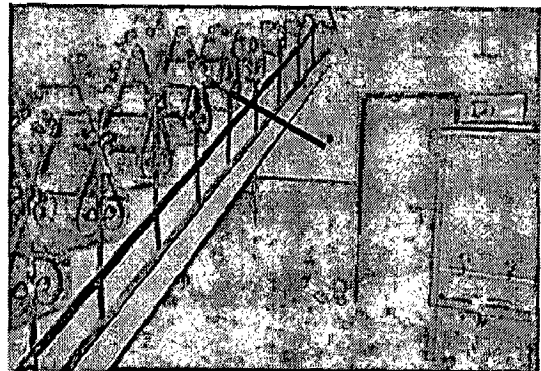
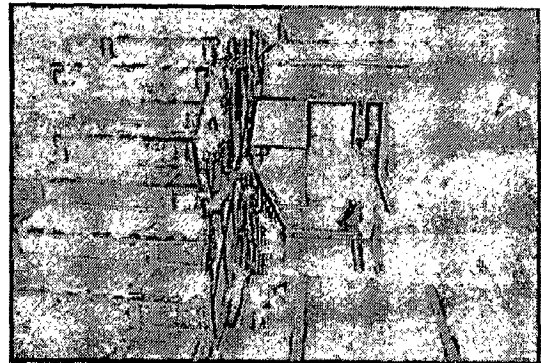


Fig 4.3.9 Stair case detail and design

4.3.10 RAILING & PARAPETS

Design of railing provides surveillance from the lower floors. Parapet does not provide any surveillance.

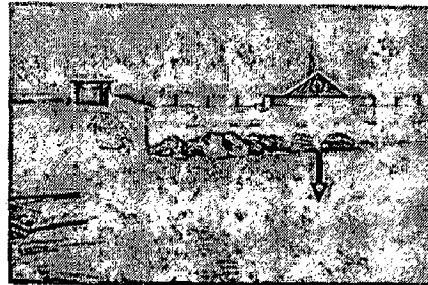


Fig 4.3.10 Railing and parapet detail

4.3.11 CLASS ROOM AND LABS

There is no vestibule is provided at the entrances of class room and labs to accommodate the traffic at peak hours .Every class room having two entries

Doors of the class room and labs not having sidelites to increase surveillance of corridors and also not having any locking and kick pad system. All the labs are located on the ground floor.

Faculty or staff station in laboratory does not have watch on work station and entrance. Also the designing layout obstruct the visual surveillance of the entire labs No, lockable room for storing costly tool and equipments. For the safety of the laboratory no fire extinguisher are there.

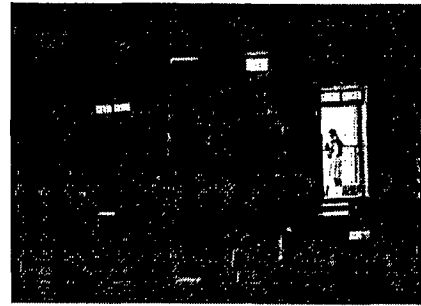


Fig 4.3.11 Class room



Fig 4.3.12 Laboratory

4.3.12 CORRIDORS

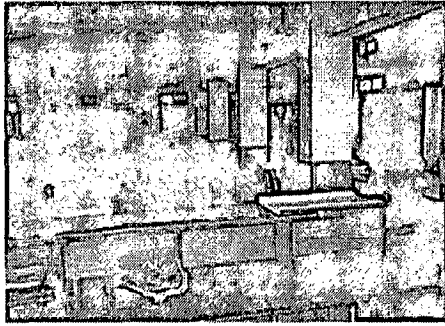
Corridors are singly loaded internal corridors and wide enough (1.8 m) to accommodate the traffic in peak hours and to allow easy circulation with out any obstruction.

The surveillance is possible from the inner courts and administrative block.

It cuts each other at 90 degree, thus creating a critical junction, which is more prone to accidents and also obscure visual surveillance.



Fig 4.3.13 Corridor junction



Location of the control point is such that it does not have visual surveillance on the entire library and also the column and arrangement of seating obstruct the visual surveillance.

There is no provision of vestibule at the entrance of the library.

Fig 4.3.14 View of library

4.3.14 TOILETS

Toilet block is segregated from the main school block thus result in lack of natural surveillance.

Entrance lobby of toilet provide negative space that may used for hiding purposes.

Drainage and maintenance of toilet is poor result in slipping of the students.

No, provision of toilet for wheel chair user.



Fig 4.3.15 Toilet block

4.3.15 HIDE OUTS

In designing of external walls alcoves and niches are provided this provide the better opportunity for hiding.

Designing of projection provide opportunities to climb to upper floors.

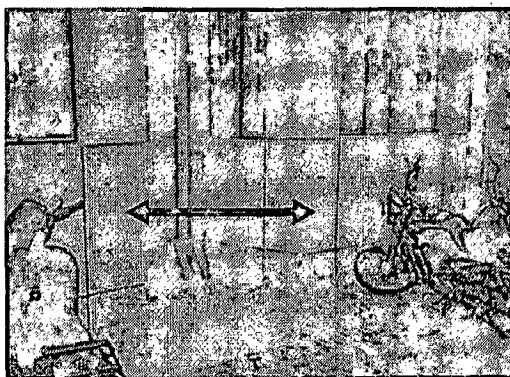


Fig 4.3.16 Design faults

4.3.16 UTILITIES

Electrical/ switch room is built on the periphery of the site and also very close to the confectionary shop entry to this area is not restricted which may result in some kind of accidents.



Fig 4.3.17 Access not restricted

Drinking fountains are segregated from rest of the building so, visual surveillance is not possible.

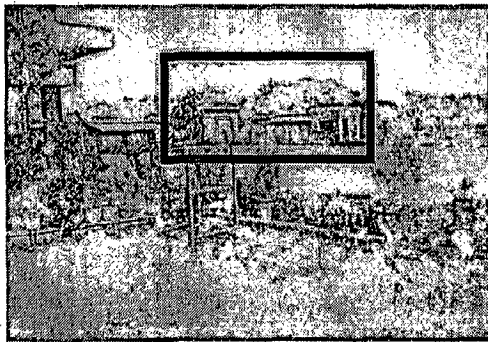


Fig 4.3.18 Isolated and segregated areas

4.3.17 INFERENCES

- Parking spaces if not provided inside the school campus result in increase of congestion to the abutting road at peak hour.
- Single entry/ exit help to control access.
- Site boundary of sound and optimum height is sufficient to control access and allow natural surveillance.
- All the vehicular routes and movement locked at one side of school campus.
- Built form of the school play an important role in prevention of crime.
- Insufficient spaces all around the building block provide easy access from surrounding building and also restrict the movement of fire tender incase of fire accidents.
- Sharp edges of columns and wall result in injuries.
- Niches and alcoves in external wall provide spaces for hiding.
- Projection or any other canopy design not provides easy access to upper storey.
- Blind corner in the corridor obscure surveillance.
- Recreational areas are not directly approached by the outsider.
- Isolated areas are more ill maintained.
- Insufficient over hang does not provide safety from sun and rain.
- Narrow widening at critical junction creates problem in peak hours.
- Enclosed type stair case obscure visual surveillance.

4.4 CASE STUDY 3. UPRAS Sr. Sec. School, Vasant Kunj, New Delhi

It is Located in South Delhi with close proximity to R.K. Puram and Haus Khas. This school was established in 1984. The site area of the school is about 3.5 acre and building block is two storey high with multiple central court yard.

4.4.1 General Information

Site Area = 14164.05sqm

Ground Coverage = 30%

Play Ground area = 3470.19sqm

No. of storey = G+1

No. of Students = 1500

Built Form = Multiple court type

Primary circulation = singly loaded corridor

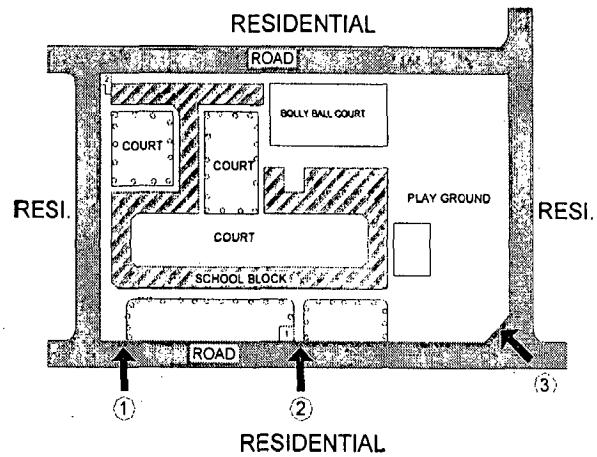


Fig 4.4.1 Site layout

4.4.2 SURROUNDINGS

The school campus is enclosed by the road on all four sides, with main road at front and having residential development on all the four sides.

4.4.3 ENTRY/EXITS

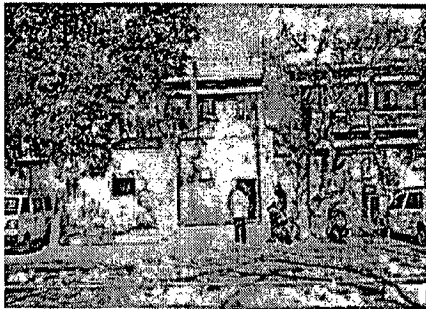


Fig 4.4.2 Main entry gate



Fig 4.4.3 Secondary entry gate

Three entry and exits are provided, from the main approaching road, main entry equipped with santry box other two entries for the students and one entry reserved for service purpose. Through service entry access is possible because it is opening directly in the play ground so that there may be chances of accidents and unauthorized access of the intruders. Entries at the crossing of the roads should be avoided because they are more prone to accidents. Entries at the crossing of roads should be avoided because they are more prone to accidents.

4.4.4 SCHOOL BOUNDARY AND FENCING

The boundary wall of school is strong, durable and maintained but it is high enough and obscure natural surveillance from the roads in side the campus.

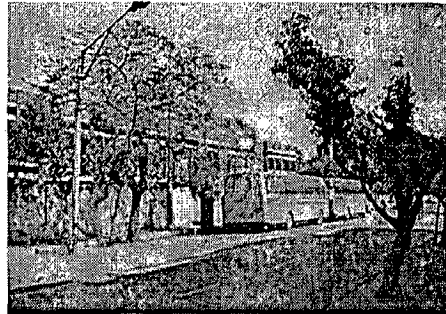


Fig 4.4.4 Site perimeter

4.4.5 VEHICULAR AND PEDESTRAIN MOVEMENT

There is no segregation of vehicular and pedestrian movement and also no specified parking space allotted for the bus, staff and students and services.

Most of the parking is done outside the campus on the main road this cause congestion at peak hour's results in to number of accidents and injuries to the inmates.

Two wheeler and cycle are parked in the side set back areas of the school building.

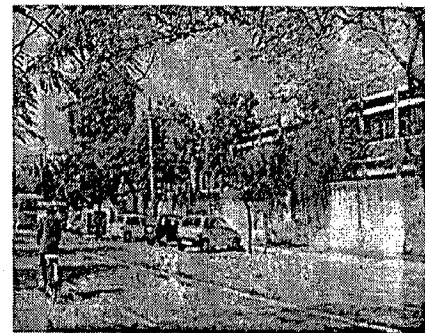


Fig 4.4.5 Visitor's parking



Fig 4.4.6 Staff and student parking

4.4.6 PLAY GROUND

The location of the play ground and courts is such that they are properly viewed from the school building. Volley ball courts are placed very close to the school building which may results injuries and breakage of window glass.

These are not enclosed to limit the access. Play ground are not having any seating for viewers and no trees are planted to provide a shading place.

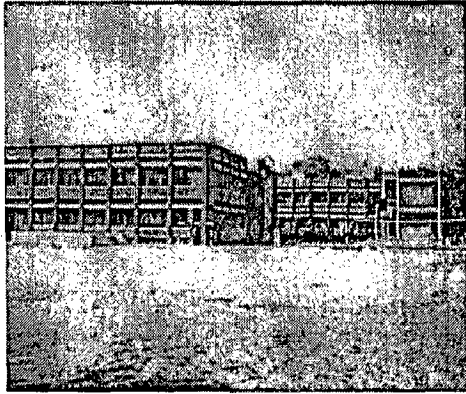


Fig 4.4.7 visibility from building

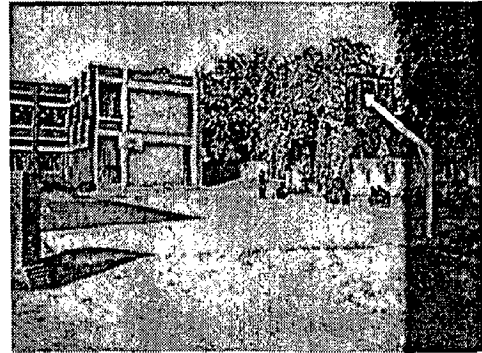


Fig 4.4.8 Volley ball court

4.4.7 BUILT FORM / ENTYR & EXITS TO BUILDING

Building block of the school is having multiple courts, two storey and having three courts properly viewed from the corridors and class rooms. There are two entries to school block one entry near the administrative block and other for students due to multiple courtyards planning number of secondary entry/exits increases so it is very difficult to control the access points.

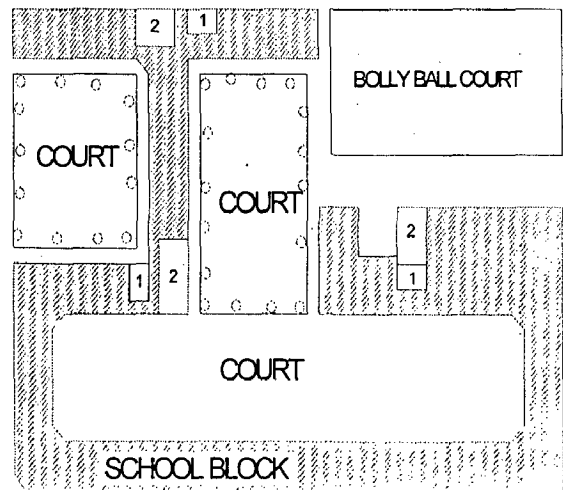


Fig 4.4.9 Built form

1) Stairs case and 2) Toilet



Fig 4.4.10 Secondary entry



Fig 4.4.11 Main entry

Canopy above the building entrances are not wide enough so as to provide shelter against rain and sun.

4.4.8 ADMINISTRATIVE BLOCK

Administrative block is locked near the main entrance of the school such that natural surveillance of the entry/exits of school campus is not obscured. But the inner courts are not viewed from the administrative block.

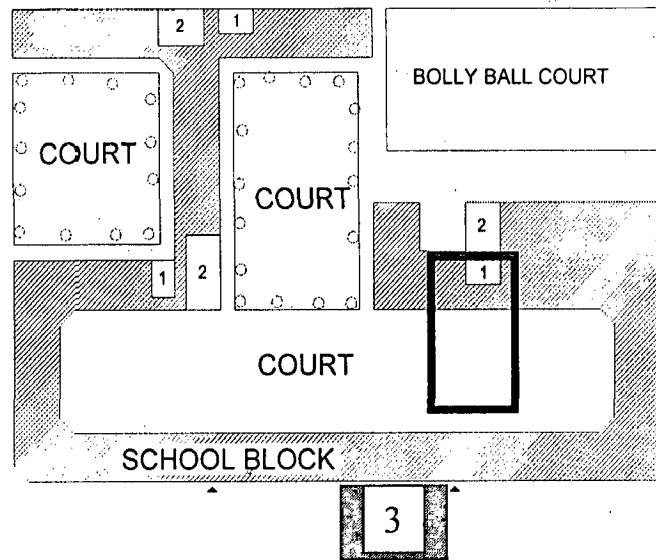


Fig 4.4.12 Adm. block

Location of the stair case is such that, allow natural surveillance from the corridors, library, staff room and administrative block, this also prohibits the easy access to stair case from outsiders. Enclosed type stair cases are avoided. Access to under side of the stair case is not restricted.

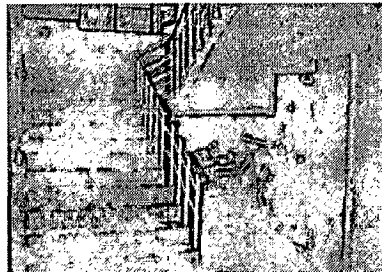
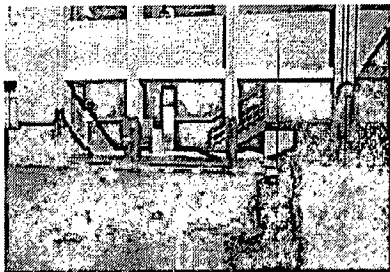


Fig 4.4.13 Stair case

Sufficient landing space is provided at the meeting edge of corridors, to free movement of the user. Design of railing allow visual surveillance, but allow sliding activities.

4.4.10 RAILING & PARAPET

Height of railing is 900 mm and design of railing and parapet not allow visual surveillance from the lower floors.

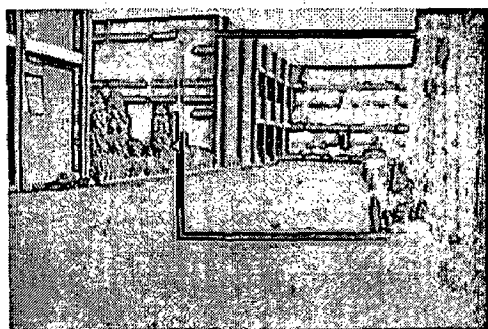


Fig 4.4.14 Parapet design



Fig 4.4.15 Natural surveillance through windows

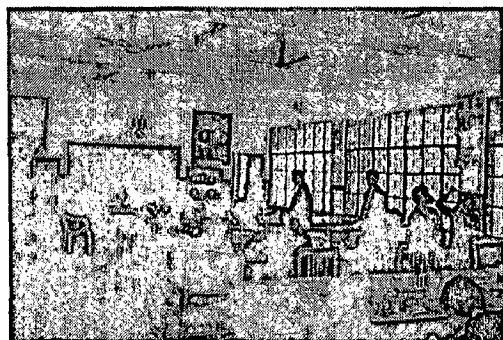


Fig 4.4.16 Interior of lab

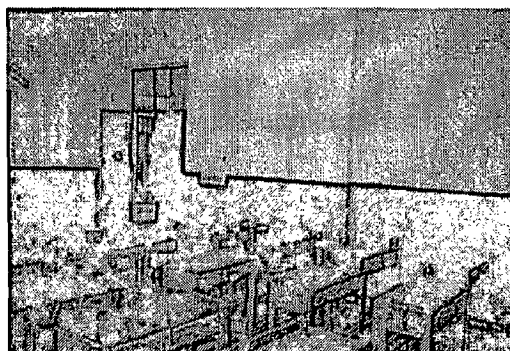


Fig 4.4.17 Class room

4.4.11 CLASS ROOM/LABS

Location of the class rooms and placement of windows allow natural surveillance of play grounds, inner courts, and basket ball courts.

Windows and doors of the class room and labs are not strong enough to restrict the entry of intruders.

Sidelites are not provided in doors.

All the labs are restricted to ground floor.

From staff cabin does not allow visual surveillance of the whole lab and entry point.

4.4.12 CORRIDORS

Corridors are singly loaded and wide enough (1.8 m) to accommodate the traffic in peak hours and to allow easy circulation with out any obstruction.

Critical junctions, of the corridors are chamfered to provide ample space, allow free movement to avoid any congestion.

Columns are flushed with the railing to allow movement without obstructions.

Opening of window panels in the corridor may results in serious injuries and also create obstructions.



Fig 4.4.18 Meeting detail of column and railing

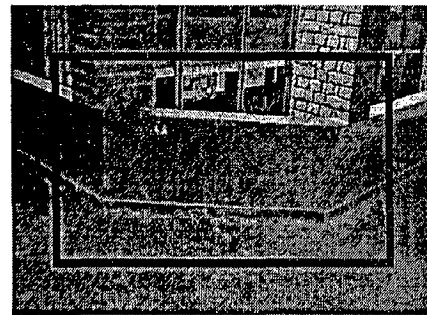


Fig 4.4.19 Corridor junction

4.4.13 LIBRARY

It is located on the first floor and the entry to the library is visible from the administrative block. Only single access point is there in library for control and surveillance.

Stacks in the library are placed in front of the windows. There is no lockable room inside the library to keep costly items.

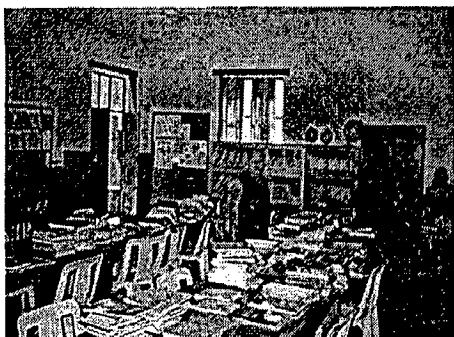


Fig 4.4.20 Library

4.4.14 TOILETS

Toilets blocks are located near the staircase in main corridors so as to increase natural surveillance.

Flooring of the toilet is antiskid type, the entire service pipe are concealed.

There no provision of toilet for wheelchair user.

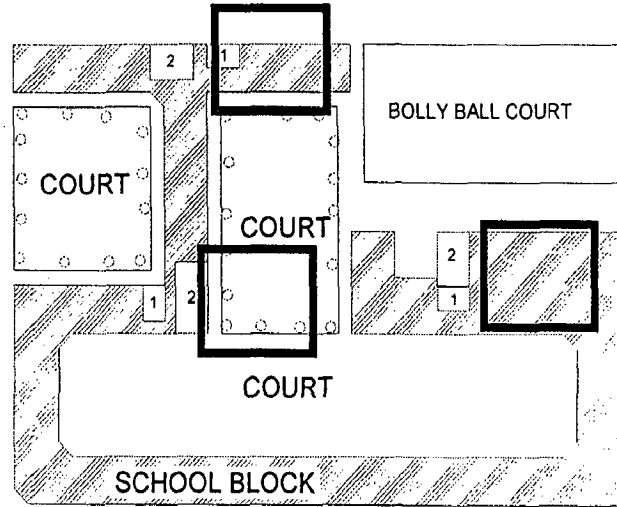


Fig 4.4.21 Toilets

4.4.15 OTHER ASPECTS

External wall of the school having too much of alcoves and niches that result in serious injuries, space for hiding and projection provide opportunities to climb up to upper storey.

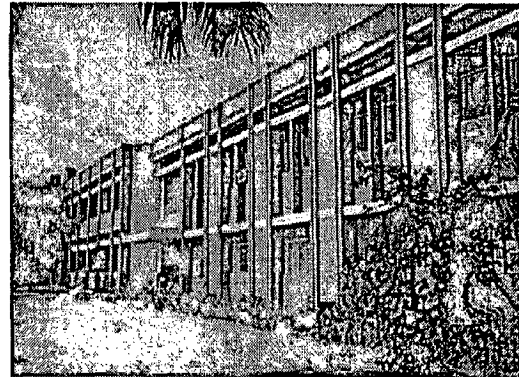


Fig 4.4.22 External facade

Canteen block is flush with the site boundary wall creating a obstruction in the movement of fire tender and also providing opportunity of access to school campus from the surrounding areas.

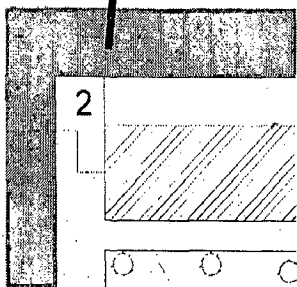
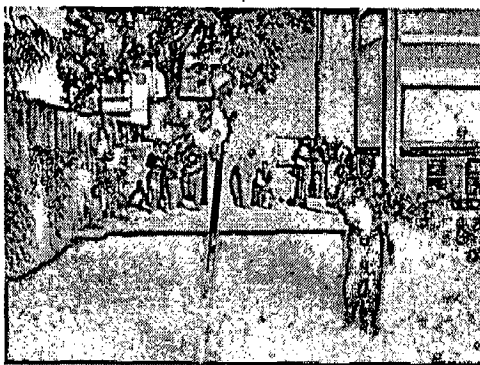


Fig 4.4.23 Blocking set back

4.4.16 INFERENCES

- Design of site boundary allows natural surveillance and recess unauthorized access control.
- There are not too many entries to the school campus.
- All the vehicular traffic restricted on one side of school campus.
- Parking spaces if not provided inside the school campus result in increase of congestion to the abutting road at peak hour.
- In multiple courtyards planning special stress is to be given on access control.
- Entries/ exits near the road crossing avoided.
- Enclosed play ground and recreational areas reduces the chances of accidents and crime in the campus.
- Too many niches and alcoves in the external wall design avoided.
- Enclosed type stair case obscure visual surveillance from near by areas.
- Location of the toilet in close proximity to staircase increases the natural surveillance itself.
- Singly loaded corridors are best circulations in school building.
- Chamfering of junction reduces the chances of accidents during rush hours and also increases the visual surveillance.

4.5 CASE STUDY 4. D.P.S. Mathura

It is located in Mathura, Refinery Township about 10 km from the main city. School established in 1982, site is about 5.6 acre and building is two storey high with multiple courts. Basically whole school building is divided in two block senior wing (6-12 class) and junior wing (1-5 class).

4.5.1 General Information

Site Area = 22662.49sqm

Ground Coverage = 35%

Play Ground area = 4419.18sqm

No. of storey = G+1

No. of Students = 1750

Built Form = Multiple court type

Primary circulation = singly loaded corridor

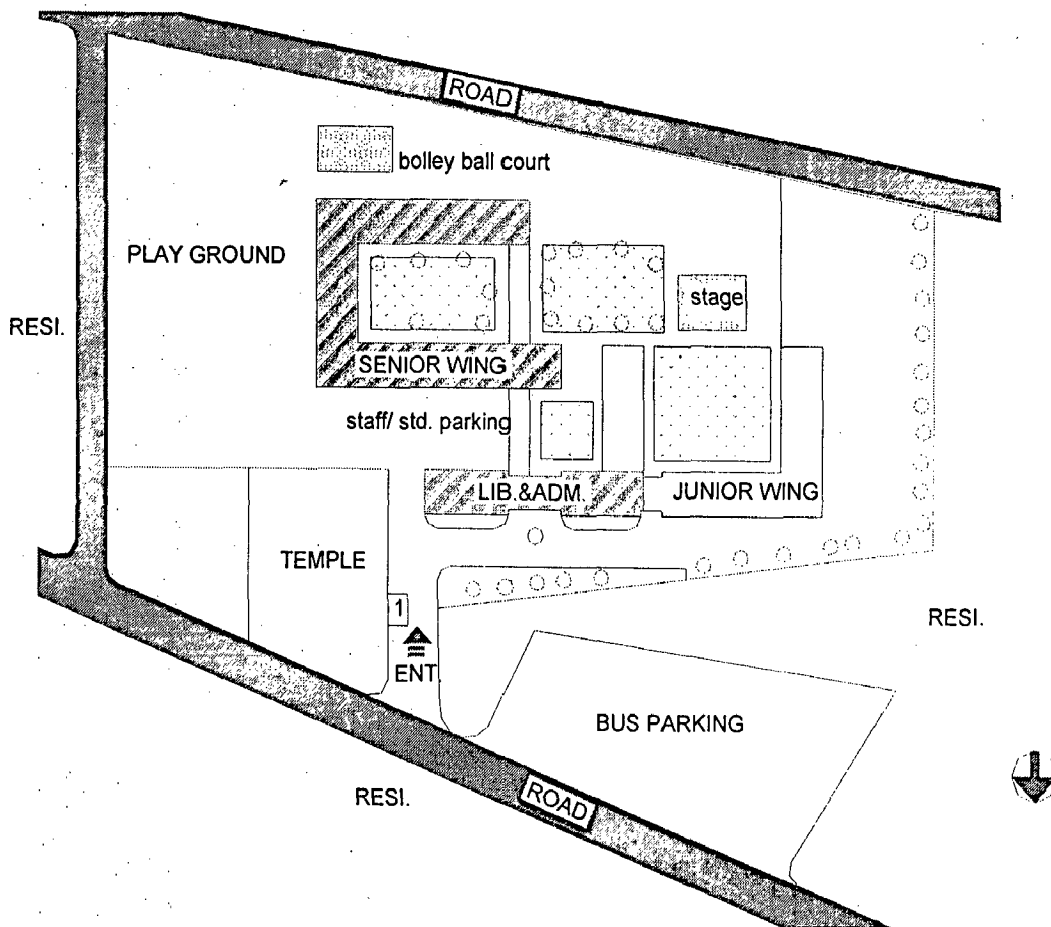


Fig 4.5.1 Site plan

4.5.2 SURROUNDINGS

The school campus is enclosed by the road on three sides, with residential development on all the four sides.

4.5.3 ENTRY/EXITS

Single entry and exits are provided, from the main approaching road, main entry equipped with santry box and about 6 mts wide.

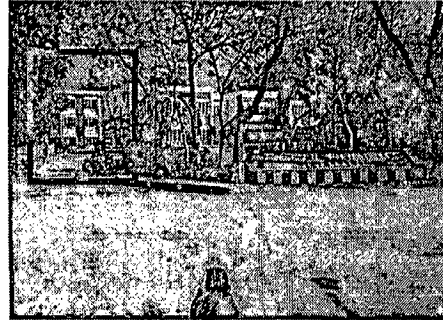


Fig 4.5.2 Main single entry

4.5.4 SCHOOL BOUNDARY AND FENCING

School campus is enclosed by the boundary wall but not high enough to control the access from outside.

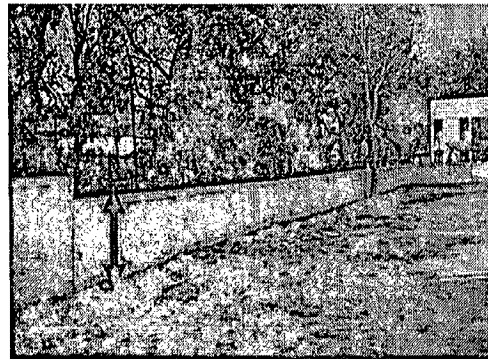
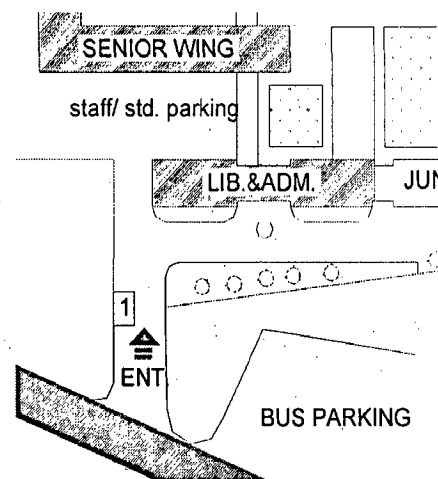


Fig 4.5.3 Site boundary

4.5.5 VEHICULAR AND PEDESTRAIN MOVEMENT

Vehicular and pedestrian routes are not defined in the school campus but some effort is done, bus parking space is allotted outside the school campus. Staff and student parking is done inside the campus but not specified properly.



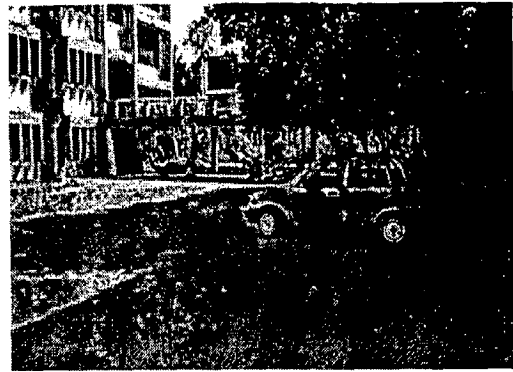
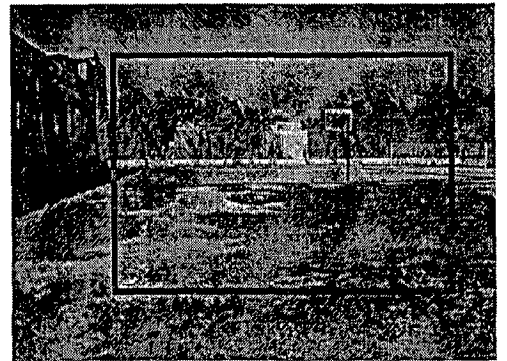
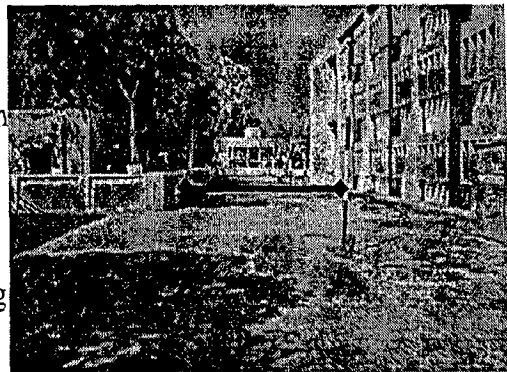


Fig 4.5.4 Parking

4.5.6 PLAY GROUND

The location of the play ground and courts is such that they are properly viewed from the school building. These are not enclosed to limit the access. Play ground are not equipped with seating arrangement for viewers and no trees are planted to provide a shading place.



4.5.7 BUILT FORM / ENTYR & EXITS TO BUILDING

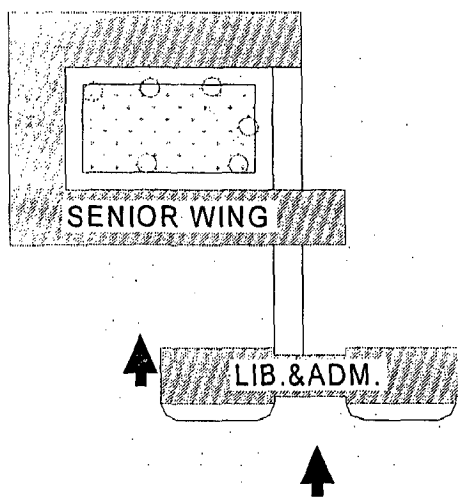


Fig 4.5.6 Built form

Fig 4.5.5 Play ground and courts are not enclosed

Building block of the school is having enclosed courtyard planning, two storey and having three courts properly viewed from the corridors and class rooms.

There are three entries to school block one entry near the administrative block and other for students and staff. Secondary entries are well secured by means of iron Gate to restrict the access.

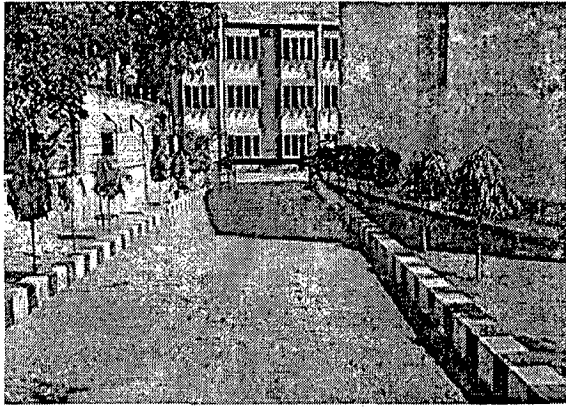
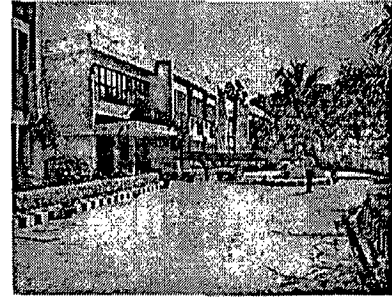
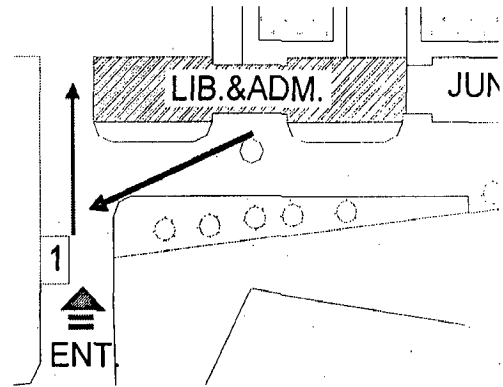


Fig 4.5.7 Secondary entrance



4.5.8 ADMINISTRATIVE BLOCK

Administrative block is placed near the main entrance of the school block such that natural surveillance of the entry/exits of school campus are not obscured. But the inner courts are not viewed from the administrative block.

Reception lobby has efficient glazing and located in such a way that path to secondary and main entry to the campus is visible. Fees counters are provided in the administrative block.



Fig 4.5.8 Main entry equipped with santry box

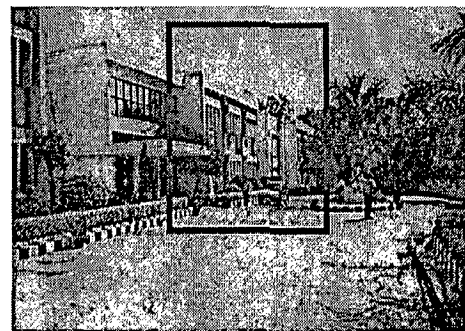


Fig 4.5.9 Adm. block

4.5.9 STAIR CASE AND STAIR WELL

Stair cases are located at the corners of the building block and are enclosed type.

Sufficient landing space is provided at the junction of corridors and stair case.

All the stair cases are directly approaching up to roof level making access to roof easy.

Under side of the stair case are not enclosed but

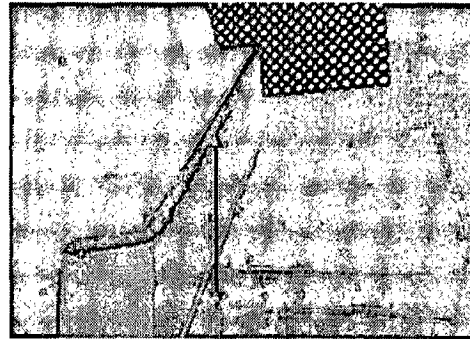
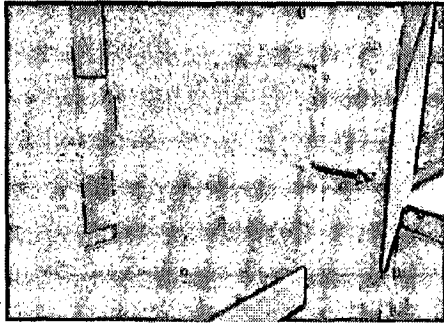
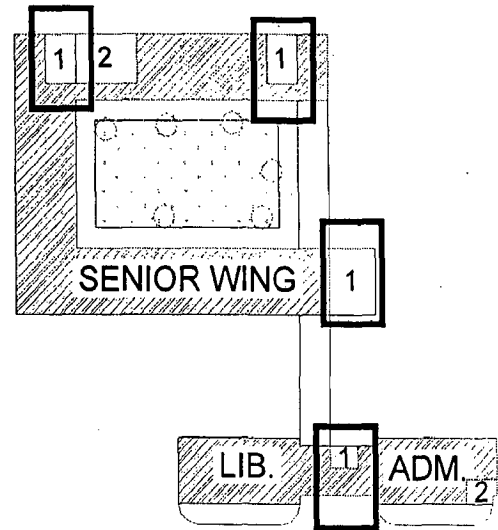
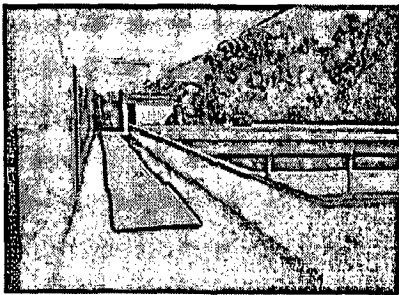


Fig 4.5.10 Location and design of stair case

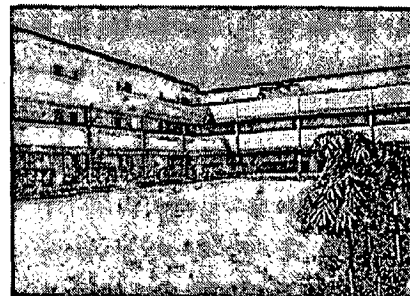
4.5.10 RAILING & PARAPETS



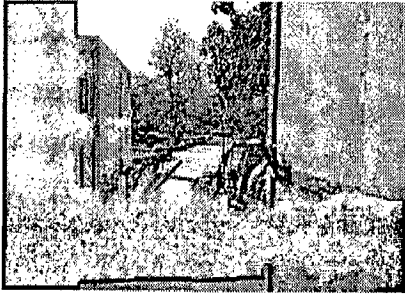
Railing and parapets are solid half brick thick and obscure natural surveillance from inner courts.

The height of the roof parapet is 600 mm may result in some accidents like roof fall.

Fig 4.5.11 Design of railing and parapet



4.5.11 CLASS ROOM/LABS



Location of the class rooms and windows are such that natural surveillance of main entry, play ground students and staff parking is not obscured.

Window opening is not provided on wall of class room facing corridor. Doors of the class rooms and labs are

Fig 4.5.12 Visibility from class room

not having any sidelites. All the labs are locked at ground floor.

4.5.12 CORRIDORS

Corridors are singly loaded and wide enough (1.8 m) to accommodate the traffic in peak hours and to allow easy circulation with out any obstruction.

Critical junctions, of the corridors are not chamfered to provide ample space, allow free movement to avoid any congestion. Columns are flushed with the railing to allow movement without obstructions.

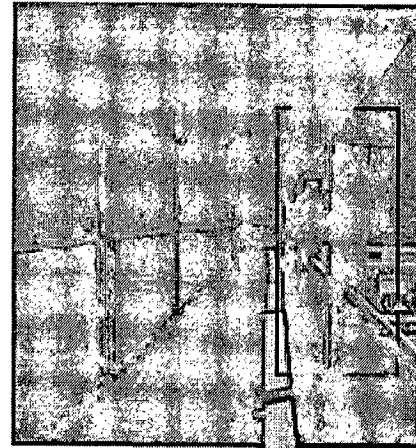


Fig 4.5.13 Corridor

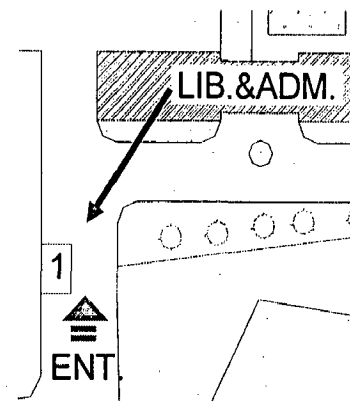
4.5.13 LIBRARY/ MEDIA CENTRE

Library is located in close proximity to main entry and near the administrative block.

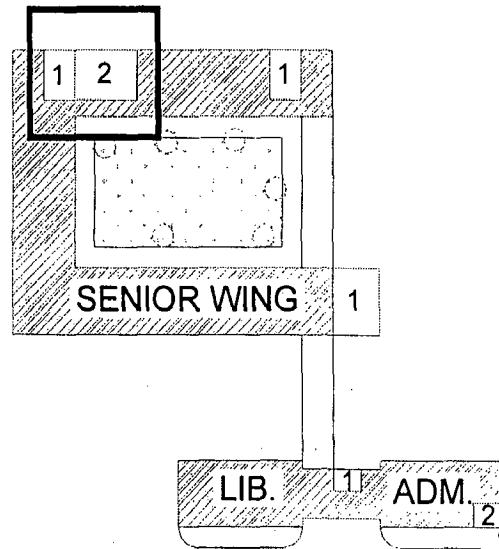
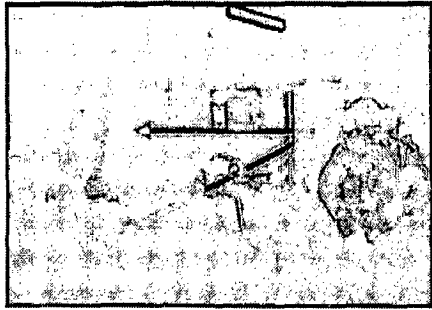
Visual surveillance of the main entry from the library and also surveillance of library from adm. Block is possible.

Media centre is located close to the administrative building.

Media centers having minimum opening to reduce the access control from outside and properly viewed from the staff /faculty room.



In library block main desk is placed closed to the entry to control the access, location of desk is such that it captures the unobstructed view of whole library. Stacks are placed away from the window opening neglecting any hiding place.



4.5.14 TOILETS

Toilets blocks are located near the stair case in main corridors so as to increase natural surveillance.

Flooring of the toilet is antiskid type, the entire service pipe are concealed. There no provision of toilet for wheel chair user.

Fig 4.5.14 Location of library block

4.5.15 OTHER ASPECTS

External wall of the school building having to much of niches, sharp corners and alcoves, which may cause serious injuries to students and also creates spaces for hiding.

Electrical utilities like pole, A.C. and other units the access to these utilities should be restricted and should be beyond the control limits of students.

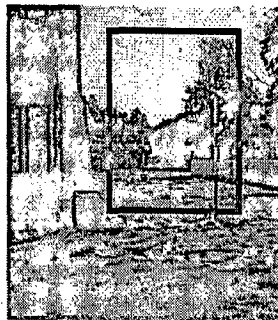


Fig 4.5.15 Access to utilities

4.5.16 INFERENCES

- Limited entry to the campus help in controlling the access.
- Site perimeters if properly defined and high enough to restrict the unauthorized entry.
- Provision of parking facilities of bus, rickshaws reduces the congestion on the abutting road.
- Enclosed court yard planning provide safer and secure environment.
- Location of administrative block help in increasing the total watch on the whole campus.
- Secured secondary entries help in controlling access from outside.
- Placement of toilet block in close proximity to the stair well enhances the surveillance of the toilet block.
- Utilities like electrical room, transformer, and A.C. units entries are restricted and are enclosed.

4.6 PROBLEMS IDENTIFIED IN SHOOOL CAMPUS

- Too many entries and access points
- Poor designing of site perimeter
- Parking space are not specified, poor zoning of parking
- Poor surveillance
- Poor building detailing such as stair case, facade treatment, Railing and parapet designing
- Narrow widening of canopy at the entrances not provide shelter from rain and sun
- Hide outs spaces in building
- Easy access to terrace and upper storey
- Dense foliage that impede surveillance and provide opportunity of hiding
- Neglected and isolated spaces in school campus
- Inadequate lighting and physical security
- Absence of multiple enclosures around the recreational areas to control the access
- Poor maintenance of services
- No, regards given to fire bye laws in school building
- No, attempted is done to make the building accessible to wheel chair user

4.7 OBSERVATIONS OF CASE STUDIES (Design Factors)

- Campus approached through one entry restricts the movement of stranger and also remain in visual surveillance.
- Enclosed courtyard planning define the territory, provides opportunity of interaction and surveillance.
- Specified bus parking reduces the congestion on abutting road during peak hours.
- Location of the administrative block at the front, near the main entry increases the surveillance.
- Well secured secondary entrances limit the opportunity of access of strangers.
- Toilets block located in close proximity to stair case, surveillance of toilets increases itself.
- Clubbing of recreational areas with utilities like toilets, drinking fountain increases surveillance.
- Enclosed staircase at the corners of the building obstructs visual surveillance.
- Meeting edge of the corridor and stair case sufficient landing space reduce the congestion in peak hours.
- Chamfering the corners of the corridors at the junction provide space for easy and unobstructed movement with out congestion.

FIELD STUDY (SURVEY ANALYSIS)

The aim of conducting the survey is to understand the public perception about accidents and crime and secondly for the identification of design parameters, which contribute to the fulfillment of safety and security needs.

A table has been developed for each parameter, which will show the strong and weak points of each case study.

Topics covered in this chapter

- **Criteria for selection of field sites & general information**
- **Survey Questionnaire result**
- **Public opinion about design factors**
- **Problems identified from field survey (Case study)**

5.1 CRITERIA FOR SELECTION OF FIELD SITES & GENERAL INFORMATION

The variety of approaches and data would provide, in the end, a more complete picture of existing conditions in school campus

The steps in the process involved

5.1.1 Literature review

5.1.2 Review of the Design Guidelines and associated materials

5.1.3 Interviews, Review, and Input

At the start of conducted direct interviews with design professionals, principals, students and parents to assess critical aspects of school design and related accidents and crime.

5.1.4 Site Visits and Review

Site visits were made to school, with the intent of seeing a cross section of schools located in as many of districts regions as possible. Further, the site visits provided the opportunity to collect unstructured data from respondents. In doing so, the surveyor asked the same general questions at each site. Responses to these questions often led to follow-up questions, which provided additional information and data.

5.1.5 Final Findings and Recommendations

Final findings and recommendations is given based upon the preceding research methodology.

5.2 SURVEY QUESTIONNAIRE RESULTS

5.2.1. Preferred layout of school building in your town?

1) One storey with central court yard	-	50%
2) One storey campus plan	-	25%
3) Single/two storey building	-	20%
4) Multiple storey	-	5%

5.2.2. General built form of school building in your town?

1) U- Plan	-	50%
2) H – Plan	-	30%
3) Campus plan	-	20%

5.2.3. Is building accessible to wheel chair user?

1) No	-	90%
2) Yes	-	3%
3) Partially	-	7%

LAYOUT,BUILT FORM & ACCESSIBILITY

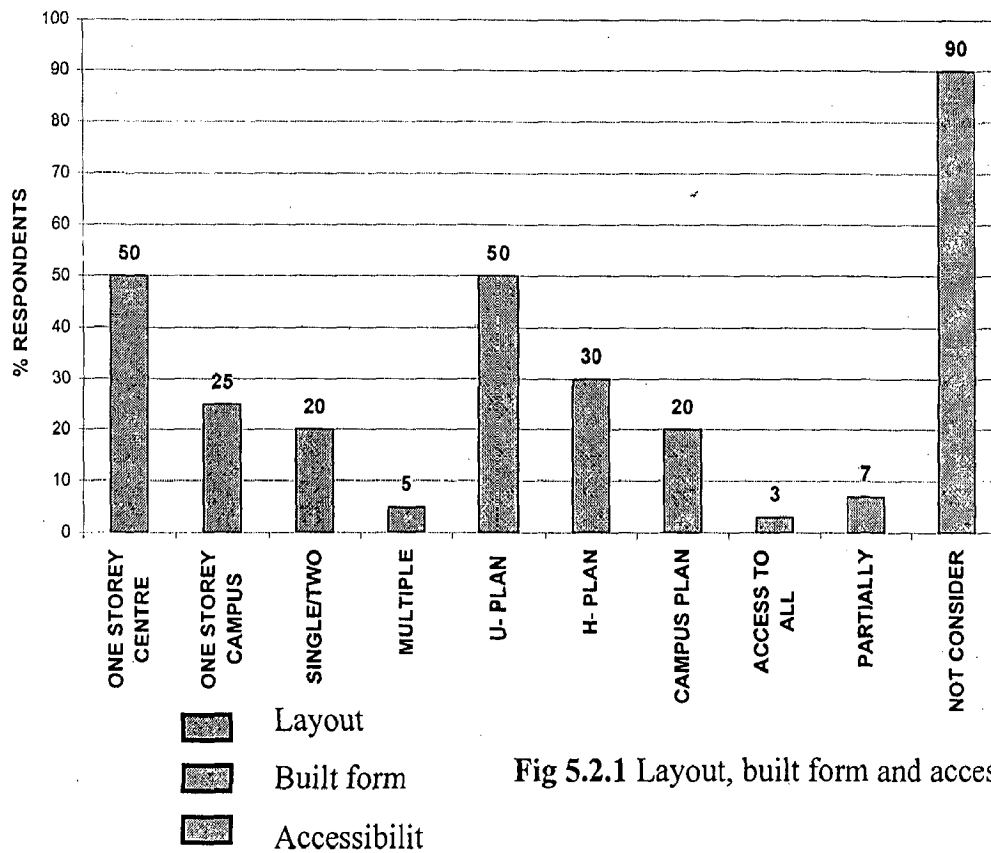


Fig 5.2.1 Layout, built form and accessibility

5.2.4. Is there provision of parking facilities in the school campus?

- 1) Not considered - 60%
- 2) Specified - 15%
- 3) Partially - 25%

5.2.5. Is fire safety measures taken in to account while designing of school campus?

- 1) Not considered - 70%
- 2) Considered - 20%
- 3) Can't say - 5%

5.2.6. Primary circulation system preferred in school campus?

- 1) Singly loaded corridors (exteriors) - 5%
- 2) Singly loaded corridors (interiors) - 70%
- 3) Both (exteriors & interiors) - 10%
- 4) Doubly loaded corridors - 15%

PARKING, FIRE SAFETY & CIRCULATION

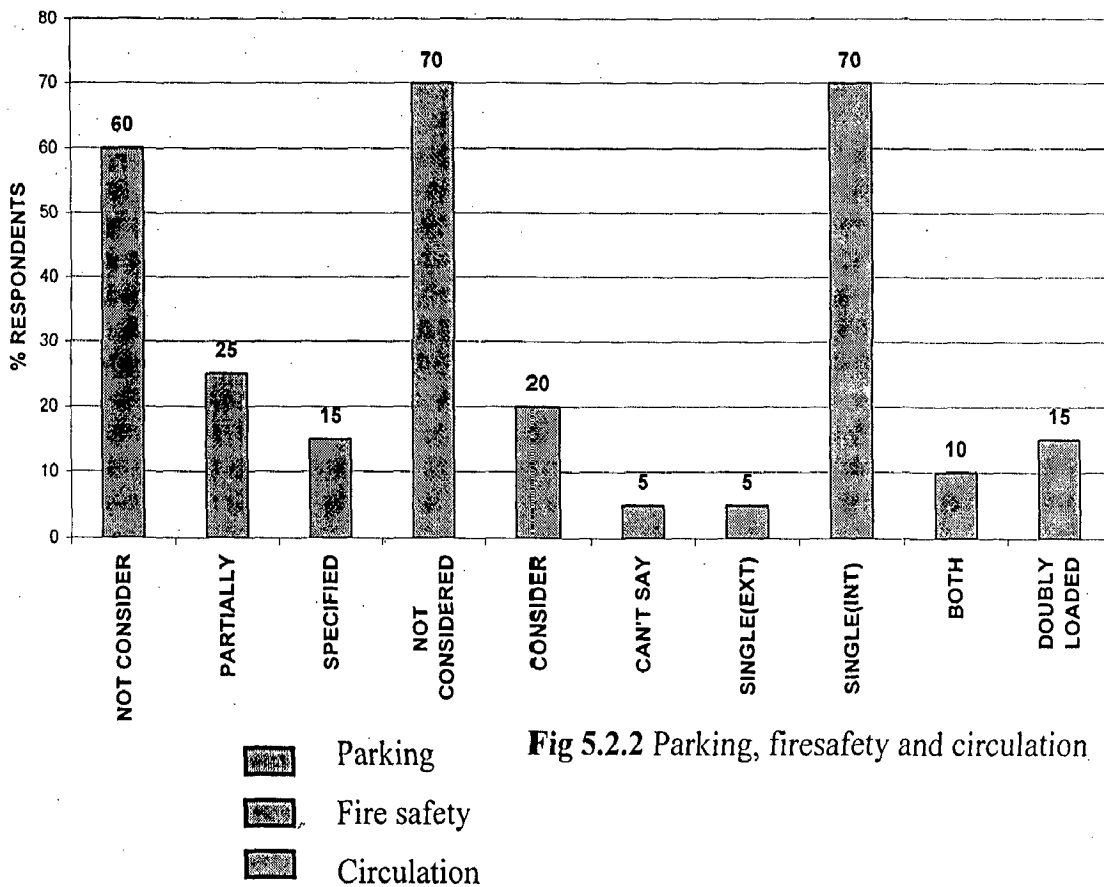


Fig 5.2.2 Parking, firesafety and circulation

5.2.7. Is crime occurred in your school campus?

- 1) Yes - 60%
- 2) No - 30%
- 3) Can't say - 10%

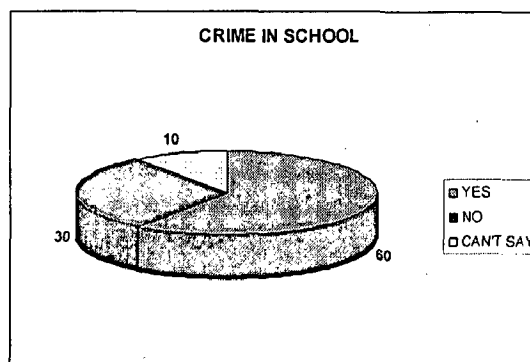


Fig 5.2.3 Crime in school

5.2.8. Types of crimes have occurred in school campus?

- 1) Fighting - 35%
- 2) Vandalism - 25%
- 3) Kidnapping - 5%
- 4) Battery - 10%
- 5) Graffiti - 4%
- 6) Theft - 12%
- 7) Drug possession - 5%
- 8) Weapon possession - 2%

5.2.9. Causes of crimes in school campus?

- 1) Lack of surveillance - 60%
- 2) Undefined enclosures - 20%
- 3) Ill maintained areas - 10%
- 4) Hide out spaces - 6%
- 5) Insufficient lighting - 4%

5.2.10. Crime by location?

- 1) Laboratory - 10%
- 2) Class room - 20%
- 3) Parking lots - 25%
- 4) Stair case - 8%
- 5) Secondary entrances - 5%
- 6) Toilets - 10%
- 7) Play grounds - 15%
- 8) Auditorium - 7%

5.2.11. Crime by time?

- 1) School hours - 20%
- 2) Recess - 25%
- 3) Immediately after school - 35%
- 4) Evening hours - 15%

TYPES, CAUSES, LOCATION AND TIME OF CRIME

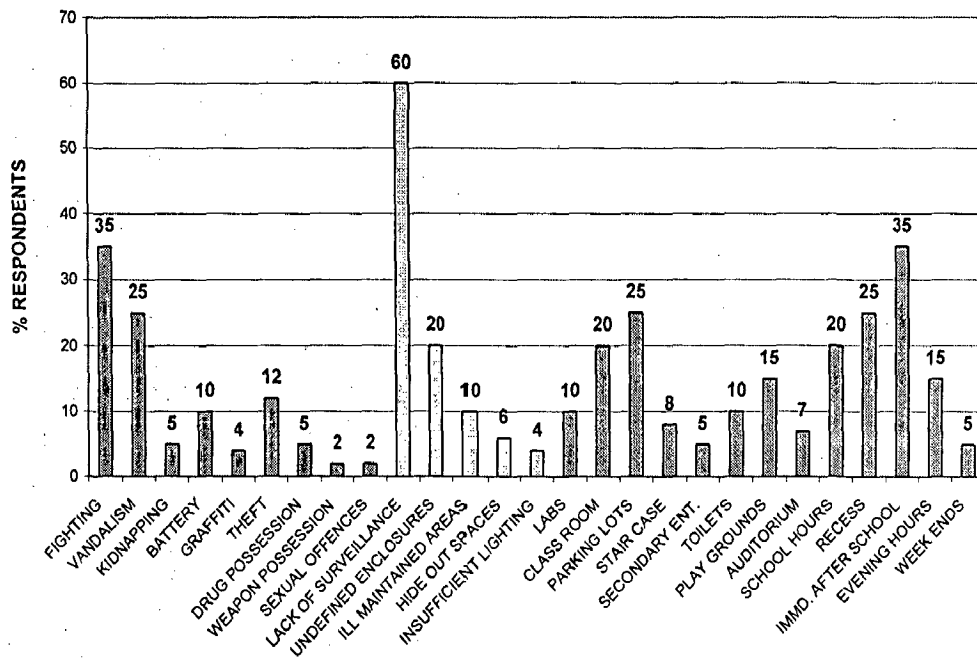


Fig 5.2.4 Types, causes, location and time of crime

- Types of crime
- Causes of crime
- Crime by location
- Crime by time

5.2.12. Is accident occurred in your school campus?

- 1) Yes - 70%
- 2) No - 25%
- 3) Can't say - 5%

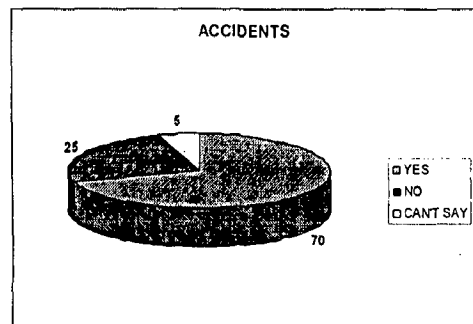


Fig 5.2.5 Accidents in school

5.2.13. Types of accidents have occurred in school campus?

1) Slip	-	50%
2) Fall	-	30%
3) Heat induced illness	-	15%
4) Electric shocks	-	3%
5) Fire break out	-	2%

5.2.14. Causes of accidents in school campus?

1) Blind corners	-	25%
2) Sharp edges	-	30%
3) Vehicular hitting	-	13%
4) Floor finish	-	8%
5) Landing width	-	6%
6) Design of hand rails/parapets	-	5%
7) Playing equipments	-	3%
8) Maintenance	-	8%
9) Lighting	-	2%

5.2.15. Accidents by time?

1) Recess	-	35%
2) Immediately after school	-	50%
3) Evening hours	-	5%
4) School hours	-	10%

TYPES, CAUSES & TIME OF ACCIDENTS

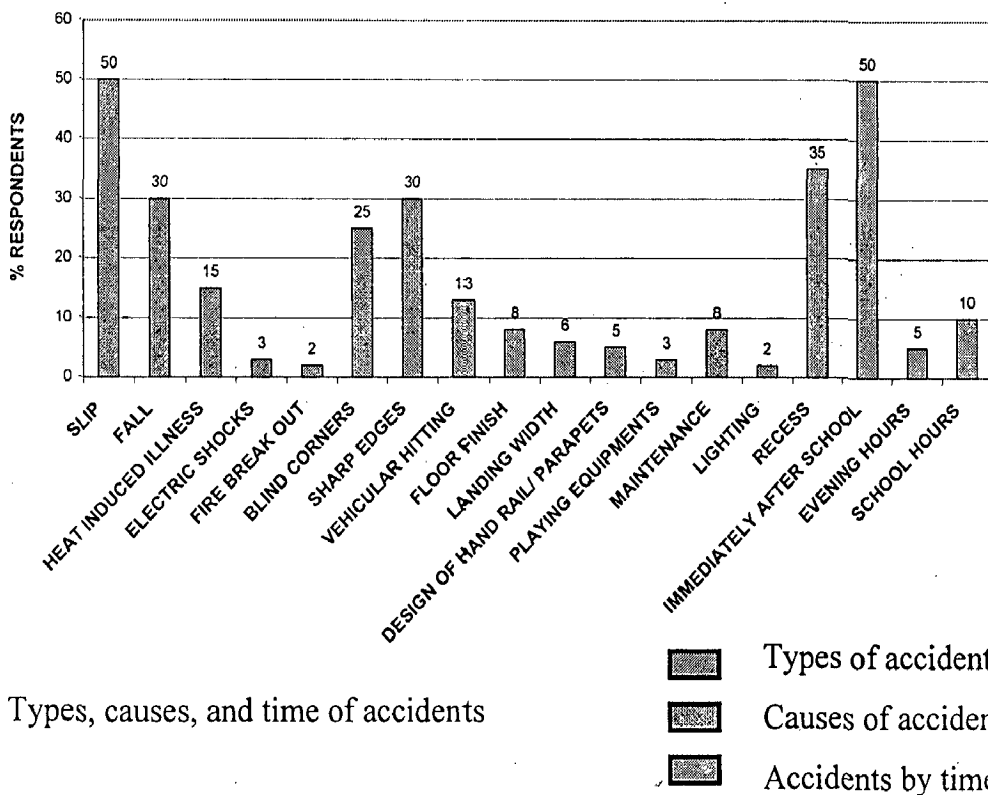


Fig 5.2.6 Types, causes, and time of accidents

5.3 OBSERVATIONS

This survey suggests that following design factors need an attention of an Architect while planning and design of school campus. It is also observed that by careful planning of these factors, accidents and crime can be prevented to certain extent.

As per following factors are responsible for accidents and crime in school campus:

- Poor surveillance
- Undefined enclosures
- No access control
- No, regard to fire bye laws
- Poor building detailing that results in accidents and easy access to outsiders
- Easy access to terrace and upper floors
- Blind corners, niches and projections
- No specified parking
- Inadequate physical security
- Designing with no consideration to physically handicapped person
- In adequate lighting

5.4 PUBLIC OPINION ABOUT DESIGN FACTORS

5.4.1 Impression of design of school in terms safety and security?

1) Poor	-	45%
2) Satisfactory	-	30%
3) Good	-	25%

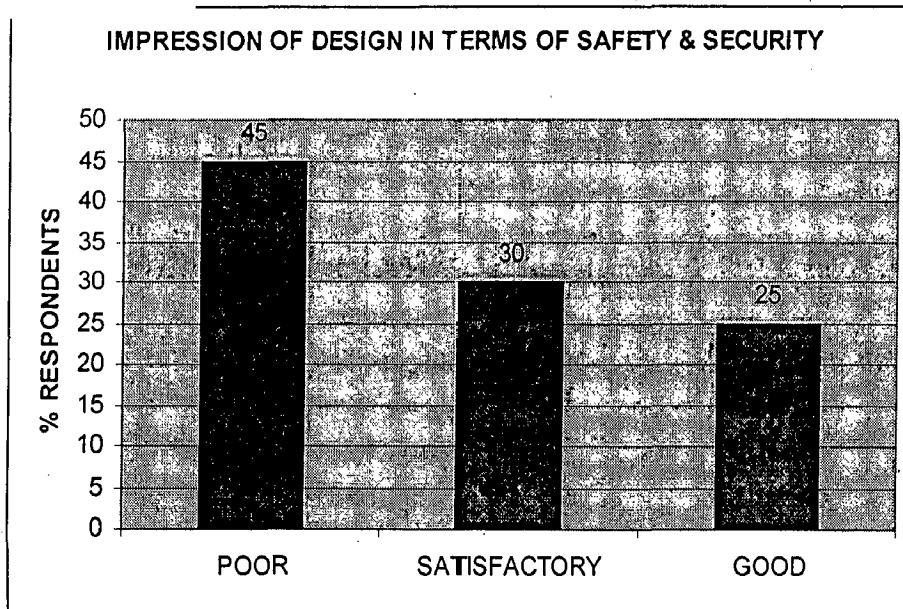


Fig 5.4.1 Safety and security

5.4.2 Does School can be made safe and secure by keeping in view these four components in design?

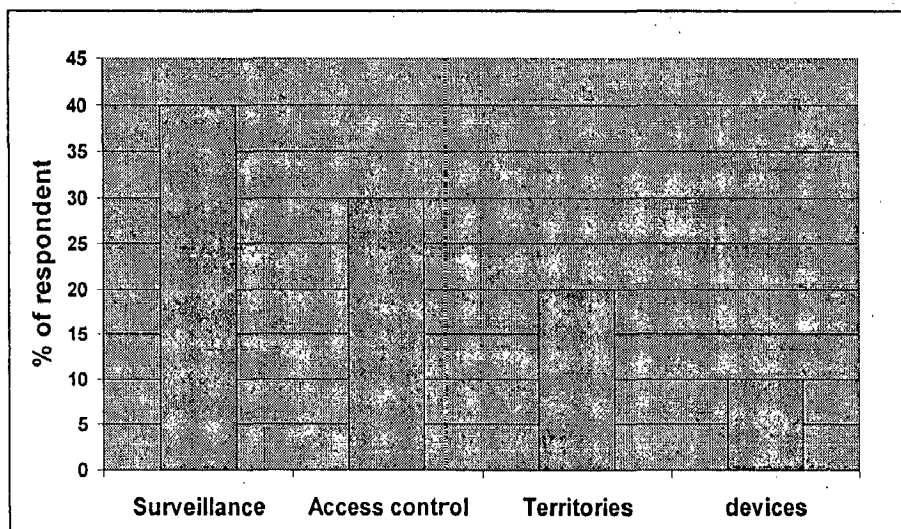


Fig 5.4.2 Four components of design

- | | | |
|-----------------------|---|-----|
| 1) Surveillance | - | 40% |
| 2) Access control | - | 30% |
| 3) Territories | - | 20% |
| 4) Electronic devices | - | 10% |

All of the respondent groups put surveillance issues clearly at the forefront, followed by access control then territoriality third and fourth electronic devices.

5.4.3 Critical areas of school campus with respect to safety and security?

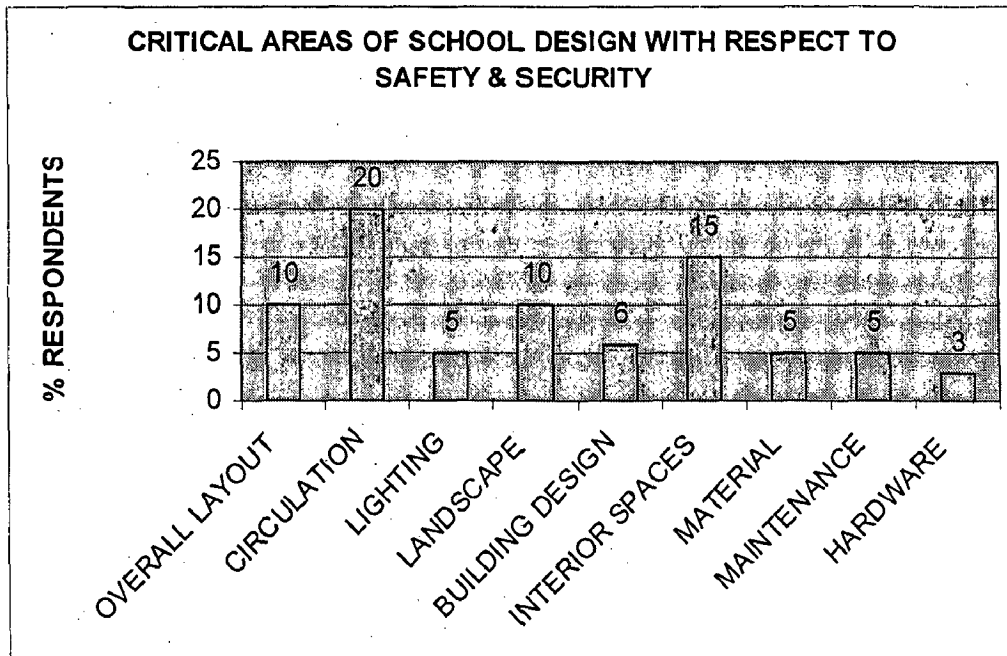


Fig 5.4.3 Critical areas of school design

1) Over all layout	-	10%
2) Circulation	-	20%
3) Lighting	-	5%
4) Landscaping	-	10%
5) Building design	-	6%
6) Interior spaces	-	15%
7) Material	-	5%
8) Maintenance	-	5%
9) Hardware	-	3%

- School District respondent's suggestions included natural surveillance designed into the building. As one said, "[we need] large secure central courtyard with clear visibility to perimeter points," and another mentioned "vision windows in all doors and vision windows and bells at all kitchen/service entrances.
- Campuses be designed "so [that the] office can see entrance and parking in order to see visitors prior to entering buildings." This is a fundamental element of Safe School Design, which has been neglected in the past (especially prior to 1993) in some school planning.
- "Limit pedestrian access points to campus," "Separate vehicle entrances/exits for employees, buses, parents, students, and visitors, Control and limit the number of entrances to parking lots," and "Restrict vehicle traffic access when closed – using gate controls."
- Establish boundaries for school property as well as to provide barriers to keep trespassers out. Some said, "[we need] enclosure of school property," "A fence in front of the school,"
- Call for the use of CCTV installs, CCTV in stair wells more surveillance cameras throughout campus, interior as well as exterior," "Full camera access from multiple locations including administrators, parking and entry and exits.

5.5 PROBLEMS IDENTIFIED FROM FIELD SURVEY

Following are the design factors which are comparatively Good, Intermediate and Bad i.e Responsible for accidents and crime in School campus.

Our Lady of Fatima Sr. Secondary school, Aligarh

Good factors	Intermediate	Responsible for accident/crime
Built form	Services	Location of Staircase
Singly loaded corridors	Maintenance	No specified parking
Security check post	Hardware	Approach to roof
Location of Adm. block	Surroundings	Isolated toilet block
	Material	Poor land scaping
	Size of windows	No fire hydrants near labs
		Over hang
		No, side lites in door
		Boundary wall Design
		Design of parapets / railing
		In adequate set back
		Un secured secondary entrances
		Un enclosed recreational areas
		Lighting
		Building facade design
		Routes

Table 5.1 Our Lady of Fatima Sr. Secondary school, Aligarh

D.P.S., Mathura

Good factors	Intermediate	Responsible for crime
Location	Lighting	Boundary wall
Security check post	Services	Design of external facade
Built form	Maintenance	Unenclosed play grounds
Single entry	Staircase	Access to electrical utilities
Placement of labs	Materials	Design of railing and parapet
Location of adm & lib.	Hardware	Positioning of windows
Parking space for bus		Parking for students
Location of toilets		
Landing		
Positioning of windows		

Table 5.2 D.P.S., Mathura

UPRAS Sr. Secondary School, Vasant Vihar, New Delhi

Good factors	Intermediate	Responsible for accidents and crime
Built form	Design of building facade	Too many entry/ exits
Natural surveillance	Surroundings	Boundary wall
Windows location	Material	Access from surroundings
Corridors	Location play grounds	Parking
Location of toilets	Lighting	Routes
Location of stair case	Services	Unenclosed rec.areas
Location of adm. block	Size of windows	Poor landscaping
		Parapets and railing details

Table 5.3 UPRAS Sr. Secondary School, Vasant Vihar, New Delhi

St. Fedallis Sr. Secondary School, Aligarh

Good factors	Intermediate	Responsible for accidents and crime
Built form	Hardware	Location
Single entry	Maintenance	Site perimeters
Natural surveillance, class room	Services	Surrounding
Landing of stair cases	Stair cases	Routes
Location of adm. block		Design of building facade
Material		Critical junction
Design of railing		Design of parapets
Labs on ground floor		Poor land scaping
Enclosed Courtyards		Lighting
Security check post		Unenclosed rec.areas
Corridors		Isolated toilet block
		In adequate set back
		Unenclosed utilities
		Over hangs
		approach to terrace

Table 5.4 St. Fedallis Sr. Secondary School, Aligarh

On the basis of results obtained, the study areas are analyzed in terms of design, planning and detailing to find out the possible design factors responsible for accidents and crime in school campus, final findings recommendations and guidelines is given based upon the preceding research methodology.

DESIGN GUIDELINES

After the extensive literature study, field surveys and case studies of various schools, we are now in a position to frame design criteria for the safe and secure environment in school campus against accidents and crime. These criteria can be directly inferred from the study of the preceding chapters.

Topics covered in this chapter

- **General**
- **Design Guidelines**
- **Conclusion**

CHAPTER 6

6.1 GENERAL

From the study it is clear that Accident and crime can be prevented by the following concepts

1. SURVEILLANCE

The general accidents and crime prevention strategy that seeks to decrease opportunity by keeping intruders under observation and/or by increasing their perception of the risk of being observed like “access control”, surveillance is generally divided into three types- natural, mechanical, and organized

Natural the use of design, including spatial definition and designation strategies, to increase the actual abilities of guardians to observe intruders, as well as to increase the *perception* of intruders that they may be observed by others. Examples here would include the placement of windows near building entryways and the design of entrance paths so that they put pedestrians in view of observers.

Mechanical the use of mechanical or electronic devices for observation purposes, such as mirrors, closed circuit television (CCTV), or sound recording devices. Visual observation is greatly facilitated by appropriate lighting which can help reduce accidents and crime opportunity by increasing perceived risks relative to the chances of being observed and can also help reduce the fear of crime.

Organized the use of human guardianship (whether formal, as in the employment of police or private security personnel, or informal, as when regular employees or residents observe a target or target site) to increase the real and perceived effort and risk of entry and detection to offenders.

2. ACCESS CONTROL

The general design/management strategy that is intended to decrease opportunity for accidents and crime by denying or increasing the effort required to approach a target or gain entry to a target area. This may also create or increase the perception of risk to the offender. Access control is generally categorized into three types- natural, mechanical, and organized:

Natural the use of design, including spatial definition and designation strategies, to deny or increase the effort and risk of entry and detection to offenders. Natural access control strategies tend to be more cost effective when they are “designed into” the structure beginning with the initial, schematic planning phases than added by retrofit.

Mechanical the use of locks hardened or reinforced doors, gates, fences, bollards, or other similar “target hardening” devices or structures to deny or increase the effort and risk of entry and detection to offenders. These may also be complemented by electronic devices associated with surveillance strategies below.

Organized the use of human guardianship (whether formal, as in the employment of police or private security personnel, or informal, as when regular employees or residents control a target’s site entry) to protect a target or target area by denying entry or increasing the real and perceived effort and risk of entry and detection to offenders.

3. TERRITORIAL INTEGRITY

A phrase derived from Oscar Newman’s original notion of “territoriality” (1973) which focused on the physical environment’s capacity, through the design and marking of space, to create in users and residents the sense of *responsibility* for and *control* of that space such that they will protect and defend it, if necessary. Territorial integrity and territoriality are promoted by the clear definitions of boundaries such that intruders (as well

as “legitimate” users) can easily determine whether spaces are “public” or “private” in nature. In well-marked and bounded places, intruders can be easily observed and are likely to be challenged by legitimate users or by space guardians. Territorial integrity is further promoted by effective access control and surveillance techniques, as defined above.

4. MANAGEMENT

Used here in terms of crime prevention theory and practice, management is the appropriate and effective use of resources, including personnel, equipment, and supplies, to preserve, sustain, or repair owned or controlled property so as to achieve crime prevention goals.

Wilson and Killing’s “broken windows” theory (1982) suggested that small levels of environmental disorder (such as a broken window, graffiti, uncollected trash, etc.) provide “cues” that no one cares about places (and hence, they are attractive to offenders). There is a presumed developmental sequence to such disorder, such that small problems lead to larger ones, including the possibility of criminal behavior. The function of responsible management, in this context, is to maintain property under their control so as to not send out the “wrong” environmental cues.

5. MAINTENANCE AND IMAGE

This is related to the neighborhood’s sense of ‘pride of place’ and territorial reinforcement. The more dilapidated an area, the more likely it is to attract unwanted activities. The maintenance and the ‘image’ of an area can have a major impact on whether it will become targeted or not.

6.2 GUIDELINES FOR SAFE AND SECURE ENVIRONMENT IN SCHOOL AGAINST ACCIDENTS AND CRIME

6.2.1. SITE DESIGN

Site perimeter

- The property line of school should be clearly defined.
- The site perimeter is secured by limiting the access with selected entry points.
- The materials used for boundary wall should be such that it maintains the safety and security as well as natural surveillance to the surrounding areas.
- Natural surveillance is possible through boundary wall.
- Boundary wall design and material inhibit graffiti, vandalism and robust.

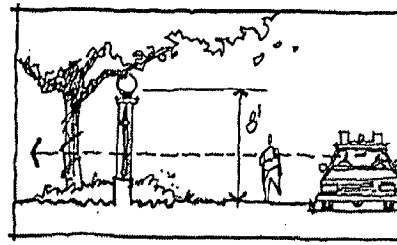


Fig 6.2.1. Natural surveillance through boundary wall

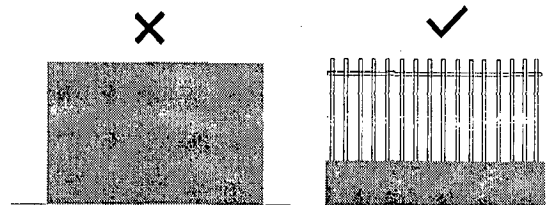


Fig 6.2.2. Design of boundary wall

Entry and Exits

- Entry point to the site is located in areas of highly visibility where they can be easily monitored by staff and students.
- Main entrances to the premises shall be of adequate width to allow easy access to the fire tender and in no case it shall measure less than 6 meters.

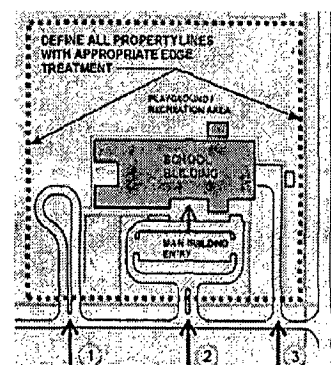


Fig 6.2.3. Entry points
1) Bus 2) Parent drop-Off 3) Service

- Security check post should be provided all entry/exits.
- Lighting should be installed near entrances/exits to provide safety in dark.
- If two entries to a campus are needed, they should be close to each other to allow one individual to monitor both.

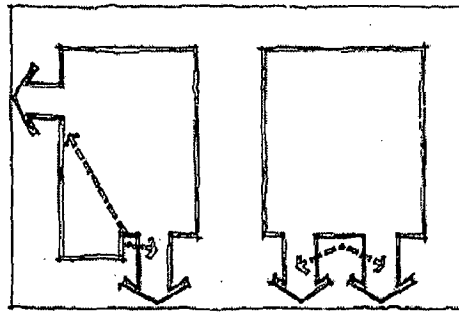


Fig 6.2.4. Position of entries

Vehicular routes and Parking areas

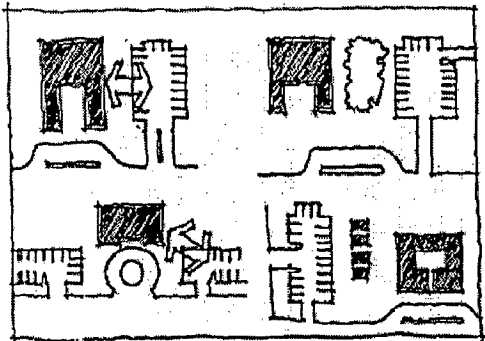


Fig 6.2.5. Parking lots

- Establish separate and clearly defined vehicular routes to service and delivery areas, visitor entry, bus drop off, student parking and staff parking.

- Vehicular routes and parking areas should be in visual proximity to strategic sections of buildings, such as administration and classrooms.

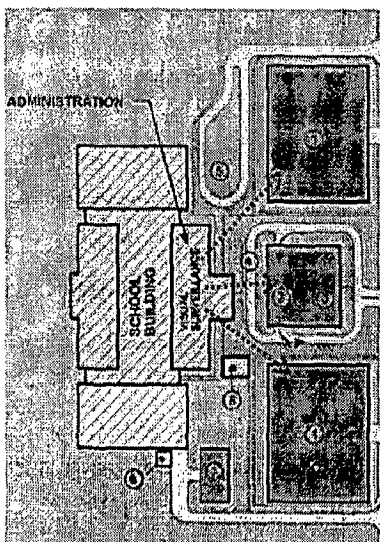
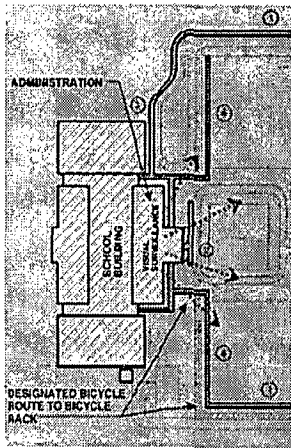


Fig 6.2.6. Zoned parking

- 1) Zoned parking
- 2) Visitor parking
- 3) Faculty/staff parking
- 4) Parent's drop-Off
- 5) Bus drop-Off

- The vehicular traffic should be locked on one side of the school campus.
- Vehicular routes should be segregated from pedestrian routes.
- Differentiate and identify parking spaces for students, faculty, staff and visitors.

- External access to parking areas should be restricted to limited number of controlled entrances.
- Long, straight layouts for parking lots, especially those used by students, should be avoided in order to reduce vehicle speeds and lower risk to pedestrians.



- Accessible parking spaces should be located as close as possible to building entrances.
- Parking spaces for the disabled should never be located at ramped or sloping areas.
- There should be at least two parking space reserved for wheel chair user.

Fig 6.2.7. Segregation of circulation

- 1) Pedestrian Entry Point
- 2) Path from Parent Drop-Off
- 3) Path from Bus Drop-Off
- 4) Path from Zoned Parking

External Pedestrian routes and Canopy

- Routes should be well defined with smooth walking surface and adequately lighted.
- Path from the drop-off areas and routes to entry point need to be wide enough to accommodate peak period of use, thus preventing congestion pushing, fighting and accidents
- Minimize hiding place along the pedestrian routes.
- Place exterior pedestrian routes so as to maximize surveillance from inside adjacent space.
- Uneven floor and levels differences should be avoided.
- Walkways should not have a gradient more than 1:20.

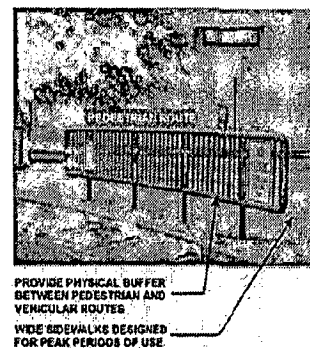
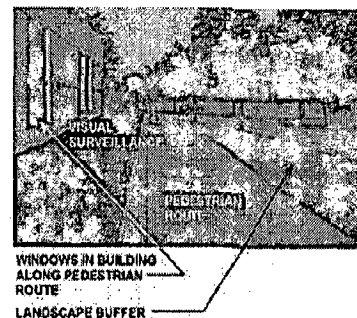


Fig 6.2.8. Routes with buffers

- To allow for the Wheelchair user pavement width should be kept minimum 1.2m.
- Tactile flooring shall be made between side walk and main road.
- Provide physical buffer between side walk and vehicular routes.
- Paving material should be non-skid, well marked and anti-glare.
- Canopies should be used to provide shaded and dry areas for students.

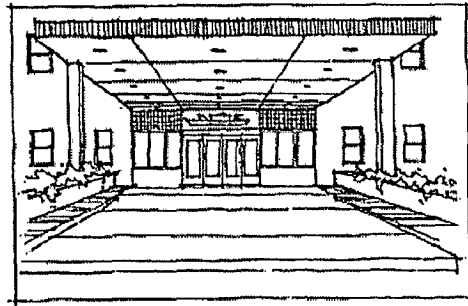


Fig 6.2.9. Design of canopy

Recreational Areas

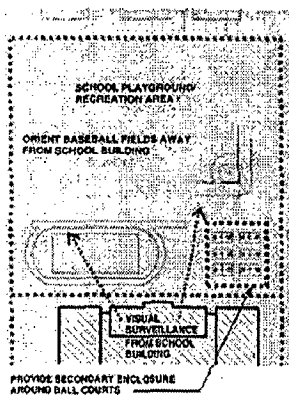


Fig 6.2.10. Secondary enclosure

- Locate recreational areas in visible location whenever possible.
- Provide separate facilities related to recreational areas such as rest room, water fountain and vending areas where applicable.
- Provide multiple enclosures around recreational areas to
- Utilize sea through fencing in recreational areas to enhance supervision.
- Avoid blocking line of sight into recreational areas with fencing, signage and landscaping.
- Locate hard courts areas away from the building.
- Protect the window opening located near hard courts with mesh covers that permit light and ventilation as well as emergency ingress and egress.

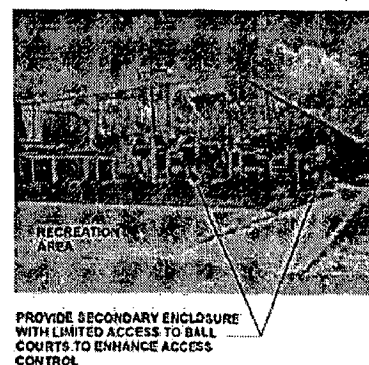


Fig 6.2.11 Fencing material

- To enhance player and spectator safety, safety borders should be provided around basketball courts--a minimum of six feet wide along the sides and eight feet wide on the ends. Walls or protrusions at the ends of courts may require padding, where safety borders are too narrow.
- Playground equipment with sharp edges, rough surfaces, or hazardous projections that may entangle clothing or cause injury should be avoided.

Signage

- Design signage with large and bold graphics and simple direction.
- Design signage to eliminate spaces that permits concealment.
- Avoid blocking lines of sight with signage.

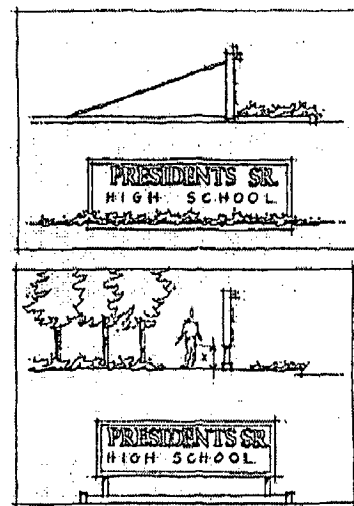


Fig 6.2.12 Signage

Landscaping

Landscape design helps to improve the appearance of an area. It adds texture and color and softens harsh building materials and outlines. Used wisely it can also make a positive contribution to accidents and crime prevention.

It can protect buildings and spaces and create a feeling of confidence in an area. It enhances the usage and image of an area.

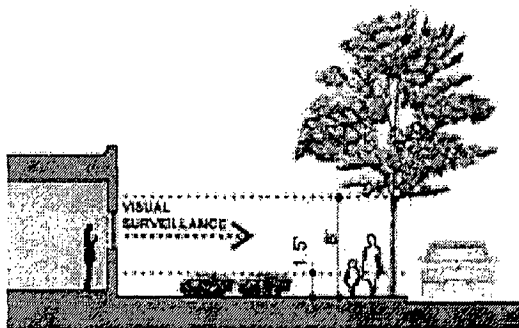


Fig 6.2.13 Height of trees canopy

- A lighter foliage variety should be used to provide visual permeability whilst still offering amenity screening.
- Tree species that will resist winds should be selected. Species that could split off in a storm, causing additional hazards, should be avoided.

- Trees should be trimmed up to 2.4 m and shrubs should not be more than 600-750 in height, otherwise they impede normal vision
- Landscaping should never prevent visual access into school property.

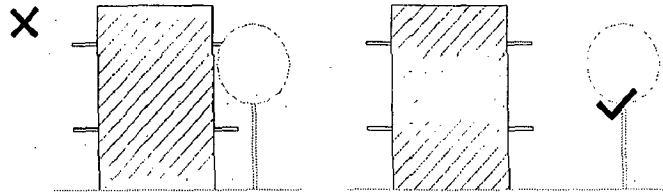


Fig 6.2.14 Positioning of trees w.r.t building block

- Trees should be located away from the school building where they can become aids to climbing over boundaries or onto buildings.
- Trees should not obscure lighting.
- Street furniture like bollards, benches, dustbins should be located away from the building edges and boundaries to avoid intrusion.
- Depth of the water bodies should not be more than 1.0 meter.

Site utilities

- All the site utilities should be enclosed and locked properly.
- Utilize sea through fencing in around site utilities areas to enhance supervision.

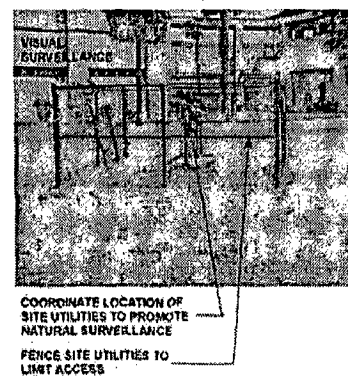


Fig 6.2.15

- It should not provide any space for hiding.
- Access to site utilities such as electric sub station, transformer, A.C. units, switch room and pump room should be restricted.

6.2.2. BUILDING DESIGN

Built form

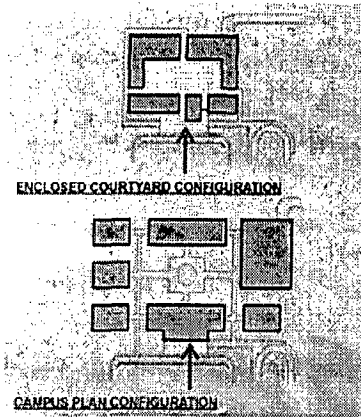


Fig 6.2.16

If properly designed, the overall organization of a school can enhance school and safety authorities' ability to maintain a secure environment and can also discourage vandalism, trespassing, and breaking and entering.

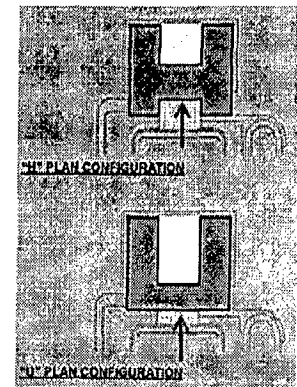


Fig 6.2.17

The narrow wing of traditional school organization lends themselves to common “alphabet” configurations.

“U” and “H” shaped buildings result in courtyards protected on three sides. This makes monitoring activity in the courtyard easier and helps provide shade and shelter. These types of organization are also easy to lock and secure.

Exterior Covered Walkways

Covered walkways provide protection from the rain and sun for primary exterior circulation paths. However, if designed improperly, these structures can provide opportunities for criminal activity, unauthorized access and also causes accidents.

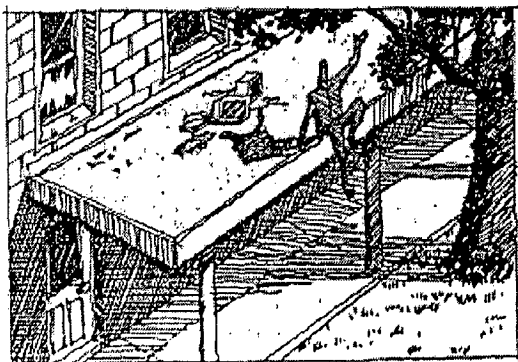


Fig 6.2.18 Covered walkways

- Design covered walkways to eliminate opportunities for gaining access to roofs, windows, or other upper level areas.
- Apply slippery finishes or coatings to columns.

- Design landscaping and tree placement around covered walkways to eliminate access to roofs, windows, or other upper level areas.
- Avoid blocking lines of sight along exterior covered walkways.

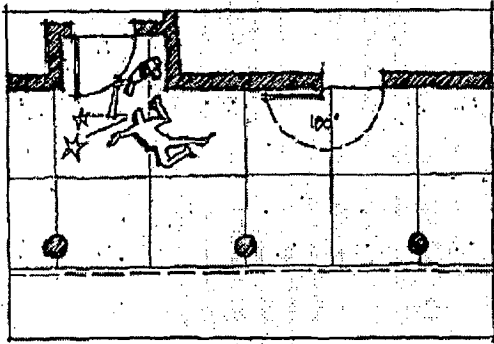


Fig 6.2.19 Niches at entry

- “T” connection at the entries ensure clear surveillance thus avoid any hitting and hide outs.
- Design lighting to reinforce natural surveillance along walkways. Low walls, trees, and planters should be located away from canopies to prevent access on to rooftops and into buildings through upper level windows.
- Incorporate windows that overlook covered walkways whenever possible.

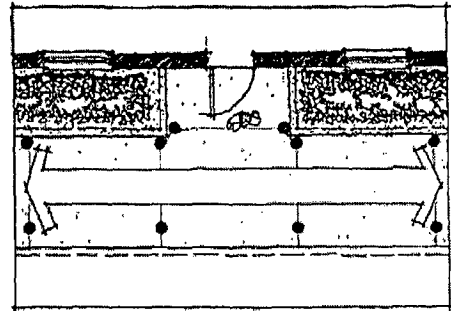


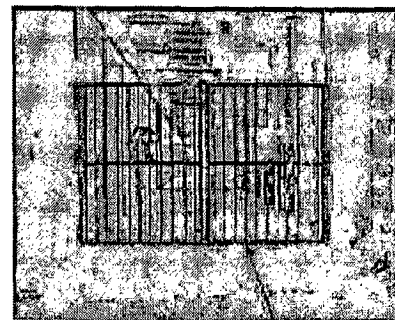
Fig 6.2.20 “T” connections

Point of entry and exits to building

Minimize the number of unmonitored entrances into the building.

Design a well defined main entry with signage and rules to direct all visitors to the administration area during school hours.

- Locate main point of entry at the front of the school near the administration area and visitor parking/drop-off area.
- Every entrance/exit within the building shall be such that a wheelchair user can use it with ease.
- All exits shall be free of obstructions.
- Exits shall be clearly visible and the routes to reach the exit shall be clearly marked and sign posted to guide the population of floor concerned.



SECURITY GATE FOR AFTER HOUR ACCESS CONTROL

Fig 6.2.21 Secured entry

- Each floor shall have minimum two exits.
- Every room with a capacity of over 45 people shall have at least two door ways.
- Entrances width shall be minimum 90 cm or more.
- The entry overhang should be large enough to shelter a large number of people from the sun and rain. This can prevent heatstroke during the summer as well as wet and slippery ground surfaces during storms.
- Provide covered seating areas at main entry and bus loading area.
- Provide windows and glazed doors at main entry to enhance natural surveillance.
- According to survey data and site visits, secondary entries are a common problem area for school security. Even if properly designed as “exit only” access points, students frequently prop these doors open.

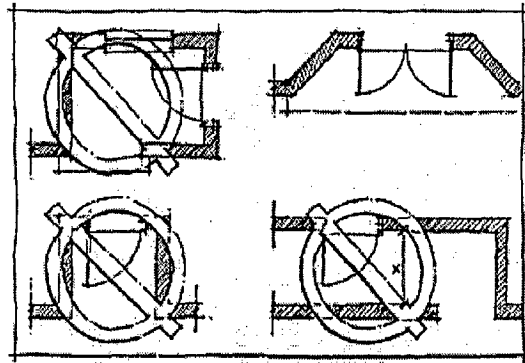


Fig 6.2.22 Design entry to avoid alcoves and niches

- Secondary entrances should be designed to avoid alcoves and niches.
- Secondary entries should be equipped with alarms to indicate when these doors are open. Secondary entries also require careful design to prevent them from becoming dark alcoves where someone can hide.
- Lifts and escalators shall not be considered as exits.
- Exits shall be so located so that the travel distance on the floor shall not exceed 22.50 m. for educational, institutional and hazardous occupancies.
- Points of entry should have adequate illumination with vandal resistant fixtures.

Courtyards

The overall organization of the school can create a beneficial enclosure of exterior space.

The traditional form of the courtyard school allows for uncomplicated supervision and

control. An outdoor circulation arcade around the courtyard allows one person to oversee activities during class changes. The arcade also helps provide protection from the sun and rain.

- Secure and limit entries to courtyards.
- Place main entry to courtyards adjacent to administration or staff/faculty office spaces.
- Design courtyards to eliminate unauthorized after hours access.
- Provide windows with views into courtyards.

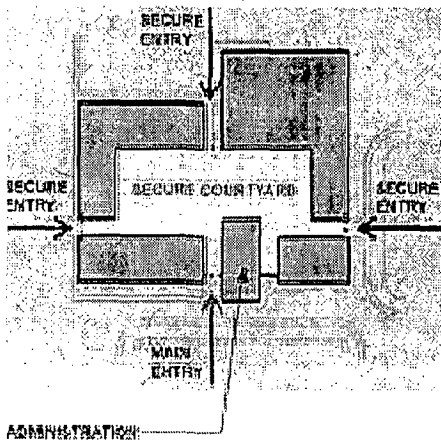


Fig 6.2.23 Location of adm. block

- Maintain unobstructed lines of sight across courtyards.
- Seating, planters, and landscaping should be located away from courtyard enclosures to eliminate opportunities for gaining unauthorized access into the courtyard.
- Minimize ambiguous or “unowned” spaces in courtyards.

External Wall

Wall form, texture, and use influence safety concerns. Avoid utilizing walls that undulate or project into small wings, which can create niches and hiding places. When such niches occur, security can be enhanced by incorporating windows that have unobstructed lines of sight into these areas. In addition, these recesses or niches should also be well-lit to enhance safety.

- Design screening walls and architectural features on exterior walls that do not allow footholds or handholds.

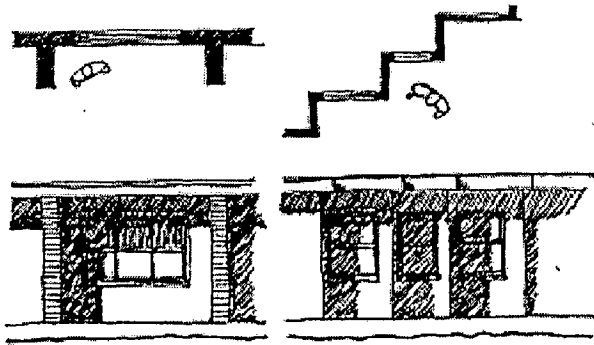


Fig 6.2.24 External wall

- Walls in graffiti prone areas should be made of a durable vandal resistant material or be replaced with see-through fencing, when appropriate, to reduce maintenance and vandalism.

Doors

- Door niches on hallways should be chamfered and wide enough to provide clear lines of sight down hallways.
- Doors which open into corridors must be recessed or protected by wing walls so that no part of the door swings projects into the circulation path by more than seven

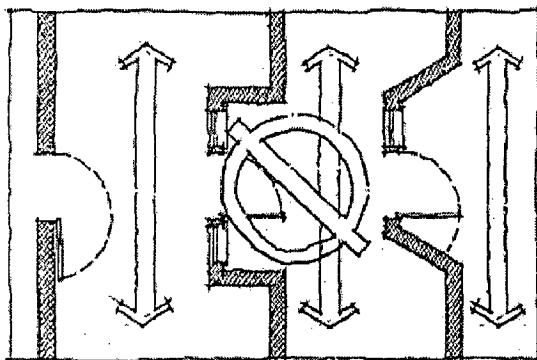


Fig 6.2.25 Door opening

inches.

- Multiple single doors reduce congestion and are recommended, rather than double doors.
- Incorporate tamper resistant doors and locks.

- Exterior doors should be a minimum of 45 mm thick, preferably of solid core wood.
- Door frame materials should be strong and of steel
- Door frame should be fixed in concrete block.
- Design classroom doors with

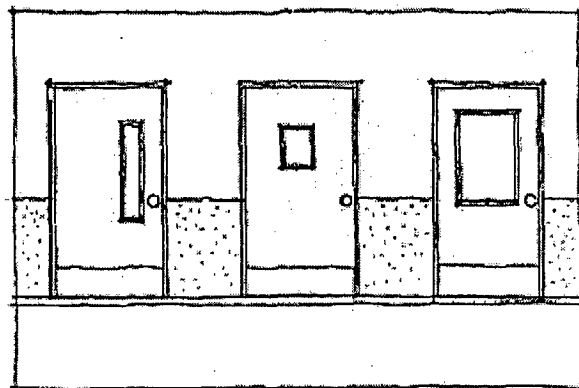


Fig 6.2.26 View panel or door sidelites

locksets that allow the door to be locked from either side and always opened from inside.

- Design doors with view panels or sidelites to increase visibility of adjacent circulation spaces.
- Provide kick plates at classroom, assembly, and circulation doors.
- Doors along main corridors must either be located in a recess or must swing a full 180 degrees; these recesses can be dark and can provide opportunities for hiding. One solution is to chamfer the corners of the recess.
- Door handles shall not be less than 90 cm and more than 100 cm.
- No doorway shall be less than 100cm in width and shall be not less than 200cm in height.
- Doorways for bathrooms, water closet, stores etc. shall be not less than 75cm wide.
- All the main exits doors should open out wards.

Window

- Frame should be of steel.
- Window glass should be fixed from inside rather than outside.

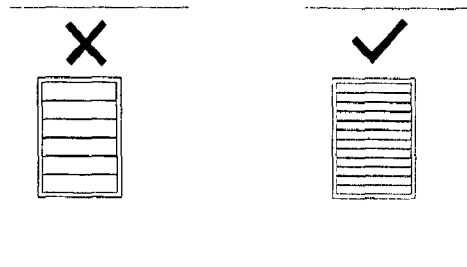


Fig 6.2.27 Grill spacing

Grill

- Should have spacing not more than 150mm.
- Should be of robust and vandal free material and of 8mm thick iron section
- Should be inserted in frame or welded, instead of screwing.

Roof

A key concept for safe school design is to minimize opportunities to gain access to school roofs and into the school from roofs through potential entry points.

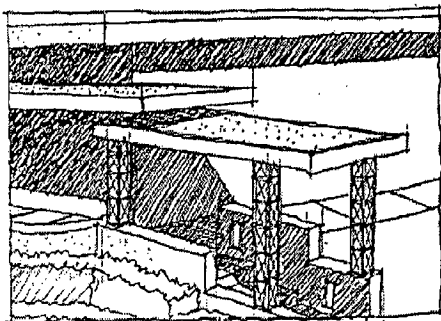


Fig 6.2.28 Roof design

- Avoid the use of permanent mounted roof access ladders, short walls adjacent to low canopy roofs, screen walls and columns using decorative block, or other building materials that make climbing up to roofs easy.
- Avoid using building materials or designing architectural elements that provide access to roofs.
- Apply slippery finishes or coatings to exterior pipes and columns.
- Install locks on roof hatches.
- Protect roof equipment from access and vandalism.
- Minimize access through roof skylights.
- Design roof parapets to allow for surveillance from the ground whenever possible.
- Height of the parapet is not less than 900 mm and spacing of railing not more than 300mm.

Lighting

Lighting should be designed to enhance external security for both people and property, through the provision of adequate continuous illumination during the hours of darkness.

Lighting should be such that it maximizes natural surveillance and creates a feeling of security.

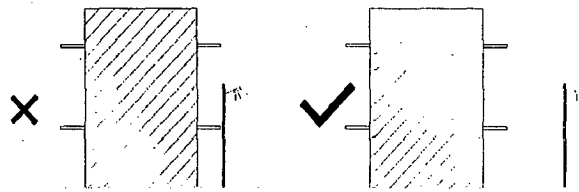
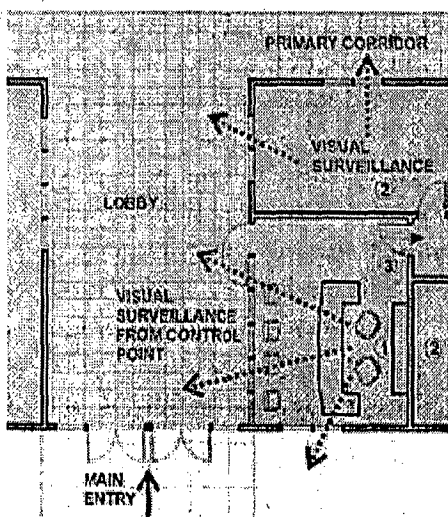


Fig 6.2.29 Location electric of poles

- All public areas like parking, streets, parks, internal courts, lifts and stairwell should be well lit to allow surveillance and usage during night hours.
- Special provisions should be made to light entrances, parking space and junctions.
- Light fittings should be robust and vandalism free.
- Street light poles should be away from school building edges to avoid climbing.
- Designing of lighting poles should not provide foot holds and hand holds for climbing
- Lighting should not create glare and such that a person can recognize face from 10m.

6.2.3. INTERIOR SPACES

Lobbies and Reception Areas

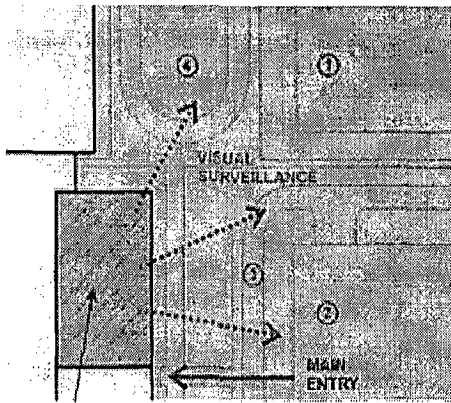


- To control access and limit intrusion, visitors should be guided to a single control point and required to pass directly through to administration reception areas when entering or leaving the building.
- Lobbies should also be designed to be easily secured after hours and during emergencies.

Fig 6.2.30 Lobbies and reception areas
1) Reception 2) Administration Area

- Lobbies and reception areas should be located close to administrative areas or desk adjacent to main entry.
- There extensive glazing and windows in lobby area for visual surveillance.
- Provide seating at reception/visitor information areas.

Administration Areas



- Administration areas should be adjacent to main entry areas and designed to allow a visual connection through windows between administrators and students or visitors.
- Incorporating extensive interior glazing in administration areas to provide unobstructed

Fig 6.2.31 Adm. Block

1) Zoned Parking 2) Visitors Parking
3) Parent's Drop-Off 4) Bus Drop-Off

- Design and locate the administration area to reinforce its role as the guardian of school facility.
- Provide seating at reception/visitor information areas.

Corridors

It is therefore vital that corridors be carefully designed to accommodate large numbers of students during peak-use hours. Although a minimum corridor width is dictated by code, research has shown that this minimum width may not be sufficient. It is recommended that corridors be designed beyond the minimum width whenever feasible, especially where lockers are located. Corridors should also be well-lit and clearly defined without projections that might impede the flow of movement.

- Designs that lead to sudden 90 degree turns should be avoided in corridors.

- Secure exterior doors located along corridors to prevent unauthorized access into the building.
- Incorporate interior glazing where possible to avoid long corridors with dead walls that block off natural surveillance. Minimize hiding places and blind corners in corridors.
- Recess lockers to eliminate hiding places.

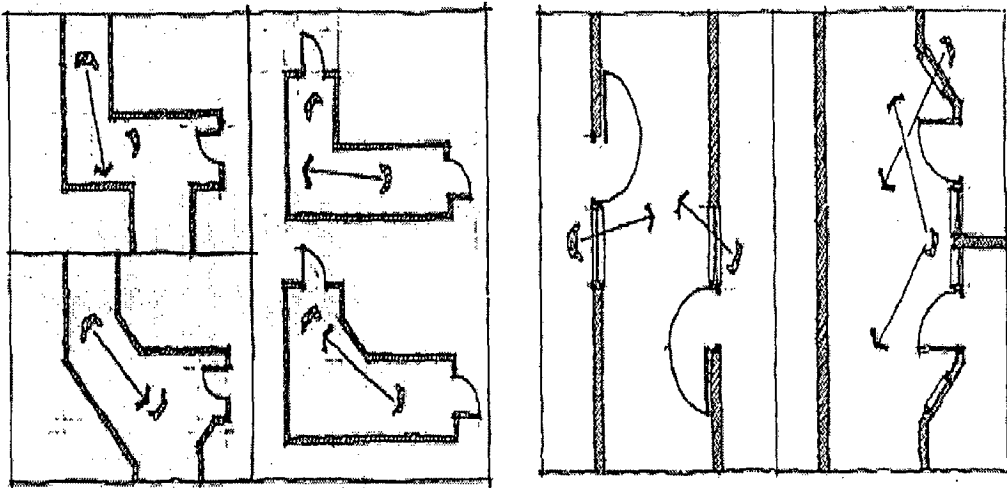


Fig 6.2.32 Corridor junction

- Increase corridor width beyond minimum requirements at the critical junction.
- Railing at 80 cm height should be provided in corridors.
- A space not less than 1.5 sqm shall be provided at every dead end.
- Corridors shall have a minimum clear width of 1.2m.
- It should have the same level and slip resistant surface.

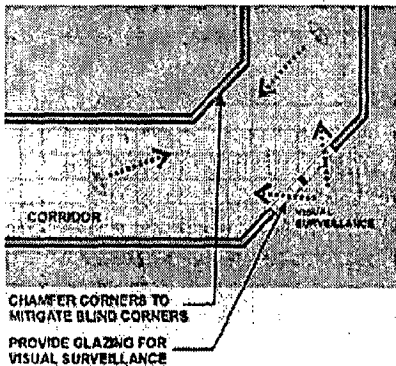


Fig 6.2.33 Chamfering of corners

Ramps

- Handrails should be provided preferably to each side of the ramp.
- A level platform of minimum length 1.5 m should be provided at the top of the ramp.

- Width of the ramp should be at least 1.2m to enable a wheelchair to turn preferably at least 1.5m to allow two wheelchairs to pass.
- Handrail should extend a minimum 45cm beyond top and bottom of ramp. The maximum gradient should be 1:12. The hand rails should have bright contrasting Colour to surroundings for convenience of blinds.

Stair case and Stair Well

- Stair case should be located in highly viewing areas.
- Minimum stair width should be 1.5 meters.
- Riser should be reduced to 15 cm and treads should be reduced 30 cm.
- Height of the railing 900 and spacing 300 cm.
- Enclosed stair case should be avoided.
- Enclose entire area under all stairs.
- Stairs should be well lighted.

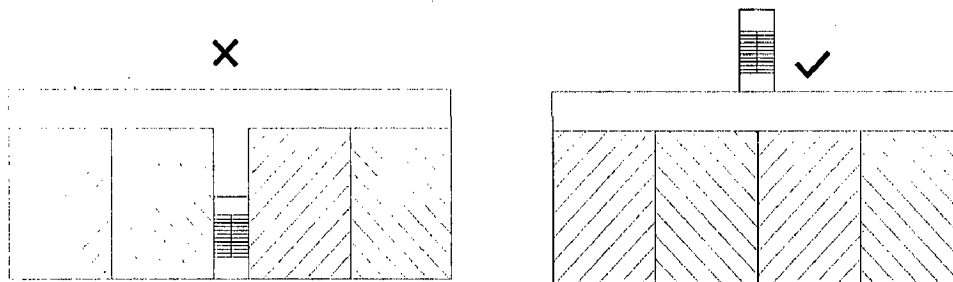


Fig 6.2.34 Stair case positioning

- Enclosed stairwells should have electronic surveillance.
- Stair handrails should be constructed so as to provide visual access from either side of the stairs. (Solid handrails can provide hiding places on stairs and landings.).
- Handrails should be designed to discourage sliding on them and horizontal rails should incorporate vertical supports that discourage climbing.

- Stairs should have handrail on both sides.
- Tactile flooring should be provided at the meeting edge of stairs and corridor
- Colour of the tread should be in contrast with the colour of the riser.

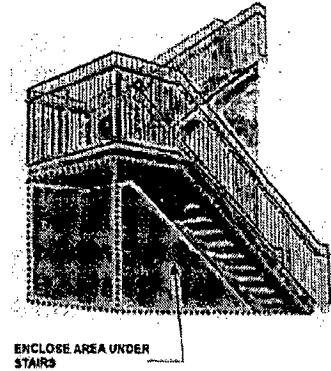


Fig 6.2.35 Access to be prohibited

Toilets

- Toilet entrances should be located in places where natural surveillance can occur such as primary corridors and administration areas.
- They should be highly visible from recreational areas.
- Large-event toilet rooms should provide secondary access and should remain locked or should be reduced in size during normal school operation.
- Mirrors, windows, and light covers in toilet and locker rooms should be impact resistant.

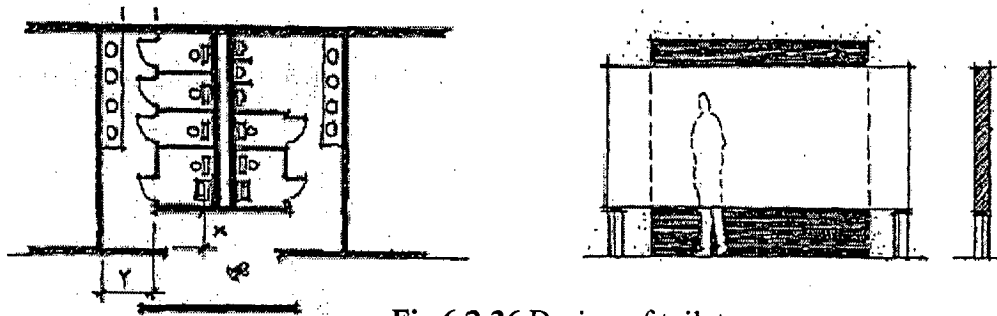


Fig 6.2.36 Design of toilets

- Toilet room hand dryers, vending equipment, and trash containers should be heavy duty, recessed, fire resistant, and lockable.
- Toilet room walls, floors, and ceilings should have a durable finish to withstand repeated cleaning of graffiti.

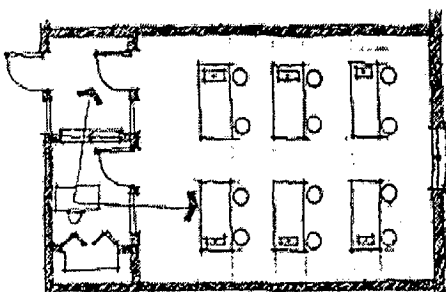
- In principal, 2% or more of toilet stall on each storey of toilet building should be toilet stall for wheelchair user.
- All water supply and drainage lines should be concealed to avoid the accidents.
- To prevent a client's being trapped upon becoming incapacitated while in a toilet, toilet room doors in health rooms should swing outward into the main room.
- The floor should be non-slippery and there should be no obstacles to prevent turning, or access to the seat.

Classroom

Classrooms are a common location on school campuses for fighting, theft, and disorderly conduct. Therefore, it is important to design classrooms for easy monitoring and unobstructed visual supervision. Designs should include windows and glazing between hallways and classrooms to help increase surveillance.

- Provide extensive exterior windows from classrooms to enhance surveillance of school campus.
- Provide interior windows and glazing between the classroom and the corridors to promote surveillance both into and out of the classroom.
- Classrooms should be organized for ease of monitoring by staff. Visual access to the corridor, and in some instances to the building's exterior, is desirable.
- There should be at least two exits in each class room.

Labs and Computer room



Clear organization and unobstructed surveillance of work spaces is essential in the design of rooms where special equipment is being used. Since theft is a primary security issue associated with labs, shops, and computer rooms, faculty and staff should have direct visual access to workrooms and entries.

- Locate labs, shops, and computer rooms with minimal direct access from the exterior whenever possible.
- Entry and work station should be visible from staff/Faculty chamber.
- Provide a lockable room for storing equipment and supplies.
- To maximize security and minimize theft, rooms with computers and other costly equipment should have a limited number of windows.
- Fire extinguishers should be located in all laboratory areas.
- Chemistry lab should be located on ground floor.

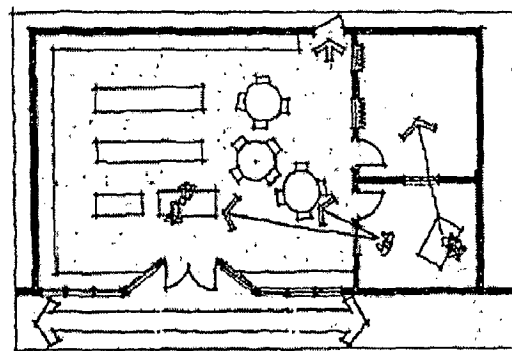
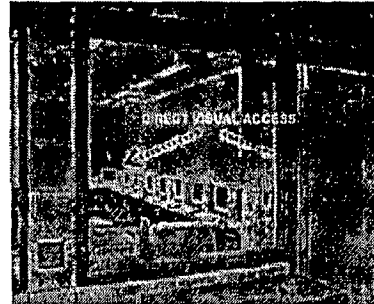


Fig 6.2.37 Visual surveillance

Libraries and Media Centers

- Locate circulation desk and/or reception area near main entrance.

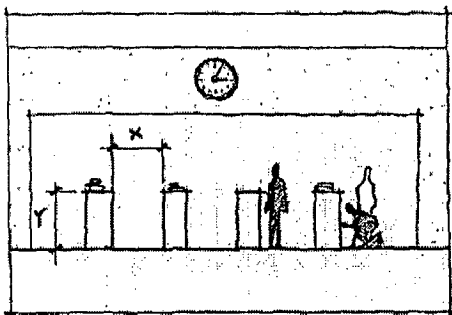


Fig 6.2.38 Hide outs

- A control point at the main entrance should have unobstructed surveillance of entire library/media center.
- Maintain unobstructed lines of sight throughout library/media center.

- Design a separate lockable area for audio-visual and computer equipment to control access.
- Low stacks that are well-spaced and placed parallel to the circulation librarian's line of sight will aid in visual control as well as reduce hiding places.

Music Room

- Entrances to the music room should be able to be easily secured and located in a highly visible area.
- Provide unobstructed view of entrances to music room for access control.
- Isolation of the music room on campus may be avoided.
- Provide a lockable room for equipment and supplies.
- Mirrors in dance classrooms should be shatterproof.
- Dance classrooms should utilize suspended wooden floors or floor covering systems which provide adequate resilient surfaces.
- Storage units, built-in furniture, or similar accessories associated with music and band practice areas should not create places to hide or obstruct surveillance of any portion of the room.

Cafeterias

Cafeterias have been cited by educators and school resource officers as the primary location on school campuses for fighting. Overly cramped and crowded designs can irritate and frustrate students. Because large groups of students move in and out of cafeterias at the same time, it is critical to design circulation patterns that eliminate traffic-flow problems.

- Locate a well defined control point near main entrance of cafeteria.
- Design kitchen and serving area so that they can be secured both during and after school hours.
- The control point at the main entrance should have unobstructed surveillance of entire cafeteria.
- Design cafeteria to eliminate traffic-flow conflicts and overcrowding.

- One way entry and exit doors avoid overcrowding and promote efficient traffic flow in cafeterias by providing ample space between serving counters and between dining tables.
- Since cafeteria restrooms may be used after hours, they should be designed to prevent unauthorized access into other areas of the school building.

Auditoriums

Like any large school assembly area, auditoriums should provide clear sight lines and easy traffic flow. Niches along walls should be eliminated, and if the auditorium is subdivided for dual use as classrooms, the partitions should fully recess into the wall.

- To eliminate the potential for accidental falls, orchestra pits should be avoided. Several rows of removable seats at the front of an auditorium should be considered as an alternative.
- To eliminate potentially serious injuries from falls, fly lofts or working stages are discouraged.
- Large assembly areas, such as auditoriums, should provide clear sight lines and easy traffic flow.
- While stage curtains can be left open to allow visual surveillance, electrical and lighting controls for an auditorium should be located in a locked panel or room.
- Locate roof openings as far away as possible from catwalks, platforms, and scaffolding to prevent access from roof into auditorium.
- Provide a secure area for controls, equipment, props, and tools.
- Limit and control student access to catwalks, scaffolding, and upper level platforms.
- Design auditoriums to eliminate traffic flow conflicts.

6.2.4. MAINTENANCE AND MATERIAL

This is related to the neighborhood's sense of 'pride of place' and territorial reinforcement. The more dilapidated an area, the more likely it is to attract unwanted activities. The maintenance and the 'image' of an area can have a major impact on whether it will become targeted.

Maintenance starts with the selection of material and finishes. The selection of materials and finishes will impact on the types of maintenance regimes that can be sustained over time.

Facade material:

- Permanent exterior finish with rough texture avoids graffiti.
- Natural and permanent finishes are easy to maintain, merge with surroundings and avoid graffiti.

Pathways

- Use hardy, easily-replaced and standard size materials.
- Avoid removable materials such as paving bricks.

Trees

- Choose light foliage variety that provides surveillance with screening.

6.2.5. SYSTEM AND ELECTRONIC EQUIPMENTS

Elevators

- Locate elevator adjacent to main circulation where they can be observed.
- Provide the electronic surveillance with in elevators cab when possible.

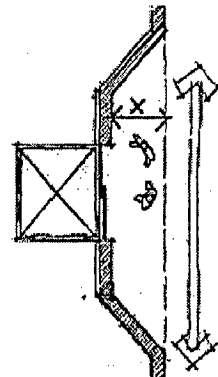
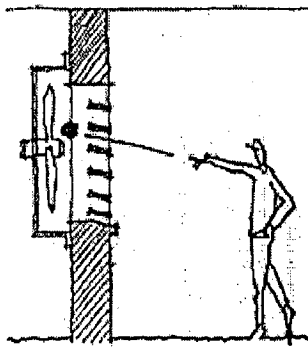


Fig 6.2.39 Elevators

- Provide vandal resistance convex mirror in elevator cabs.
- Elevator's lobby should be well lit to enhance surveillance and security.

HVAC/Mechanical Equipment

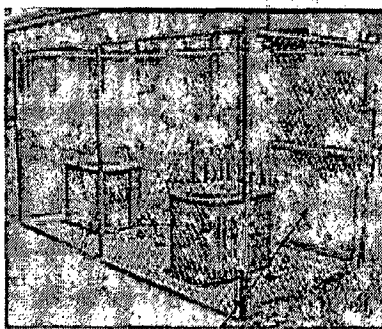
- Locate HVAC/mechanical equipment in a secured area, accessible to authorized person.



- Provide Lockable enclosures for equipment.
- Locate these structures in areas where general site lighting is used will make the night time surveillance easier.
- Spacing of vent slats should not allow persons

to reach in or to pass objects through them, potentially causing damage to equipment or exhaust fans.

Water Fountain



PROVIDE A SECURE ENCLOSURE AROUND CONDENSING UNITS

Fig 6.2.40 Utilities

Controls

- There should be at least one accessible fountain per floor for wheel chair user.
- Locate water fountain near group toilet in areas with natural surveillance.
- Utilize wall hung type of water fountain to prevent vandalism when possible.
- Electric controls should be in the zone 900mm to 1200mm from the floor for convenience of disabled.

- The height of window controls for operation should be maximum 1200mm from the floor level.

Fire fighting system

- Over head tanks.
- Static storage tank.
- Fire hydrants.
- Portable fire extinguisher. Hose reel.
- Automatic sprinkler system.

Technology

Advances in security technology have allowed us to provide and enhanced the level of protection in our residential environment



CCTV STRATEGICALLY POSITIONED TO MONITOR VISITOR PARKING AND BUILDING PERIMETER

Fig 6.2.41 Electronic surveillance

- Electronic equipments like CCTV etc should be used to keep a vigil on strangers
- Alarm working with backup power should be installed between neighbors, to communicate in case of danger.
- Card access system should be used to take the entry in a school campus.

Finally, basic aim of design should be to provide safe and secure environment in school and to remove the possibilities of accidents and crime in school campus.

6.3 CONCLUSION:

6.3.1. Accidents and Crime in school campus can be prevented by Design through following concepts:

NATURAL SURVEILLANCE

NATURAL ACCESS CONTROL

TERRITORIALITY

MAINTENANCE AND IMAGE

MANAGEMENT

6.3.2. Relationship between crime and Architecture

People live in environments; people work in environments and people take leisure in environments. Crime occurs in all environments and is committed by people not buildings or any other component of the environment. The environment is created by Architecture.

Finally

- **The proper design and effective use of the built environment can lead to a reduction in the possibility of incidence of accidents and crime, and gives psychological safety and security in school campus.**

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CHECKLIST FOR SAFETY AND SECURITY IN SCHOOL IN CAMPUS:

Name of Area _____

Date _____

SITE DESIGN & PLANNING

*or what
can't*

- Is the site planning introvert? Yes[] No[]
- Is the site planning extrovert? Yes[] No[]
- Is it mixed kind of planning (Introvert + Extrovert)? Yes[] No[]
- Is the pleasing built environments compromise safety & security concerns? Yes[] No[]
- Is there space that can become dead space? Yes[] No[]
- Is unprotected & secluded area between & behind buildings are avoided? Yes[] No[]

Site Perimeters

- Is the edge of property line clearly established and defined? Yes[] No[]
- Is boundary wall provided all around the site? Yes[] No[]
- Does boundary wall design and material inhibit graffiti and vandalism? Yes[] No[]
- Does the boundary wall provide appropriate and adequate safety and security? Yes[] No[]
- Does natural surveillance is possible through boundary wall? Yes[] No[]

Entry/Exits

- Is there limited entry and exit in school campus? Yes[] No[]
- Are entry/exits wide enough to accommodate fire tender? Yes[] No[]
- Is the main entry properly secured? Yes[] No[]
- Are main entrance/exits clearly visible from abutting street, administration block and parking areas? Yes[] No[]
- Is security check post is provided at entry/exits? Yes[] No[]
- Are measures taken to prevent unauthorized entry to the premises? Yes[] No[]
- Is lighting installed near entrances/exits to provide safety in dark? Yes[] No[]
- Are visitors encouraged to use the main door? Yes[] No[]

Vehicular Routes and Parking Areas

- Is there defined space for parking in school campus? Yes[] No[]
- Is there segregation of vehicular routes? Yes[] No[]
- Does vehicular routes and parking areas located in visual proximity to administrative block and class room? Yes[] No[]
- Are all parking lots and vehicular routes restricted in front of the school building? Yes[] No[]
- Are there separate vehicular routes to service and delivery areas, visitor entry, bus drop off, student parking and staff parking? Yes[] No[]
- Is parking areas adequately lit with vandal proof lighting? Yes[] No[]
- Is the car park designed to exclude entrapment spots? Yes[] No[]
- Is visitor's parking located directly adjacent to main entry and administrative block? Yes[] No[]
- Is there any provision of parking for physically handicapped people? Yes[] No[]

Exterior Pedestrian Routes

Are all exterior pedestrian routes well defined?	Yes[] No[]
Is the path from drop off areas wide enough to accommodate peak period use?	Yes[] No[]
Is the paving material non-skid, well marked and non-glare?	Yes[] No[]
Is there any hiding place along the pedestrian routes?	Yes[] No[]
Is exterior pedestrian routes properly lighted?	Yes[] No[]
Is there physical buffer between side walk and vehicular routes?	Yes[] No[]

Recreational Areas

Is enclosures provided around the recreational areas?	Yes[] No[]
Is recreational areas is visible from the building it serves?	Yes[] No[]
Is fencing of recreational areas provide natural surveillance?	Yes[] No[]
Are hard courts located at sufficient distance from the building?	Yes[] No[]

Signage

Is signage provided there?	Yes[] No[]
Is signage blocking the line of sight?	Yes[] No[]
Is signage providing hiding space for people?	Yes[] No[]

Landscaping

Is the landscaping designed to reduce spaces where intruders can hide?	Yes[] No[]
Is landscaping block the line of sight?	Yes[] No[]
Are trees planted away from the building to avoid climbing?	Yes[] No[]
Are trees and shrubs obscure lighting?	Yes[] No[]
Are parks and playground well landscaped and trees properly trimmed?	Yes[] No[]

Site Utilities

Is the access to site utilities restricted?	Yes[] No[]
Are the site utilities are enclosed and locked?	Yes[] No[]
Does a site utility provide space to hide?	Yes[] No[]

BUILDING DESIGN

Building Organization

Built form	
Compacted single/multistory plan?	Yes[] No[]
H – Plan configuration?	Yes[] No[]
U – Plan configuration?	Yes[] No[]
Enclosed court yard configuration?	Yes[] No[]
Campus plan configuration?	Yes[] No[]

Exterior Walk Ways

Are walkways eliminating opportunities for gaining access to roof and windows?	Yes[] No[]
Is column having slippery finishes?	Yes[] No[]
Is line of sight along exterior covered walkway blocked?	Yes[] No[]
Is niches provided at the entries?	Yes[] No[]
Is low wall, trees and planters located away from external walkways?	Yes[] No[]
Is door opening creating obstruction in clear passage of walkways?	Yes[] No[]

Point of Entry/exits To Building

Are there limited entry/exits in building?	Yes[] No[]
Is main entry located at the front of administrative areas?	Yes[] No[]
Are secondary entrances secured?	Yes[] No[]

- Is lighting installed near main entrance? Yes[] No[]
- Is overhang at main entrance sufficient enough to provide shelter from sun and rain? Yes[] No[]
- Can wheelchair user use the entrance with ease? ✓ Yes[] No[]
- Are exits wide enough to provide safe escape of the occupants in case of fire? Yes[] No[]
- Is each floor having two exits? Yes[] No[]

Court Yards

- Is entry to court yard is limited/secured? Yes[] No[]
- Is main entry to court yard located adjacent to highly visible areas? Yes[] No[]
- Is natural surveillance of court yard possible through corridors? Yes[] No[]

Door

- Is door having view panel or side lites? Yes[] No[]
- Is exits door open upwards? Yes[] No[]
- Is door opening obstructing the circulation path? Yes[] No[]
- Is there a wide recessed area near the door opening? Yes[] No[]
- Is door having proper locking device? Yes[] No[]

External Walls

- Is screening and architectural features on exterior wall provide footholds and hand holds to upper storey? Yes[] No[]
- Is external wall providing blind corners and dark niches? Yes[] No[]
- Is external wall repelling graffiti? Yes[] No[]
- Is all external walls 230mm thick? Yes[] No[]

Roof

- Are external pipes and columns providing access to roof? Yes[] No[]
- Is access to roof is restricted? Yes[] No[]
- Is roof hatch installed with locks? Yes[] No[]
- Is roof parapet allowing surveillance from ground? Yes[] No[]

Lighting

- Are light fixtures provided for areas that require good visibility such as pedestrian routes and entrapment areas? Yes[] No[]
- Are light fixture protected against vandalism? Yes[] No[]
- Does designing of lighting poles provide foot holds and hand holds for climbing? Yes[] No[]
- Is lighting adequately provided such that a person can recognize a face from about 10 meters? Yes[] No[]
- Is lighting fixtures blocking the line of sight? Yes[] No[]

INTERIOR SPACES

Lobbies and Reception Areas

- Are lobbies and reception areas located close to administrative areas or desk adjacent to main entry? Yes[] No[]
- Is lobby area can easily be secured? Yes[] No[]
- Is there extensive glazing and windows in lobby area for visual surveillance? Yes[] No[]

Administrative Areas

- Is administrative area located adjacent to main entry and lobby? Yes[] No[]
- Is there extensive glazing in administrative area for visual surveillance? Yes[] No[]

Is main entry to campus, visitor entry and internal building properly viewed from administrative areas? Yes[] No[]

Corridors

Is the corridor is singly loaded? Yes[] No[]

Is the corridor is well lit and clearly defined? Yes[] No[]

Is there any hiding space and blind corner in corridor? Yes[] No[]

Is the width of the corridor increased beyond minimum at critical junction? Yes[] No[]

Is corridor crosses each other at 90 –degree? Yes[] No[]

Is corridor having natural surveillance from the class room? Yes[] No[]

Is corridor having slip resistant surface? Yes[] No[]

Stair and Stair Wells

Is the area under all staircases enclosed and made inaccessible? Yes[] No[]

Is tactile flooring provided at meeting edge of stair case and corridor? Yes[] No[]

Is staircases and stair well properly lit? Yes[] No[]

Is stair case width extended beyond minimum? Yes[] No[]

Is roof is easily accessible from all staircases? Yes[] No[]

Is stair case located in highly viewing areas? Yes[] No[]

Is all the staircase enclosed type? Yes[] No[]

Is stair case having hand rail on both sides? Yes[] No[]

Is stair case providing any hiding place? Yes[] No[]

Is hand rail of the stair case discouraged sliding? Yes[] No[]

Is upper floor is accessible to wheel chair user? Yes[] No[]

Toilets

Is toilet block isolated from the main building? Yes[] No[]

Are all the fixtures vandal resistant? Yes[] No[]

Is toilet wall and surface having durable finish? Yes[] No[]

Is there any provision of toilet for wheelchair user? Yes[] No[]

Is toilet door open outward? Yes[] No[]

Class Rooms and Labs

Is all the class room having proper locking devices? Yes[] No[]

Is natural surveillance of areas like play ground, parking and corridor possible through class room? Yes[] No[]

Are class rooms having two exits? Yes[] No[]

Is chemistry lab on ground floor? Yes[] No[]

Are fire extinguishers located in all laboratory areas? Yes[] No[]

Is there any lockable room for storing equipments and supplies in labs? Yes[] No[]

Is faculty/staff having direct visual access to work room and entry areas? Yes[] No[]

Libraries and Media Centers

Is circulation desk/reception areas located near main entrances? Yes[] No[]

Is faculty/staff having direct visual access to work room and entry areas? Yes[] No[]

Is there any lockable room for storing equipments and supplies? Yes[] No[]

Are stacks blocking the line of sight? Yes[] No[]

SYSTEMS AND EQUIPMENTS

Is security system like?

CCTV Yes[] No[]

Automatic alarm Yes[] No[]

Electronic card system Yes[] No[]

Metal detector Yes[] No[]

Is alarm connected to near by police station? Yes[] No[]

Fire Fighting System Adopted in School Building

Manual Yes[] No[]
Over head tanks Yes[] No[]
Static storage tank Yes[] No[]
Fire hydrants Yes[] No[]
Portable fire extinguisher Yes[] No[]
Hose reel Yes[] No[]
Automatic sprinkler system Yes[] No[]

Water Fountains

Is water fountain located in isolation? Yes[] No[]
Is there any fountain for wheel chair user? Yes[] No[]
Is water fountain is vandal free? Yes[] No[]

Elevators

Is elevators located adjacent to main circulation? Yes[] No[]
Is elevator equipped with electronic surveillance? Yes[] No[]

OTHER INFORMATION

Site Area = Built up Area =
Open Area = Built Form = No. of storey =
Location = Nos.of Students =

CONCLUSION Safe & Secure [] Unsafe & Unsecured [] In-between []
Can be corrected with little modifications []

DEPARTMENT OF ARCHITECTURE AND PLANNING
INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE-247667

TITLE: DESIGN GUIDELINES FOR SAFETY AND SECURITY IN SCHOOL
Survey Questionnaire

(Information collected will be confidential & entirely used for the academic purpose)

Please 'X' the appropriate box (X)

District Name..... Surveyor: **Rachit Saxena**
Name of the school..... Student of M.Architecture, IIT-Roorkee
Resident of Flat no. 25 P.W.D. colony
Behind S.B.I. Samad Road, Aligarh (U.P),
202001, Ph: 0571-2504225

1. GENERAL INFORMATION

How many senior secondary schools do you have in your town?.....

Where these schools located?

Down town/ inner city () City/ town () Sub urban () Rural ()

Of all school in your town, which is the preferred general layout of the building relative to provide optimum safety and security?

Single storey building ()

Multiple storey building ()

One storey with centrally organized court yard ()

One Storey campus plan ()

General built form of school building in your district

Compacted single/multistory plan? ()

H – Plan configuration? ()

U – Plan configuration? ()

Enclosed court yard configuration? ()

Campus plan configuration? ()

Is there provision of parking facilities inside the campus? Yes () No ()

If yes, there routes are properly defined. Yes () No ()

Is building is accessible to wheel chair user? Yes () No ()

Is building designed w.r.t. fire bye-laws? Yes () No ()

Which primary circulation system is preferred?

Interior corridor ()

Exterior corridor ()

Both (Interior & Exterior) ()

2. INFORMATION ABOUT CRIME

Is crime occurred in your school? Yes () No ()

Type of crime has occurred in your school district over the last two years.

1. Burglary () 2. Vandalism () 3. Graffiti ()

4. Arson () 5. Theft () 6. Fighting ()

7. Robbery () 8. Kidnapping () 9. Battery ()

10. Burglary () 11. Sexual offences () 13. Alcohol use ()

14. Trespassing () 15. Weapon possession () 16. Traffic crimes ()

17. Any other crime ().....

Causes of crime

Lack of visual surveillance () Undefined enclosure ()

Improper landscaping () Hide out spaces ()
 ill maintained areas () Insufficient lighting ()
 Any other cause

.....
 How many of schools allow public access to recreational facilities after school hours.....

Where the majority of these incidents do takes place? Rank in descending numerical order the top five?

Class room ()	Hall ways ()	Toilets ()
Laboratories ()	Auditorium ()	Cafeteria ()
Gymnasium ()	Lockers room ()	Play grounds ()
Parking lots ()	Corridors ()	Roof tops ()
Building tops ()	Secondary ent. ()	Court yard ()
Stair case& stair well ()		

Other (please describe).....

What time of day do these incidents predominantly occur?

Before School ()
 During School hours ()
 Recess time ()
 Immediately after school ()
 Evening hours ()
 Week end ()

Other (please describe).....

Has there been a significant increase or decrease in criminal incidences in your school district over the past 10year crime.....

3. INFORMATION ABOUT ACCIDENTS

Is accident occurred in your school? Yes () No ()

If yes, *Type of accident*

1. Fall () 2. Slip () 3. Vehicular accident ()
 4. Electric shock () 5. Fire accident () Heat induced illness ()

Other (please describe).....

Causes of accident

Niches () Sharp edges () Blind corners ()
 Poor maintenance () Improper landing () Non slippery surface ()
 Low Parapets () Unsafe playing equipments () In adequate lighting ()
 Absence of hand rails () In adequate lighting ()
 Un recognizable level differences () No, regards to fire bye laws ()

What time of day do these accidents predominantly occur?

Before School ()
 During School hours ()
 Recess time ()
 Immediately after school ()
 Evening hours ()
 Week end ()

Other (please describe).....

4. INTERNAL SAFETY AND SECURITY

Do you feel door/windows are strong enough to stop the entry of criminal in your school?

Yes () No ()
If no, due to Poor joining () More gaps between grill () Poor material ()
Less strength () Any other reason ()

Is any electronic gadget have been installed to keep an eyes on stranger?

Yes () No ()
Are all external doors having additional Iron Gate? Yes () No ()

Are all windows having iron grill? Yes () No ()

Is the door lock/handle accessible to wheel chair user? Yes () No ()

Are doors having side lites? Yes () No ()

Is there any arrangement to communicate the nearest police station, hospital and fire station in case of accidents and crime? Yes () No ()

5. LIGHTING

What is your impression of school external lighting?

Poor () Satisfactory () Good ()

Is it Creating glare to eyes Yes () No ()

Are you able to see a person from 10 m distance in night? Yes () No ()

6. HIDE OUTS

Do you feel any obstruction to see the movement of person clearly? Yes () No ()

If yes, reason may be Sharp corners () High walls () Bushes ()
Fences () Dense Plantation ()

Other reason (please describe).....

Are there places for hiding?

If yes, the places are Garbage bins () Alcoves () Niches ()
Dense shrub () Corners () Isolated Areas ()

How easy would it be for criminal to disappear?

Very easy () Quite easy () Easy () Difficult ()

7. MAINTENANCE (play grounds, path, landscape, Garbage bins, buildings)

What are your impression of maintenance of general utilities, recreational areas and building?

Poor () Satisfactory () Good ()

If poor what are the problems?

Playgrounds No fencing () Dense plantation () No plantation ()

Path ways Broken () Poor drainage () Unmaintained ()

Building Façade Permanent finish () White wash ()

If white wash Done Yearly () Once in two year () Never ()

Garbage bins Good () Broken () Open ()
Used by garbage collectors ()

External lights Maintained properly () Not maintained at all ()
Occasionally ()

Landscape Trimmed () Not Trimmed ()

8. VEHICULAR MOVEMENTS AND PARKING

Is adequate parking available? Yes () No ()

If yes, than segregated from pedestrian movement? Yes () No ()

If no, where do they park vehicles?

Main road () No specific place () Play grounds ()

Is parking visible from main building of school?

Clearly () Slightly () Invisible ()

9. OVER ALL SITE

What is your impression of the overall design in terms of safety and security?

Poor () Satisfactory () Good ()

Is the circulation pattern is well defined? Yes () No ()

Are the entry/exit well defined? Yes () No ()

Are path/parking/public areas visible from building? Yes () No ()

Is the planning too congested? Yes () No ()

If yes, it gives feeling of Security () Insecurity () Fear ()

10. CRITICAL AREAS OF SCHOOL DESIGN

What are the most critical areas of school design with respect to safety and security? In descending numerical rank the top five from the list below:

Maintaining visual surveillance from the abutting road ()

Maintaining visual surveillance in corridors ()

Minimizing niches, alcoves and other residual spaces that that provide space for hiding ()

Window design ()

Exterior door design ()

Location of electrical panels ()

Enclosures of school property (fencing, wall) ()

Landscaping ()

Access to roof tops ()

Location of stair case and stair wells ()

Design of stair case ()

Design of roof, railing and parapets ()

Use of electronic visual system ()

Does school can be made safe and secure place by keeping in view these four components in design? Rank in descending numerical order.

Surveillance () Access Control () Territories ()

Mechanical and electronic devices ()

Other (please describe).....

11. FROM THE QUESTIONS THAT YOU HAVE JUST COMPLETED

1) Do you have any other specific recommendation regarding school design to make it safe and secure against accidents and crime, please suggest?*

2) If you know the modus operandi of any accident and crime in your school or other school, please write.

3) Sketch the senior secondary school in your district which you considered most secure and insecure.*

Signature & Date Name:..... Age:..... Status:.....

* Use separate sheet to fill the suggestions if required (write in Hindi / English)

APPENDIX 3

Do you Feel Following Design Factors are responsible for accident and crime in your school campus?

1. OVERALL LAYOUT

- Placement and connection of block Yes / No / Can't say
- Location of play grounds Yes / No / Can't say
- Location of parking lots Yes / No / Can't say
- No boundary wall Yes / No / Can't say
- Surrounding community/Other structure Yes / No / Can't say
- Location of services Yes / No / Can't say
- No. of Entrances/Exits Yes / No / Can't say

2. CIRCULATION

- Vehicular routes Yes / No / Can't say
- Pathways Yes / No / Can't say
- Narrow alleys Yes / No / Can't say
- No. of approaches Yes / No / Can't say
- Thoroughfare Yes / No / Can't say

3. LIGHTING

- Street light Yes / No / Can't say
- Design of lighting fixture Yes / No / Can't say
- Location of street lighting Yes / No / Can't say
- Lighting in service areas Yes / No / Can't say
- Lighting in play grounds Yes / No / Can't say

4. LANDSCAPE

- Location of trees Yes / No / Can't say
- Canopy of trees Yes / No / Can't say
- Height of shrubs Yes / No / Can't say
- Location of street furniture Yes / No / Can't say
- Depth of water bodies Yes / No / Can't say

5. MAINTENANCE

- Building façade Yes / No / Can't say
- Public areas Yes / No / Can't say

6. BUILDING DESIGN

- Built form Yes / No / Can't say
- No. of storey Yes / No / Can't say
- Location of court yard Yes / No / Can't say
- Access to roof Yes / No / Can't say
- Design of external wall Yes / No / Can't say

7. INTERIOR SPACES

- Location of lobby and reception Yes / No / Can't say
- Location of adm. block Yes / No / Can't say
- Width of corridor Yes / No / Can't say
- Location of Openings Yes / No / Can't say
- Location of Toilets Yes / No / Can't say
- Location of stair cases Yes / No / Can't say
- Design of stair cases Yes / No / Can't say
- Design of parapets Yes / No / Can't say
- Internal lay out of labs and libraries Yes / No / Can't say

8. HARDWARE

- Door lock Yes / No / Can't say
- Window lock Yes / No / Can't say
- Door fixing Yes / No / Can't say
- Grill Fixing Yes / No / Can't say
- Grill spacing Yes / No / Can't say

9. MATERIAL

- Façade material Yes / No / Can't say
- Door Material Yes / No / Can't say
- Surface Finish Yes / No / Can't say

