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Perspective Solutions for Modern Schools Design in the Gaza Strip (Study Sase- UNRWA Schools)

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Abstract: ***Architectural design is the result of solutions carried out through a design process to solve the individual issues while at the same time resolving the global issue of the building proper. It is an intense and complex mix that involves all sections of this curriculum using the design elements defined herein to fulfill the purpose of the design. This paper explores the factors affecting school design generally and in the Gaza Strip especially. Architectural design principles are not neatly identifiable as "fixed parameters". The reality is, they are flexible. It remains the responsibility of the architect to interpret the client needs through the use of the intended principles; allowing for variation and abstraction as required to suit the intended solution; The challenge of architectural design lies in the task of resolving a wide variety of functional and aesthetic requirements (the problem) into a coherent, satisfying structure (the solution). The effort to resolve the varied requirements makes use of specific design elements by assembling the properties of these elements into a coherent whole. Our recommendation the planning of the school should be seen not merely as a grouping of rooms listed in the schedule, it is important that the school be flexible and capable of future expansion. Flexibility incorporating design aspects and features that will enable the built accommodation to be used for a range of activities, not only by the school, but also for the benefit of the community. Ensuring colour contrast throughout the building, where glazing is used, ensure daylight glare is manageable, either by carefully selection of internal surfaces or provision of blinds. This result gives sets of new ideas to improve the quality of schools by adding new architectural elements especially on site layouts, plans and elevations to be more attractive.***

Keywords: Design Brief, Process of Design, Design Philosophy, Shape, Concept of Space

1. Introduction

Every design is completed in order to serve a defined functional aspect of our existence. The success of a design solution is evident when it resolves the Problem by providing a suitable environment.

The failure of function is evident when the design does not achieve this goal. All refugee children of school age are eligible to enroll in UNRWA schools, which provide free basic education across nine grades in the West Bank, the Gaza Strip, Syria and Lebanon, and ten grades in Jordan. This includes six years of primary schooling and three or four years at a preparatory level. Over time, UNRWA schools have built a reputation for high academic achievements and low dropout rates, while groundbreaking progress has been achieved in gender parity since the 1960s. Today, literacy and levels of educational attainment among Palestine refugees are among the highest in the Middle East. Responding to the evolving needs and educational priorities of the learner, and in the context of major reforms of the education programme, the Agency strives to ensure that refugees receive an education which reflects international standards, and is guided by three mutually reinforcing pillars: the educator, knowledge and skills, and tools and resources. Resource constraints within the UNRWA education programme remain a recurrent challenge. Since the 1950s, the Agency has operated many of its schools on a 'double-shift' basis, whereby one group of pupils attends in the morning and a second in the afternoon.

This research Paper aims at discussing and explores the measures that should be done to improve the UNRWA new schools design; the proposed measures are based on the feedback collected during the discussion with the related education staff for Optimization of School Design conducting. This Paper will shaded lights on the currant School design and it will present a tool for better understand and enhancing the coordination between different stakeholders; Education Program, Architects, Structural Engineers, construction and maintenance engineers.

2. The Process of Design

Architectural design as a conscious act begins with a level of organization [1]. The specific steps in the order of this organization vary on a personal level with each individual, however a general outline for the process involves:

- Definition of the project
- Analysis of the possibilities
- Definition of the specific problem
- Examination of the alternatives
- Selection of characteristics
- Production of the solution
- Clarifications/revisions to provide a final result.

The tools and devices used in the process of architectural design can be defined as either design elements or design principles. Design elements are those which can be defined as specific "parts" of a design solution. Design principles are those items which influence, direct or resolve the overall composition of the design elements.

Architectural design elements include:

- Materials
- Colour
- Line
- Shape
- Mass

- Space
- Texture

Though these elements are reviewed independently, it should be remembered that they are inherently linked, acting on and contributing to each other's influence in the design solution [2]. Architectural design is the method of organizing materials and forms in a specific way to satisfy a defined purpose. Two key aspects of human involvement are contained in the design process. The first aspect relates to the architect, the second aspect relates to the user or participant of the solution.

The architect contributes to the process of creation through interpretation of the problem, inspiration in the design solution and originality stemming from personal style which defines the work as individual and unique. The user or participant contributes to the process by provision of a clearly defined set of needs as well as through the use of the completed structure, recognizing the aspects of architectural design that contribute to the success of the solution. Due to the limitation of this research I will discuss only three important aspects which have direct impact on school design.
-Colour is an aspect of architectural design which provides a wide array of Potential affects. A summary of the colour definition divides colour into two categories: warm and cool. Each category provides an emotional response to the colour[2], [3]. The psychological aspects summarized here represent an overview of the majority, not necessarily the definitive response by every individual. These colours are related to our Psychological response to colours produced by light (the sun), heat and fire. The relationship of warm colours to heat/light define the colour range as having a cosmic influence, linked to overriding principles of life. Items finished in this colour range may tend to have more visual weight, thus appearing as dominant when compared to cool colours. The influence of daylight as well as artificial lighting (specific type, intensity, focus) will alter the effect of colour, possibly minimizing or eliminating the intended result. Brilliant lighting can be focused to create emphasis relative to the colour; softer warm hued lighting casts more of a glow which will provide a calming effect. Lighting when designed in conjunction with colour and texture can greatly enhance the intended aspects of a design. The researcher advice to restudying the colouring system on the UNRWA schools from internal and external walls in order to give an attractive coloured internal spaces and modern view from outsides.

- Shape as a design element relative to architectural principles refers to the two dimensional representation of form. Shape is the outline, shadow or basic form of structure that which is the simplest to realize in built form. Shape evokes a responsive emotion in the viewer, providing the "first" affect of the building solution. The forms and types of shape will provide varied responses, utilized by the architect to create an emotion in accordance with the intended design solution. Shape is categorized by four distinct types: geometric, natural, abstract and non-objective. These basic shapes dominate our built environment as almost every building form can be derived from them. These shapes are common to our culture, simplistic and understood by the mass population as they are easily interpreted. They are considered to be "perfect" shapes and therefore elicit a sense of stability and order. The concept of shape as a two-dimensional object leads our analysis directly into the next level of three dimensions.
- The Concept of Space Architectural design involves the practice of enclosing undefined space to serve defined use or need. Architecture as an entity contributes to the richness, effectiveness and variety experience of human life within the spaces created.

There is sensation in every centimeter of it (Architecture space), and an accommodation to every architectural necessity with a determined variation in arrangement, which is exactly like the related properties and provision in the structure of organic form. The concept of undefined space is sufficiently vast to encumber the mind in limitless thought. Space stretching on outside our borders and world into infinity defies the imagination. It may be said that space exists in the absence of form. We do not begin to grasp the concept of space until it is enclosed by form. A positive space is one that presents the enclosure, the actual form. It contains a measured volume of enclosure that is visual and tangible. A negative space is the void enclosed by the form. Negative spaces may be said to be the interior volumes of a design (See fig.3).

2.1 Function of schools

The function of school is a place where students receive education in order to fully improve themselves, and education is an action aimed at perfectly forming the character of students. In my opinion, the primary mission of school is teaching student’s knowledge. A new design would also incorporate the most appropriate technology available. It would include designing the curriculum for teaching the staff. Every design is completed in order to serve a defined functional aspect of our existence. The success of a design solution is evident when it resolves the problem by providing a suitable environment. The failure of function is evident when the design does not achieve this goal. Function relates to the essence of the design solution. Function also has to respect the rhythm of life relating to those who occupy the spaces [4]. Architectural design must be considered in its context that is relative to the intended location, time and space. Good design is only good for a one time specific use application repetition elsewhere without change or modification will not achieve the same successful result. Along with this consideration, one must realize that no design solution exists in isolation for there is always a contextual element present. A design solution that is completed relative to its contextual application is more likely to be accepted (judged) as appropriate. A design solution completed in contrast to its context must be done so with intent.

2.2 Approaches to School Design

The school should be lively and welcoming, a place that the pupils will make their own with an atmosphere and sense of scale that is not over-powering, or impersonal.

a) The planning of the school should be seen not merely as a grouping of rooms listed in the schedule of accommodation but as a complex of spaces permitting the optimum degree of variety in use. The need is for a building that can accommodate that variety of activities; a school that will stimulate experiment will support and encourage interest in the pupils.

b) It is important that the school be flexible and capable of future expansion. The design of the school should allow for future change and the possible addition of further accommodation. The possibility of expansion should be considered when determining the organization and layout of the school so that it can still operate effectively if the school grows in size. First, we should consider a philosophy of site design. It should be expected that the new schools should consider the followings points:

c) Educationally Effective provides superior teaching and learning environments that accommodates present and future needs.

i. Healthy and Productive - enable students and teachers to achieve maximum Potential by providing healthy, safe, and comfortable environments.Cost Effective - provide facilities that save both, capital as well as operating costs over time by being efficient to build, maintain, and operate.

ii. Sustainable - minimize environmental impacts and maximize the use of nonpolluting, renewable resources.

iii. Community Centered and Culturally Appropriate - create schools that are integral parts of their surrounding communities' role during the design process in order to:

- Suggest options
- Clarify expectation
- Explain approved policies
- Ensure coordination between the parties
- Review design submissions for compliance with Design policies and requirements.
- Recommend the approval of each design phase

Design teams are encouraged to seek solutions that heighten educational effectiveness and provide long term value. Imagination should be put to work by looking at examples of other building types, solutions already adopted in other latitudes with similar climate and socioeconomic conditions, by a thorough review of the latest publications, and active participation. Inspiration about images, shapes, textures and colors should be drawn from the community and cultural context which the project will serve [5]. Respect for local culture and natural environment are mandatory, though design solutions must also seek creative approaches to highlight and add value to the local context. Suitable and well designed school buildings are essential for the successful implementation of education programmes. The UNRWA schools follow

Slightly modified Version of the academic process. They only cover nine grades, which in Gaza strip completes the Basic cycle according to Palestinian Authority requirements. After the ninth grade, UNRWA students can either enroll in governmental secondary Vocational Training Centers award successful students with a diploma [6]. Due to population bulge clearly apparent in the younger ages, an increased pressure is put on education. In absence of adequate funds it is quite possible that more schools will have to move over to a two-shift system. Therefore the researcher aims to give direction for the future designed schools meeting the latest standard of school design improvement.

3. Types of schools

The UNRWA school follows from design point view of two standard types of design:
-Double side school (See fig.1)
-Single side school (See fig.2)

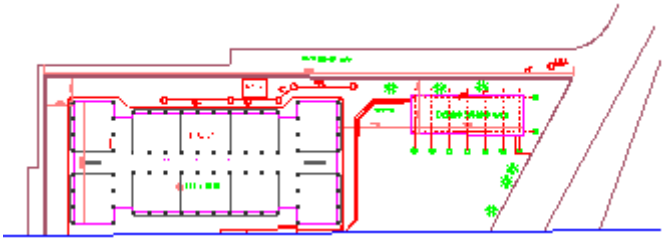


Figure 1: Sample of Double side school

Figure 2: Sample of Double side school

Disadvantage of double side school

- Disturbance (no sound isolated)
- None enough ventilation.
- Electrical lighting is necessary.
- Difficult to get inside and emptying.
- There is no control on utilities cleaning.
- A consideration of safety is not available.
- There is no store.

No control from administration on students. Temperature is undesirable.

Disadvantage of single side school

- Occupy very large spaces from the land.
- It's costly more than another type and the maintenance too.
- It's hard to provide playing and opining spaces.
- The buildings are exposed to steal or destruction especially after the formal day hours.

Advantage of Double side school

- Easy to control the building.
- Occupy Specific place from the whole land.
- Beautiful shape all the empty
- Save cost
- Maintenance cost is cheaper.
- Can save outdoor spaces for another usage.

Advantage of Single side school

- Ability to extension of building.

- (Staircase movement) considerations of safety are available.
- Lighting and natural ventilation is available.
- The administration staff can control all facilities of school.
- Outdoor is charring with indoor.

3.1 School requirements

According to the UNRWA education department at the Gaza field office there are the following required for schools:
30 classroom/30-50 student per class (currently)
2 Head teachers' rooms
2 Assistant head teachers' rooms
2 Teachers rooms
2 Home economic units for girls were cancelled.
2 Hand craft units for boys were cancelled.
1 Computer lab for above 27 classes the number will be two.
1 Science lab for above 27 classes the number will be two.
1 Multipurpose room
1 Library
1 Guidance & counseling room.
1 Medical room
1 Special education room
2 latrine units for students
2 latrines for teachers one for male, one for female
1 Latrine for handicapped students
2 stores
Shading shed
Canteen
Stage
Playground
Guard room (new requirement)
Time, budget and land-use constraints faced by school design developers can lead to buildings being assembled with little consideration for durability, sustainability or environmental health. The researcher tries by the followings figures 3-8 to shows all existing types of UNRWA schools .the selection criteria for the shape of schools depends most likely from the size of lands and the existing site layouts.

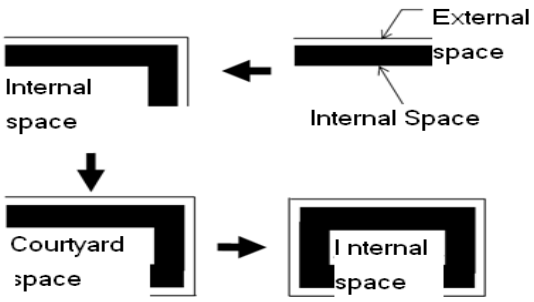


Figure 3: Shape Types of Standard Used UNRWA Schools

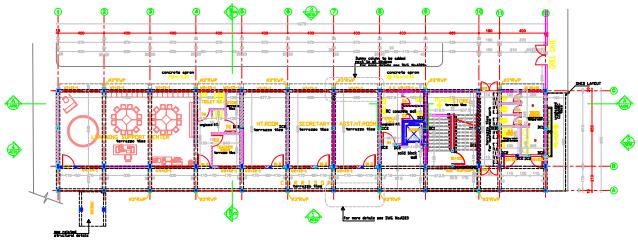


Figure 4: I-shape school Floor Plan

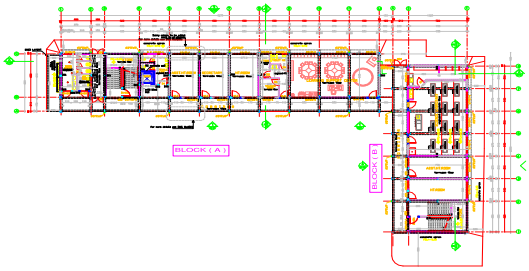


Figure 5: L-shape school Floor Plan

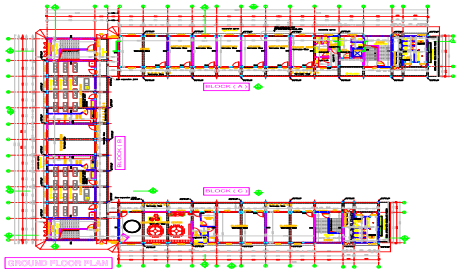


Figure 6: U-shape schools Floor Plan

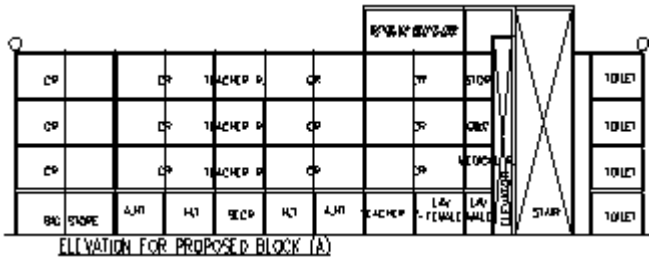


Figure 7: Sectional elevation of the main block A of U shape school

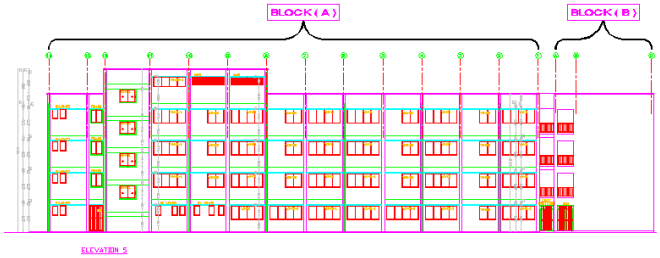


Figure 8: Elevation Sample

3.2 Site Selection Criteria

Site layout dimensions should be sufficient for proper school design and to accommodate the building footprint to the most favorable orientations, adequate outdoor learning and physical education spaces, access to convenient parking, and have well designed pedestrian and vehicular paths, as well as ample green area. Except in densely populated urban areas school sites should provide for not less than a 30 % increase in the footprint against either possible growth or the addition of other facilities [7].

Site selection will start with the analysis of several possible options that are to be graded in consideration of safety, suitability and convenience. The cost of land shall not be a consideration for site selection. If no suitable site is found in a given community that needs a school, a change of land use and/or the demolition of existing structures in an appropriate location shall be addressed with the Pertinent authorities. Characteristics of undesirable sites for school development include: The distance shall be measured from the nearest portion of the runway to the most adjacent portion of the school site.

Sites within potentially unsafe distances from high voltage power transmission lines. Distances are from the edge of the power line easement

Site Security and Site Access Learning activities require securable sites that feature controlled access for the protection of the students, staff and visitors. The following are the most important requirements for all school projects:

- Perimeter walls and/or fences around school sites that provide security for the entire campus, including play fields and green areas. Fences and/or walls at boy's schools maybe of a more open design which allow for views into the Campus. Girl's schools must have a more opaque design that prohibits views to the recreational and sports areas of the school campus.
- When possible, walls and fencing shall be integrated into architectural designs to enhance and compliment the characteristics of buildings that occupy the campus. Designers are encouraged to find interesting textures, colors and shapes for perimeter walls. Perimeter walls shall not block views to the entrance of the school and to the access to community facilities.
- Building façades shall to be designed and integrated visually with the boundary wall and landscape.
- Specially marked entry locations into community use spaces shall be provided.
- Clear and safe routes for community use spaces from public ways and from parking areas shall be provided. Lighting systems to connect school entrances, walkways, and parking areas for night use by the community shall be designed.
- A well defined shaded pedestrian path shall be established from the parking and drop off areas to the main entrance.
- Conduct shade studies to ensure proper shading of pathways and drop-off areas.
- Visual supervision of the main entry from administrative areas shall be provided.
- School sites for more than 1500 students shall be considered as very exceptional and designs for these large campuses shall allow for multiple, smaller and distinct, entry areas for each cycle within the school.
- Blind spots that prohibit the ability of the staff to adequately supervise all areas of the site and within the school shall be avoided.

4. Community Integration

Schools have the potential to be integral parts of community life. The involvement of families and prominent members of society in education, through the shared use of facilities can positively influence the culture of schools as well as impact positively on the surrounding society. Further, this will help to build a political constituency that shows support for public education and emphasize to educators their responsibility for ongoing improvements.

Parental cooperation increases confidence in teachers and administrators, reduces behavior problems, and boosts student achievement; it also demonstrates to educators that parents specifically, and the adult community at large, are proactive participants in the education process. Educational facilities shall be designed to meet a variety of community needs by:

- Helping meet some of the community's educational, recreational, and wellness needs.
- Being accessible to people of all ages and physical abilities.
- Encouraging active parental involvement and presence in school activities.
- Supporting relationships with local businesses that are productive to students and supportive of the local economy.
- Promoting participation by members of the community in a variety of ways, Including mentorships, apprenticeships and other learning opportunities based on work and service.
- Containing shared public spaces that are accessible year round, on alternate schedules.
- Being places where creative space configurations expand school use, where learning occurs after school, at night, and on weekends, and where school-to-school partnerships, links with businesses, and collaborations with higher education are encouraged and supported. All of the above mentioned ideas should study carefully to be considering on the future school design.

4.1 Sustainability

Sustainable building is a fully integrated; "whole building" approach to design, construction, renovation, and operation. This approach differs from the traditional design/build process, as the design team examines the integration of all building components and systems and determines how they best work together to save energy and reduce environmental impact. Consideration must be given to site selection, architectural design, building method and materials, and landscaping practices for both new buildings and those undergoing improvements [8].

- Designers should consider the environmental impact of the school when making design decisions. Opportunities should be taken to utilize passive and active energy systems which will demonstrate prudent environmental stewardship to students and the community.
- Incorporate shades as much possible into the design of outdoor learning areas and circulation spaces throughout the campus. Options include, but are not limited to: overhangs, awnings, trellises, and sail or fabric type shade structures.
- All windows shall be protected from the direct incidence of the sun.
- Design walls with thermal masses high enough to prevent heat gain within its perimeter.
- Consider use of vegetated roofs for some portions of the building. I recommend implementing these types of roofs for UNRWA Schools in order to increase the green areas factors.
- Incorporate, when possible, traditional passive systems such a drip irrigation system.
- Design outdoor water features and garden spaces that are appropriately scaled, that create a soothing ambiance, provide positive effects on the microclimate and which may also provide learning opportunities for students.
- Provide all hot water needed for toilets blocks with a sustainable solar water heating system appropriate to the local climate.
- Reduce as economically possible the need for electricity from off site sources. Integrate sustainable electrical strategies such as incorporation of photovoltaic panels for the generation of electricity on site.
- Explore strategies for capture of rainwater for small-scale building or irrigation use.
- •Sustainable design requirements and strategies are not limited to this section, but also can be found in the following sections: landscape, utilities, lighting, thermal comfort, day lighting, energy efficiency, constructability and durability.
- The above analysis shall include several alternatives along with integrated studies of construction costs, the effects of building construction materials, building orientation, lighting, usage schedules, fuels equipment, maintenance costs, and other factors that relate to the initial capital cost of the building versus the annual operating costs.

Sustainable schools allows us to go above and beyond just meeting the needs of today without Compromising the ability of future generations to meet their own needs. Sustainable schools give students and teachers what they deserve: comfortable, healthy learning environments contributing to academic success and the achievement of each student's maximum potential, necessary to be responsible and productive citizens and life-long learners beyond the classroom [9].

4. 2 Concluding Remarks

Any project should attempt to:

- Find social and physical appropriate planning and design methods to help advancing the post-war reconstruction efforts in the Gaza Strip. Such an approach is required not just to rebuild what has been destroyed in the fighting; rather it should establish a strategic plan towards more sustainable developments for the Palestinian society in the Gaza Strip.
- School buildings shall be equipped to allow for computer technology in every educational and administrative space, and a central server shall be placed in a room not accessible to students and close to the administration area.
- The newly designed facilities will encourage and support a variety of individual, small group and large-group learning modalities. These facilities will contain resources and spaces that will enhance the delivery of personalized educational programs and services to all students, encourage student-to-student, adult-to-student, and adult-to-adult collaboration.
- The new schools to be built will be places of culture and tradition that reach out to local communities as multi-functional local resources that encourage parents and families to become partners in the educational process.
- These new schools will embrace quality teaching and learning in ways that meet the aspirations of the Palestine in general and its future generations.
- Communities will have a space and a function in the new school designs. Using the purposely designed community meeting room as their base, parents are to be welcomed to the school in a variety of roles such as assisting in classes, meeting with teachers, planning all-school activities, or the like. After school hours, and subject to management agreements, different portions of the school building may be open to community members for educational and recreational activities including the gymnasium, swimming pool, auditorium, library, cafeteria, design and technology workshop, etc.
- It is expected that the design quality of the school buildings defined in design manual, including aesthetics, functionality, durability, cost effectiveness, sustainability, and long term planned maintenance, will be an asset for the local community and serve as an example to be followed by other government and private facilities in Palestine .
- The improvement process should exceed the structural upgrading to urban ones reaches all the components of the community (environment, socio-economics, infrastructure, urban planning .etc).
- Towards improvement of design steps you can

Find new proposed elements for elevations and site layouts arrangement which was prepared from my side to get clear indication about the proposed developments. **Figure 9-16**.:

Figure 9: Proposed Elevation with symmetrical architectural elements.

Figure 10: Proposed Elevation with natural used materials

Figure 11: Proposed Elements of Elevation

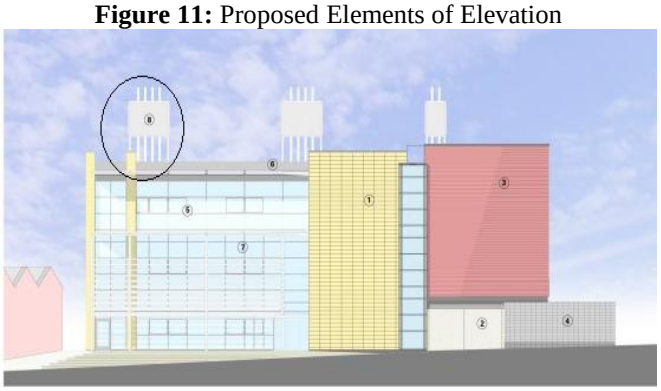
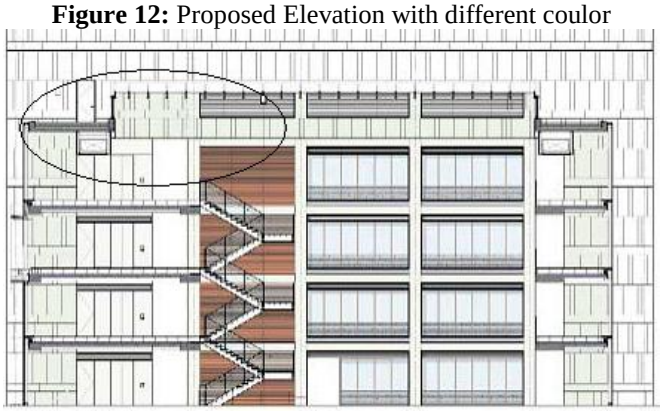


Figure 12: Proposed Elevation with different coulor



Proposed Elements of Elevation and section

Figure 13: Proposed Elevation with sample internal space design

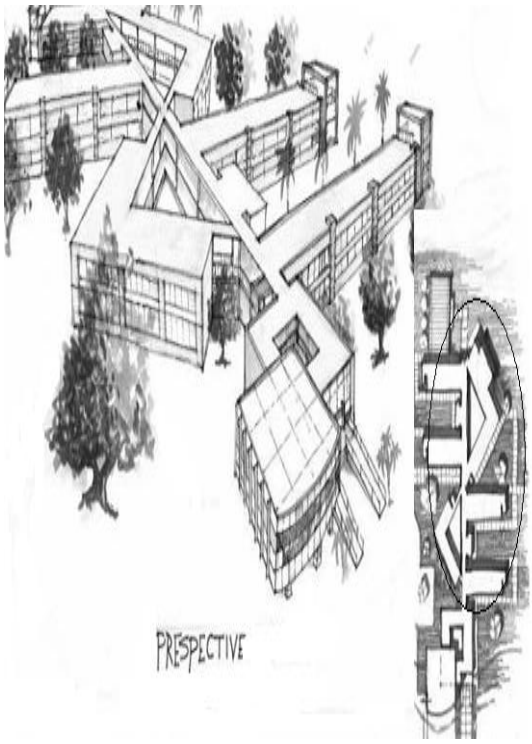


Figure 14: Proposed new design shape for school

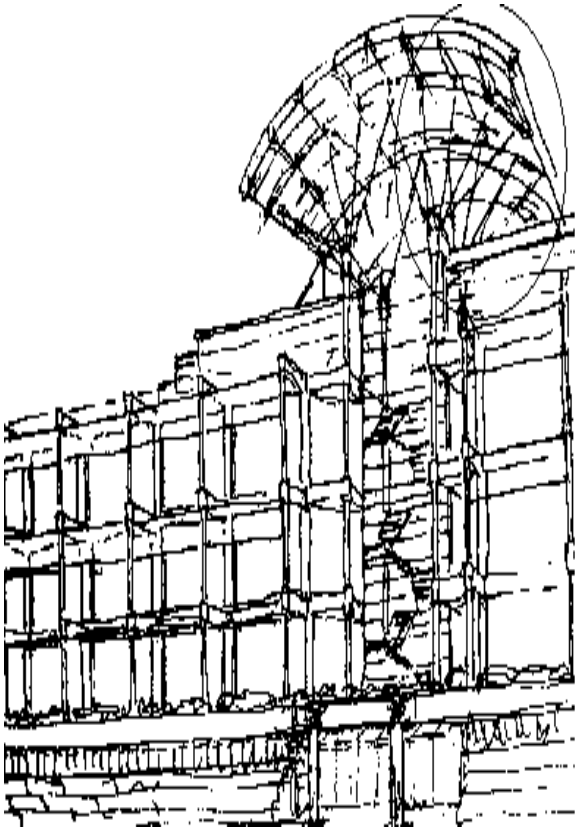


Figure 15: Proposed new design shape

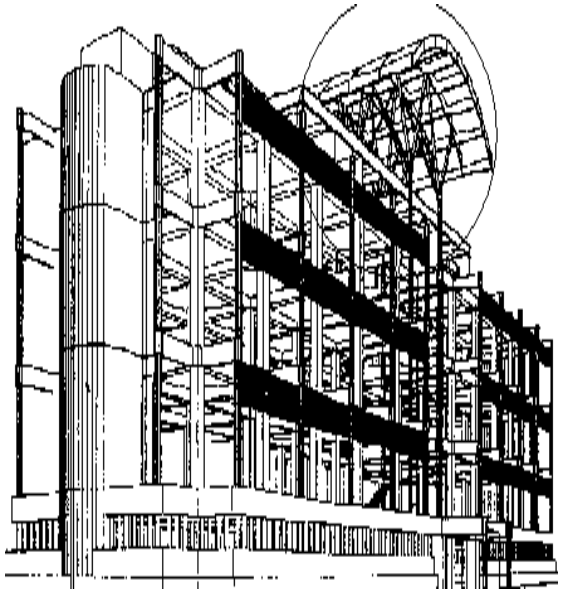


Figure 16: Proposed new design shape with staircase cover

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