



MINISTRY OF EDUCATION, YOUTH, & SPORT

**SCHOOL ARCHITECTURE FOR A NEW CENTURY:
New Generation School Designs & Guidelines
for Aesthetic Infrastructure Investment**



Phnom Penh, 2020

This publication was developed by MoEYS' *New Generation School Central Office* and in cooperation with Kampuchea Action to Promote Education in order to document recent innovations in architectural design in the Kingdom's schools and to facilitate their replication more broadly in the public education system. New Generation Schools are also co-funded with generous support from the Franks Family Foundation and Child Fund Australia.

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*“We shape our buildings; thereafter, they
shape us.”*

-Winston Churchill

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List of Acronyms

CFS	Child Friendly Schools
CPD	Continuous Professional Development
HS	High School
ICT	Information & Communication Technology
KAPE	Kampuchea Action to Promote Education
MoEYS	Ministry of Education, Youth, and Sport
NGS	New Generation School
NGPRC	New Generation Pedagogical Research Center
NIE	National Institute of Education
PCR	Pupil Class Ratio
PLC	Professional Learning Community
PS	Primary School
STEM	Science, Technology, Engineering, & Mathematics

Preface

The Ministry of Education, Youth, and Sport is happy to authorize the publication of this book that summarizes some of the most dynamic innovations in the design and re-design of public schools. These changes in the design of Cambodia's public schools have relied on intensive consultations with developments in other countries to ensure that the Kingdom's education system derives maximum benefit from the latest trends in school architecture. Innovations in school architecture help to increase the credibility of the public schools as trustworthy places of creative learning and thinking. They also promote the idea of the public schools as attractive places of learning for Cambodians of all social classes. Although many of the architectural design ideas described in this publication were developed under the Ministry's New Generation School Reform Program, they are often applicable to any setting and in any project. Indeed, one of the lessons from the New Generation School Initiative is that innovative designs are often no more expensive than more traditional forms of building investment. The Ministry, therefore, hopes that educators in all corners of the country can learn from these architectural design experiences to further enrich the learning environments in the public schools.

H.E. Dr. Hang Chuon Naron
Minister of Education, Youth, & Sport

Phnom Penh,
June 2020



1. INTRODUCTION

The Persistence of Traditional Design: When surveying the Cambodian educational landscape, one notices that regardless of what province one is visiting, there seems to be a near total standardization in building styles and designs from school to school. This usually consists of an elongated building with 4 to 5 classrooms of identical design, all of which are painted in yellow, both inside and out. These educational designs were developed in the middle of the last century at about the time of independence and provided basic educational facilities for children in both rural and urban settings. Such designs were very suitable when Cambodia was just beginning the task of reforming itself from a pre-industrial society into a modern state where basic literacy and numeracy were the order of the day; however, their relevance today is more questionable.

During the French colonial period, some urban areas were sometimes fortunate enough to be endowed with more aesthetically tasteful building designs that usually exemplified a Second Empire architectural style, but even these buildings duplicated very outdated educational models from France that are no



longer used. Classrooms in such buildings tend to be even smaller than the dimensions of rooms currently mandated by the Ministry of Education, Youth, and Sport (MoEYS).

If one fast forwards to the 21st Century, one notices that Cambodia's public education system is still building 'new' educational facilities that use designs developed over 70 years ago, with little that is innovative or accommodative of the needs of a new century. Whether the setting is urban or rural, the design is almost always the same. The basic classroom in such facilities is also used to accommodate multiple educational functions such as libraries, offices, and meeting rooms. That is, the basic classroom design of a 7 x 8-meter rectangular space is used to meet all needs and purposes. Aside from the impact of a monotonous aesthetic style on the appearance of Cambodian schools, the functional usefulness of such facilities needs much to be desired. They are clearly not efficient in facilitating the new methods of teaching and learning that MoEYS and its development partners are trying to promote, as they seek to prepare Cambodian youth to adapt to a 21st Century economy.

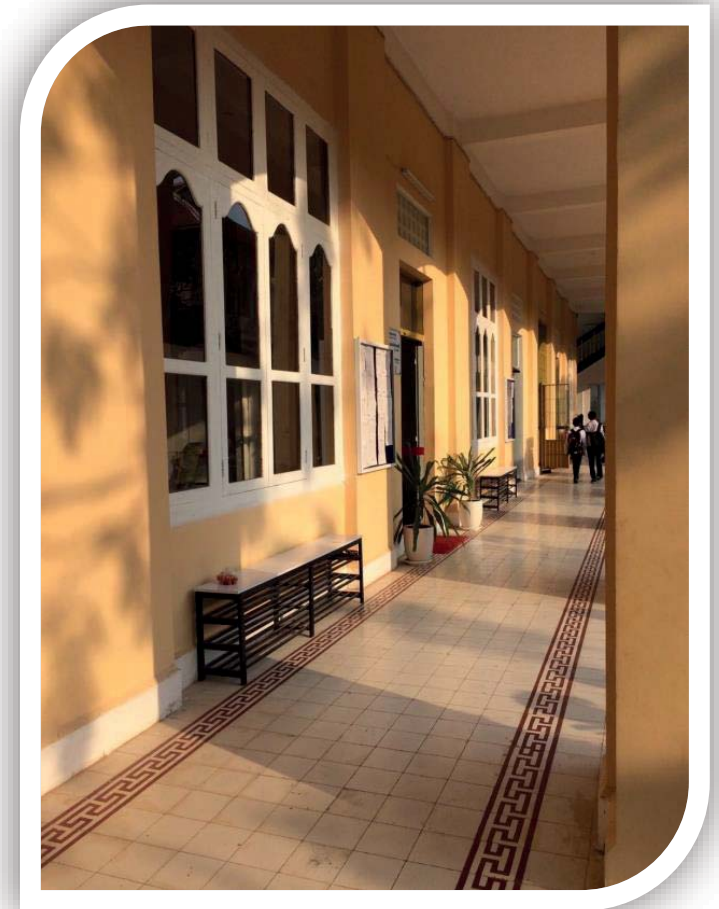
Enter the New Generation School: In 2015, MoEYS initiated multiple reforms to the education system that included investment in new educational designs. These designs are intended to help drive new pedagogies and methods of

management that educational reformers know are essential for preparing Cambodian youth for the 21st Century. These reforms, aimed at modernizing both the content and methods of education as well as the physical layout of Cambodian schools, have collectively come to be known as the *New Generation School initiative (NGS)*.

Depending on resource availability, the implementation of New Generation School programming often alternates between 'new' design in the case of new construction or 're-design' when dealing with existing structures with traditional features. In both

cases, investments in physical design have sought to consciously develop layouts that promote modern practices of teaching, learning, and management. Such investment includes considerations of the 'physical layout' of educational facilities as well as 'furniture configurations.' Both of these considerations go hand in hand as part of the NGS re-design process.

In some cases, the NGS re-design process has also had to take account of conservation issues in the case of historic schools built during the French Colonial Period. Preah Sisovath HS is a good example of an educational facility built at the turn of the 20th Century that has proven very difficult to modernize while



← Modern educational facility built at Hun Sen Kampong Cham HS (left)
Redesigned historical façade of a New Generation School at Sisovath HS (above). ↑

at the same time taking care to preserve the historical appearance of the school.

Nevertheless, New Generation School re-design efforts at historical locations have been able to take advantage of such physical features as high ceilings to provide library and meeting lofts as well as old style lecture halls, which can be upgraded into colorful study areas.

Building on the Experience of Other Countries and Regions: When creating NGS architectural designs, MoEYS and its partners have been careful to consult the experiences of other places in creating new school environments for a new century. Indeed, there has recently been intensive interest throughout the world in re-designing school environments to meet the needs of the 21st Century economy.¹ In this way, the NGS experiment with new school architecture has helped to keep Cambodian education up to date with the latest developments in other countries.

Programmatic consultations on new school designs have considered the need for (i) multi-functional spaces; (ii) the use of materials and layouts that are sustainable and eco-friendly; (iii) intensive focus on the STEM subjects and the use of technology; and (iv) the need to balance all of these considerations with a concern for aesthetic appearance. These considerations have not always been easy when budgetary constraints have often been a serious concern.

A library loft utilizes the high ceilings of an old colonial building (above); A redesigned lecture hall utilizes bright colors and carpeted surfaces to create a more comfortable space for teaching and learning (below) ↗



¹ Yin, Q.,(ed.) (2012) *The New School*, Hong Kong: Design Media Publishing Ltd.

Where We Go from Here: The New Generation School Initiative has demonstrated that it is possible to modernize Cambodian public schools using cutting edge educational design ideas. Some of these design ideas are summarized in Box 1.1.

In the experience of NGS programming, the architectural upgrades described in Box 1.1 are often about the same cost as more traditional designs and in some cases, they are actually cheaper. The present document, therefore, seeks to share some of these experiences with educators working in the sector so that they can be more widely employed by both government departments as well as the international donor community. To this end, this document includes a compendium of floor plans for various educational facilities including libraries, science labs, non-science classrooms, offices, meeting facilities, and student clinics. It also provides furniture specifications and local costs to help with procurement and a number of individual school case studies that show how inputs can be matched to the specific context of an individual school.

BOX 1.1: Selected New Design Ideas for Cambodian Public Schools

1. Promoting classroom configurations that can drive new pedagogies;
2. Introducing the use of modern materials such as glass, formica, chrome, and textiles;
3. Designing multi-functional furniture to match the physical contours of an educational space;
4. Improving coordination of colors to create 'visible harmony';
5. Considering more aesthetically pleasant appearances to make learning spaces more attractive.

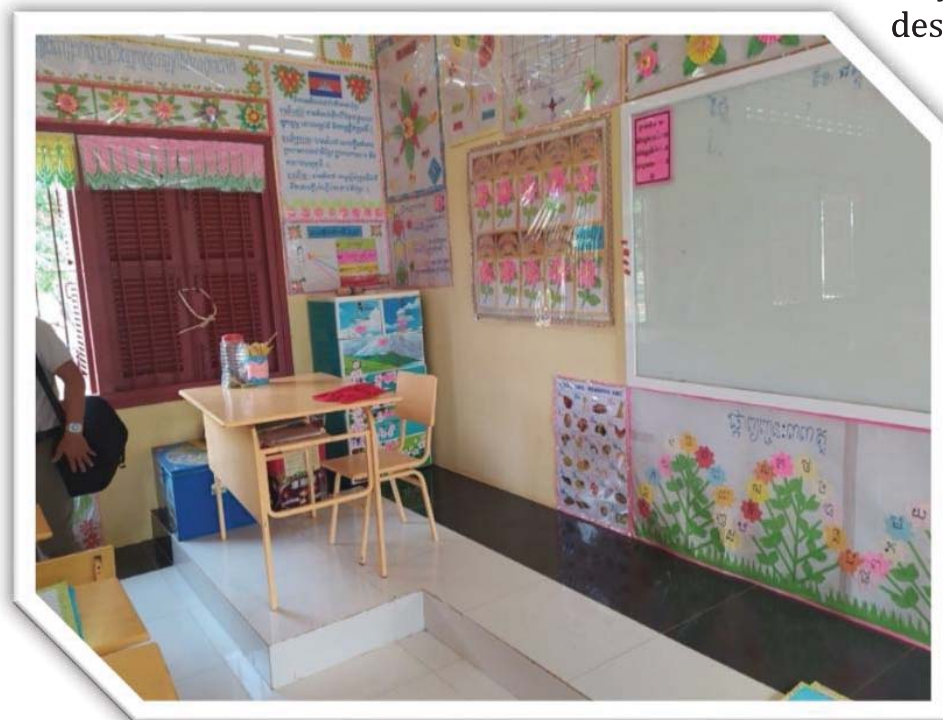


2. SOME KEY DESIGN PRINCIPLES IN MODERNIZING EDUCATION FACILITIES

How Building Designs Can Influence Educational Practice:

The linkages between building design and educational practice are often very subtle. Many observers barely notice how the design of a classroom building can influence the behavior of both teachers and students. For example, traditional Cambodian classrooms usually have a platform at the front where the teacher sits and/or lectures. This design feature suggests the centrality of the teacher in the learning process and promotes lecture-style pedagogy. It is often ironic that many projects seeking to foster student-centered learning are also funding the construction of new educational facilities with this

old-style design



feature. Thus, the building designs that they promote are often inimical to the methodologies that they are also advocating for.



↑ A private niche in a rounded cabinet in the library facilitates small group meetings to discuss projects or things that students have read.

← A newly renovated classroom using traditional design features such as a raised platform at the front of the classroom emphasizes the ascendant position of the teacher. This is a good example of how classroom design can indirectly affect pedagogy.

The formulation of building designs should consider the different ways that students learn most effectively. This may include individualized study, group learning, large lecture style settings, access to the internet, and other modalities. The way that classrooms and study areas (for example in the library) are laid out can have a major impact on promoting or inhibiting these modes of study.

Similarly, design considerations should focus on the spatial setting of different facilities to promote maximum communication and coordination. For example, it is important to place a library at the center of a school rather than at its periphery. In the same way, the library should be in close proximity to such facilities as ICT labs, Offices, and or Faculty Rooms to maximize coordination with educators who run these other facilities.

Using Minimalist Design Principles: The New Generation School Initiative has identified several key guiding principles that have proven very useful for designing or re-designing educational spaces in Cambodia’s public schools. These principles often borrow a great deal from *Minimalist Design Approaches* that foster low cost solutions to design challenges with very aesthetically appealing outcomes. In this regard, there are three very useful ‘Minimalist Principles’ that have proven very useful to New Generation School redesign activities. These are summarized in Box 2.1 and some specific examples below.

BOX 2.1: Some Essentials of Minimalist Design

Principle 1: Extensive Use of Monochromatic Color Schemes: Minimalism requires the simple use of colors for walls, floors, and furniture. Usually only one color should dominate though it is possible to amplify the chosen color by using it in combination with a neutral color such as white, black, or grey.

In some cases, different shades of the same color may also be used.

The New Generation School initiative has made extensive use of this principle in the development of *color-coded classrooms*. Schools have assigned different colors to be used in different rooms depending on what subject is taught there. For example, blue is used for social sciences, red is used for Khmer, orange is used for English, and wood tones for science labs.

Principle 2: Allowing Spatial Areas to Blend into One Another to Maximize the Appearance of Spatial Size: Educational facilities in Cambodia tend to be very small, especially in primary and secondary school facilities. This has proven to be a difficult challenge when renovating existing structures. Minimalist design approaches recommend the use of techniques that help to blur the boundaries between facilities or areas with different functions. The extensive use of glass partitions has been very helpful in achieving this effect as well as the use of wooden partitions that consist of slats or the use of different kinds of floor coverings (e.g., a wooden parquet floor transitioning into a carpeted area). Blurring the boundaries of different areas in this way helps to make a space appear bigger than it actually is while also maintaining some degree of separation.



← The wooden partition shown to the left uses open slats to break up the space in a library while at the same time blurring the boundaries between the entrance area on one side and the reading area on the other. This is one example of a Minimalist technique that causes areas with different functions to blend into one another while maintaining the spatial integrity of each.

Principle 3: Projecting the Natural Environment into Building Spaces: Human beings function more effectively in natural settings. Being with nature usually relaxes people. Unfortunately, many educational facilities throughout the world often present children and youth with learning environments that could almost be described as ‘industrial.’ Minimalist techniques urge designers to find opportunities to allow for the projection of plants, trees, and green spaces into a school setting. This may be achieved in many ways such as separating inside and outside areas with glass partitions, using 3-D wall paper with natural scenes, integrating external landscaping with a building’s design, or placing gardens within the open areas of a building.

When we talk about *Minimalist Design* in Cambodian schools, what we are seeking is 'simplicity'. Sometimes we describe Minimalism as the philosophy that 'less is more.' In some cases, this philosophy of simplicity in design conflicts with cultural norms that prefer a 'cacophony' of colors and pictures when decorating classrooms. But from a pedagogical point of view, we know that the human eye has optimal perception when the number of objects that it views is 7 or less.² Thus, 'perceptual overload' is something that educational settings should try to avoid; this in turn suggests that Minimalist Educational Design is not only aesthetically attractive but also pedagogically sound.



↙ **The Opposite of Minimalism:** The classroom decorations shown in this picture violate a desire in Minimalist Design to achieve simplicity in the presentation of educational images. The cacophony of imagery shown contributes to perceptual overload among children and defeats the purpose of effective classroom decoration.

↙ This is an example of a Minimalist Design Classroom from overseas. This classroom uses a simple color design of black and white and wall decorations that do not overload the perception of the child.

² Goldsmith, E., (1984). The Analysis of Illustration in Theory & Practice. In Houghton, A. and Willows, D.M. (eds.), *The Psychology of Illustration*, Vol 2. New York: Springer-Verlag.

In Minimalist Design, Less is More. . . .

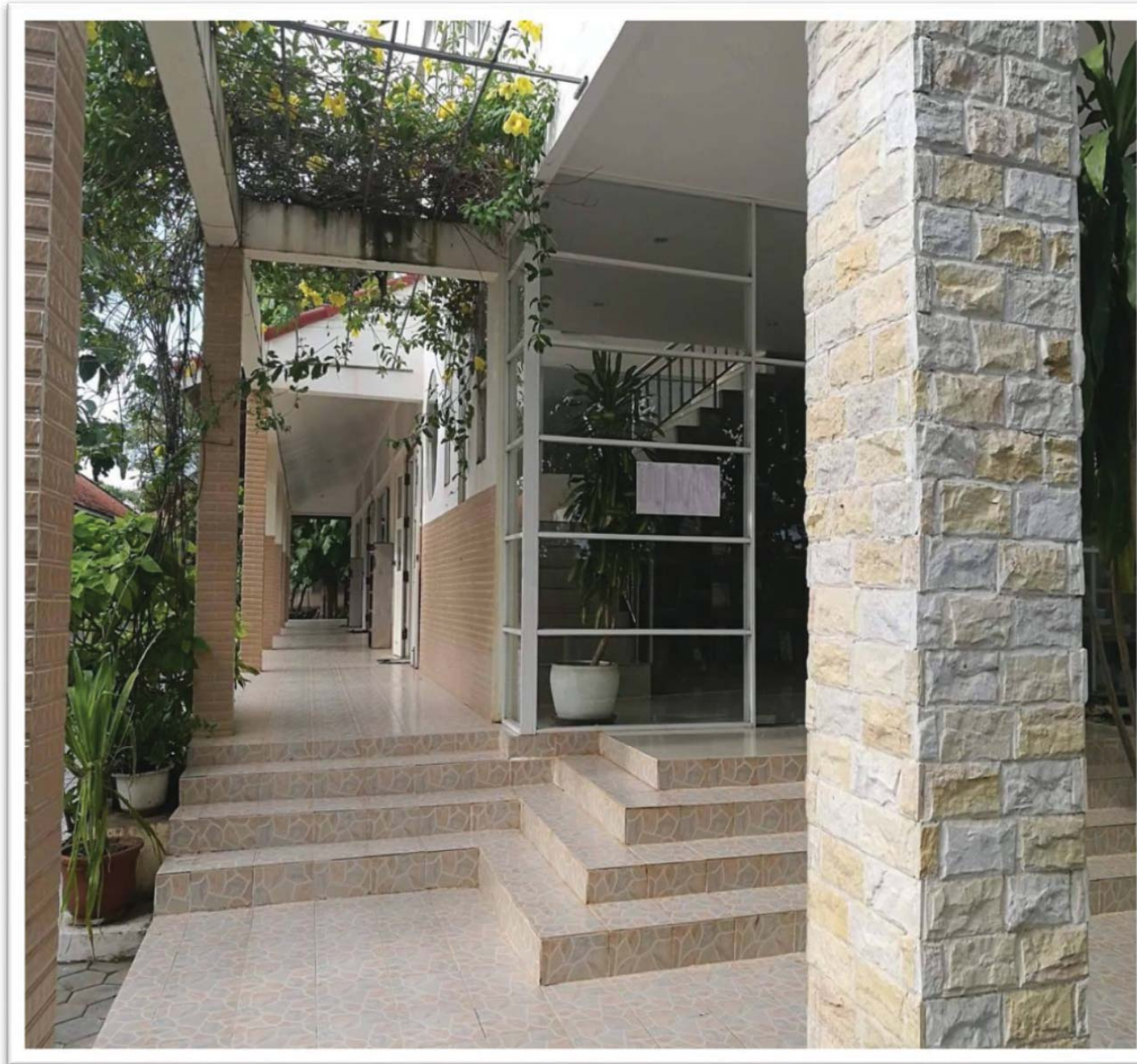


A philosophy of cleanliness and simplicity lies at the heart of all Minimalist Design, along with the mantra that "simple is best." Modern styles in educational design still place high value on clutter-free spaces with sparingly (yet thoughtfully) chosen decor that enhances without overwhelming.

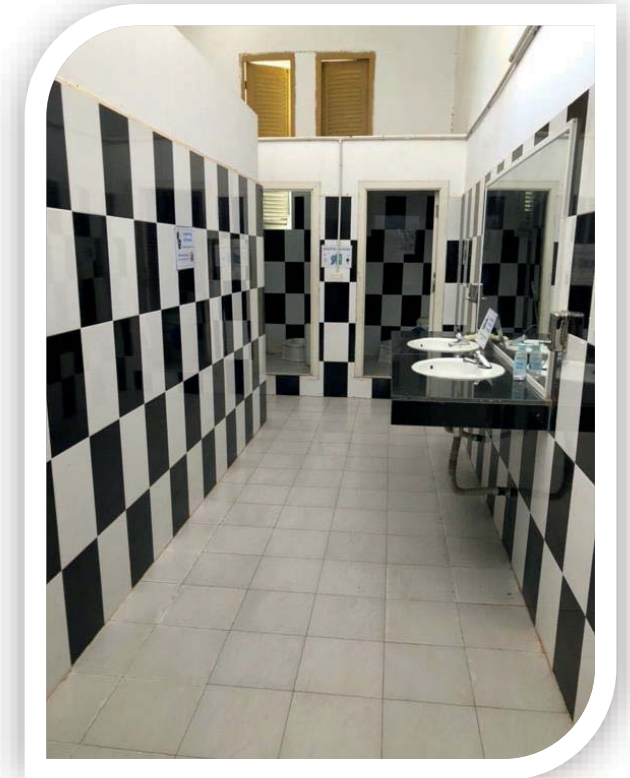
The pictures shown illustrate how Minimalist Classroom Designs have been replicated in a Cambodian school in Kapong Speu Province. The classroom presents a clutter-free environment with a monochromatic use of the color blue. ➤



Other Design Principle Applications



← **Visible Harmony:** The exterior perimeter of a new school structure in Kampong Cham Province exemplifies several aspects of Minimalist Design. The tiling used in the design of the building is a monochromatic use of a beige earth color, which harmonizes with the natural environment of the school. The tiling used on the floors, columns, and walls are slightly different shades of the same color and combine together to give the school's exterior one of visible harmony. At the same time, a trellis over the top of the arcade helps to project a natural environment into the building's interior, which is highly visible due to the extensive use of glass in the outer wall of the building's lobby. This combination of harmonious color, glass panels, and accommodation of natural greenery epitomizes a Minimalist style.



↑ **Monochromatic Use of Colors:** The use of simple color schemes can be used to great effect in the most basic of facilities such as this faculty bathroom at Preah Sisovath HS.

Blending the Boundaries of Space: The use of glass panels at this New Generation School located in an old French educational facility helps blur the boundaries between a school office, a stairwell leading up to a meeting room loft, and a waiting area outside of the office. The functional integrity of each space is preserved while the illusion of copious space is enhanced. →



↑ **Proper Building Placement:** The school in Kampong Cham shown above has configured two buildings to form an 'L' shape that enables intensive integration of a green area with educational facilities all around including a glass paneled library (in the corner) and an open-air cafeteria space (on the right). This spatial placement of buildings helps achieve a Minimalist principle to project 'natural settings' into surrounding school structures.





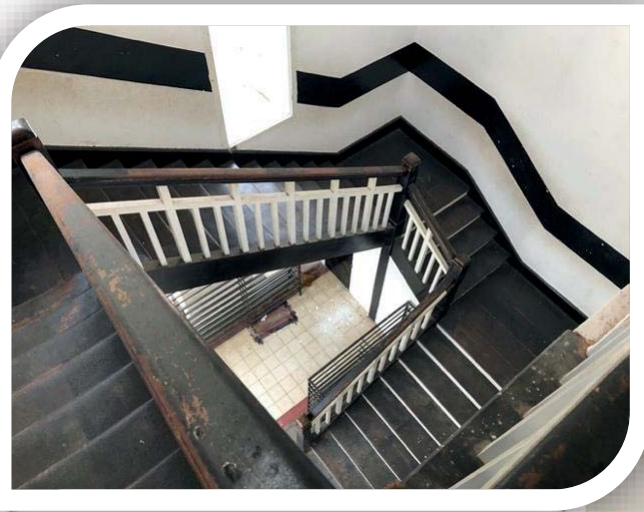
↑ **Creating a Naturalistic Setting:** The library above uses a 3-D mural to create an autumn forest scene within the library at Peam Chikong HS in Kampong Cham Province. The color of the mural scene harmonizes perfectly with the monochromatic use of orange on the walls and furniture of the library to create a very naturalistic setting within the school library.



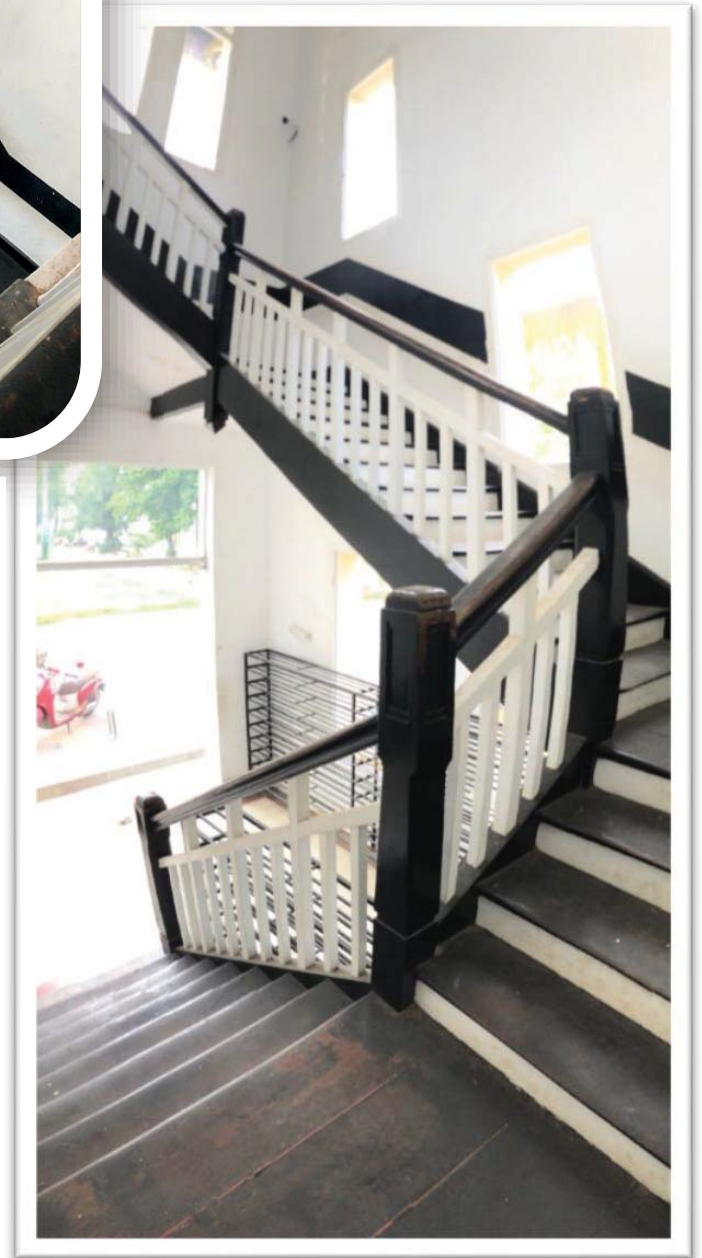
↙ Color Coded Classrooms:

A red color-coded classroom in this New Generation School at Preah Sisovath HS means that the subject taught is Khmer. At this school, designers have sought to use the idea of color-coded classrooms to push against the monotony that often occurs when all classrooms are completely standardized both in terms of their furniture configuration and coloring. Once again, a very aesthetic effect is achieved by a monochromatic use of the color red against a neutral white background.

Bright harmonious colors can drastically change the learning environment . . .



Monochromatic Stairs: Stairwells are often dreary facilities in most Cambodian schools (see bottom left inset). Gritty walls, dreary use of yellow color, and poorly lit corridors are common features of stairwells in most public schools. One New Generation School introduced a monochromatic use of black and white to brighten up its stairwells. At the same time, wide black strips along the side help to cover up hand marks as students ascend and descend. In addition, rectangular windows placed in the stairwells admit sunlight and heighten the contrast of colors.





↙ **Interior Gardens:**
Combined with the use of glass panels, interior gardens in a school setting can greatly increase the aesthetic value of a learning environment. This newly constructed school facility introduced many innovations including the use of an upstairs garden that provides a point of access to three classrooms (back and right side) where students can go to do group work and other project activities. Such gardens help to bring naturalistic settings into a building's internal environment.





↳ **Creating Garden Spaces for Study:** *Creating natural spaces near libraries and classroom areas is an ideal way to expand the learning experience for students. Garden areas help to provide more space for students to study, especially when classrooms are crowded. The placement of the lawns are ideal at this school because they are located right in front of the library as well as very close to surrounding classroom buildings.*



Helping schools to make 'Green Time' a part of the learning experience. . .

✦ **Expanding the Creative Use of Windows:**

Classroom buildings in Cambodian schools frequently include the use of a 'blind' wall. This is usually the wall at the end of a building, which is windowless (see top inset). Although blind walls do provide a space for teachers to place teaching aids, they frequently darken the classroom and create a closed in feeling. The placement of teaching aids is better addressed in an alternative way, such as through the placement of bulletin boards, custom-made to fit between wall windows.

Some New Generation Schools have experimented with replacing blind walls with windows of various shapes and sizes such as in the picture shown. In the building to the left, the school took part of a neighboring classroom and inserted a new educational space at the end of the building to house a Student Council Meeting Room (downstairs) and a Student Clinic (upstairs). This required the creation of an upper loft to house both facilities. In order to give these new facilities a unique look, designers used round as well as rectangular windows to admit much light as well as local scenery.



A primary school replaces a blind wall in its library with a 'window on nature' as a backdrop to children reading. →

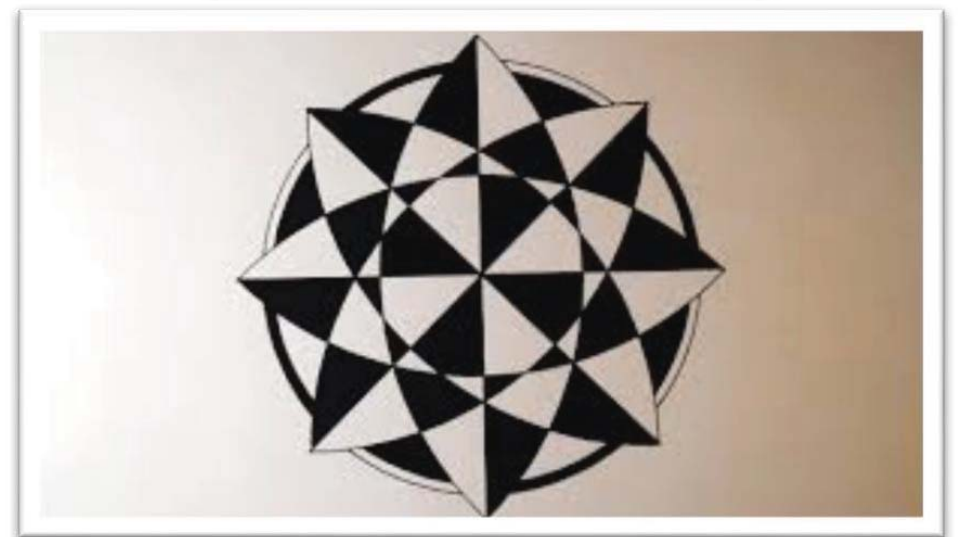


➤ **Using Geometric Wall Art:** One of the easiest ways to give school facilities an attractive and modern look is to use geometric wall art. This technique is highly inexpensive and could even be organized as a student project in geometry. In its simplest form, geometric wall art is the basic use of geometric shapes and colors to create a unified art form. The New Generation School auditorium shown below used this simple technique to decorate walls without the need for expensive procurement of wall paintings.



Geometric wall art is an inexpensive technique that can give school facilities a very modern appearance . . .

Some simple examples of Geometric Wall Art...



3. SUGGESTED DESIGNS FOR SPECIFIC FACILITIES

3.1 The Facilities in a New Generation School

New Generation Schools possess a wide array of educational facilities to ensure a high-quality learning experience for students and optimum working conditions for teachers and administrators. Because New Generation Schools do not permit teachers to engage in teaching private classes, there is a high rate of utilization of these facilities by both teachers and students. These conditions of development ensure good justification for the high investment in such a wide array of facilities. In general, a New Generation School includes all of the facilities that are summarized in Box 3.1 at the right.



BOX 3.1: Educational Facilities Included in a New Generation School

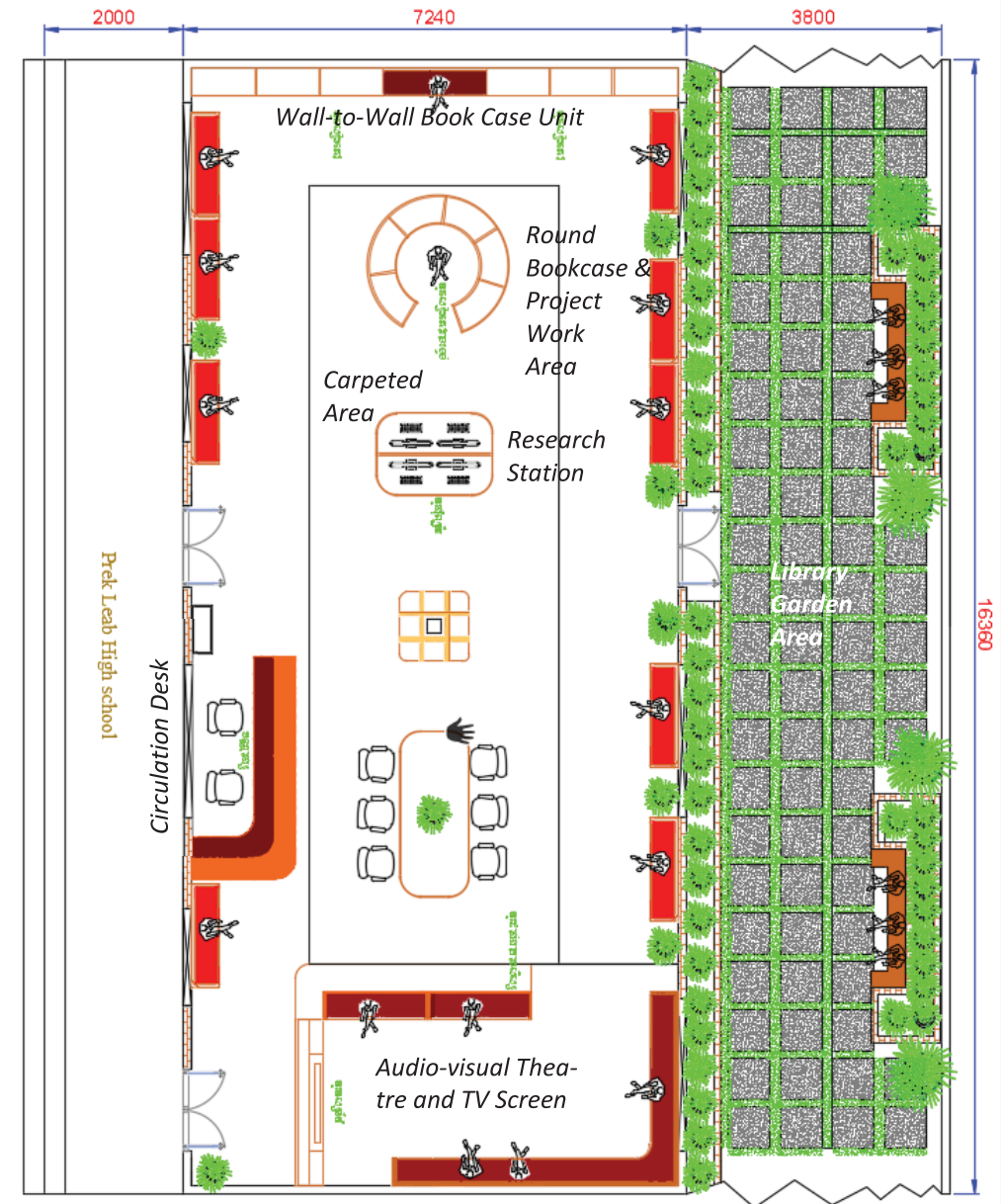
- **21st Century Library:** This is a facility of central importance and should be able to accommodate at least 70 to 80 students at one time.
- **Science Labs:** One science lab is provided for every 4 classes so that there are usually multiple science labs in a school. Science labs are generally specific to the subjects for which they are intended (e.g., Chemistry, Biology, Physics, etc.).
- **ICT Labs:** One ICT Lab is provided for every 9 classes in a school.
- **Non-science Classrooms:** These are attractive learning spaces that are often color-coded.
- **Auditorium:** These are facilities that can accommodate at least 80 students or more.
- **Teacher Faculty Room:** These are rooms for teachers to work on lesson plans or meet with students between classes and provide kitchen and bathroom facilities
- **School Director's Office cum Meeting Room:** The school director's office provides a professional work setting that is usually close to the Faculty Room and includes provisions for small meetings.
- **Student Clinic:** Each New Generation School has a clinic staffed by a licensed nurse and comes complete with beds, medical equipment, and some basic medications like aspirin and first aid.
- **Student Council Meeting Room:** Each New Generation School has a Student's Council to help manage the school and provide a communication bridge between management. The Student Council Meeting Room provides a place for the council to meet and plan special events.

← The sample school layout plan to the left illustrates the organization of a New Generation School and indicates all required facilities and their location relative to one another.

3.2 Twenty-first Century Libraries

The 21st Century Library is often considered the ‘heart’ of the New Generation School. Its design provides specialized areas for private reading, audio-visual presentations, and research on two to four computer stations, depending on the size of the school. A circulation desk is positioned in a way to give a wide view of the library to ensure easy monitoring, order, and continuous oversight. The central area of the room is usually carpeted to enable students to sit comfortably on the floor to enhance the idea of ‘maker’ spaces while a runner of parquet flooring around the perimeter helps to limit ambulatory activity to a prescribed area and prevent wear and tear on the carpet.

Re-designed libraries are generally equipped with enough built-in cabinets to house over 10,000 books. Custom-made furniture designs provide research stations, an audio-visual theatre, a circulation desk, and small niches for individualized self-study. Custom-made furniture allows the configuration of the library to follow the contours of the existing building; for example, supporting pillars in the middle of the room can be used to accommodate specialized seating while wall-to-wall cabinet emplacements allow optimum utilization of wall space to store books. Color tones can vary in a 21st Century Library. Sometimes, wood tones are used to give a uniform and warm ambience for readers while other schools have employed more colorful use of color schemes (e.g., red) against a white background. Where possible, library planners also try to include a *Library Garden* at the back of a library as a means to expand the library’s physical capacity to accommodate students. This space is usually secure and only accessible through the library itself.



↑ A sample floor plan for a 21st Century Library in a New Generation School.



↑ A multi-functional book case at Preah Sisovath HS above includes individualized seating for students within a wall-to-wall book storage unit.

A Research Station in the library at Prek Leap HS makes very economical use of space and can accommodate four student researchers in a very small area. →

Innovative Furniture Designs: 21st Century Library facilities generally make use of innovative furniture designs that are economical in their use of space, frequently multi-functional in character, and follow the contours of the room in which they are placed. Such furniture exhibits a common aesthetic design and is harmonious in its use of color.



The Round Book Case Unit shown in this library is highly functional in its ability to house books. In this respect, it can hold up to 5,000 volumes because the shelves are wide enough to hold one row of books on the outside and another row of books on the inside (see inset). In addition, the inside of the book case provides a nice study niche for students to read individually or even meet in a small group. The color tone of the unit blends in with a brown carpeted floor. These book case units provide a commanding center of gravity within the library. →

A small audio-visual theatre consists of a custom-made cabinet unit that can house a 65" TV Screen as well as seating for about 30 students around the perimeter of the viewing area. The other side of the cabinet houses a large bulletin board at the entrance to the library, providing once again a multi-functional feature in the design of library furniture. ↓



Libraries for Promoting Children's Exploration

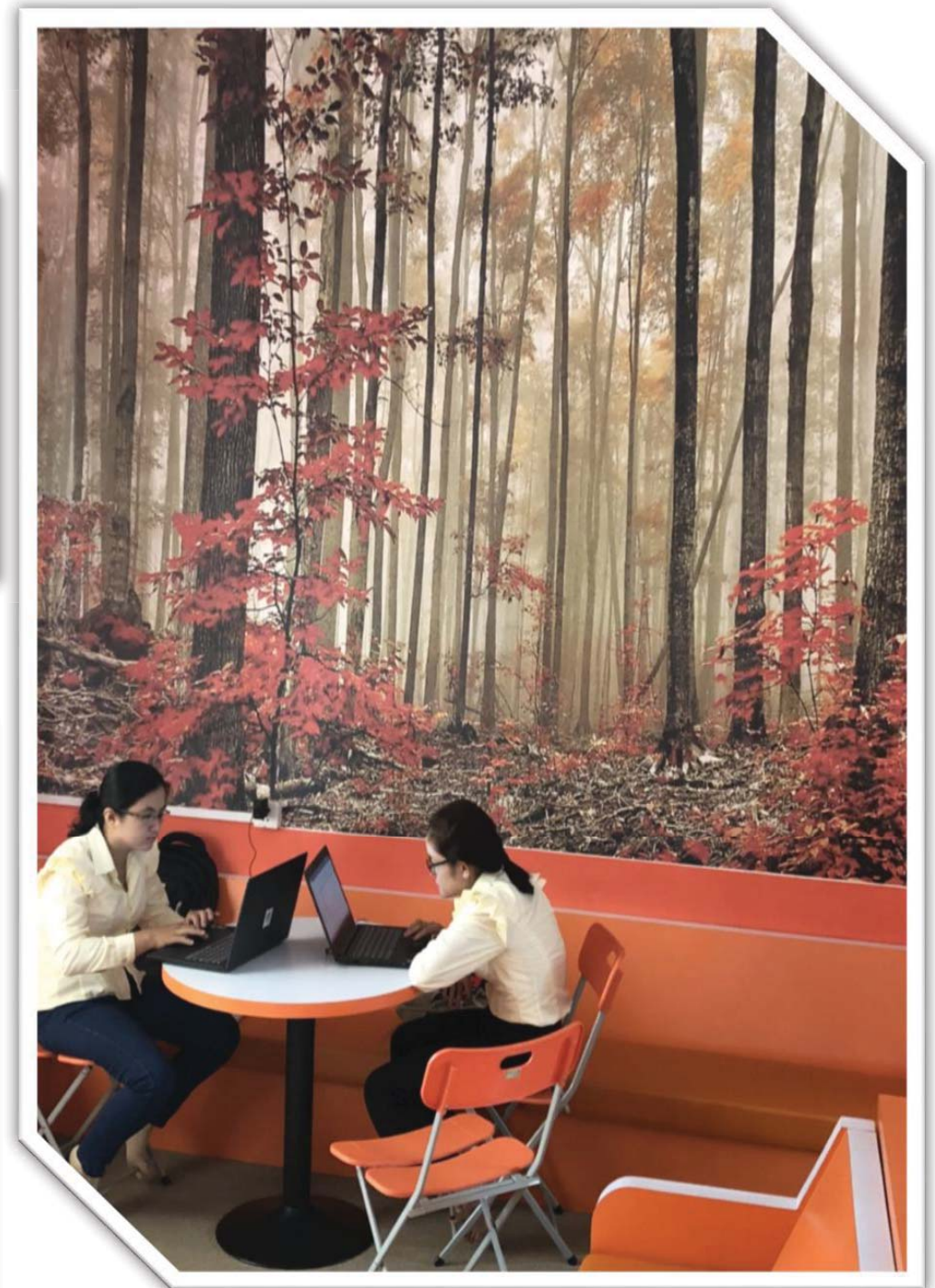
This children's library in a New Generation School has been designed to encourage children's exploration, individualized reading, and storytelling. The reading stairs at the center of this library allow children to read on their own or sit as a large group to listen to a teacher read a story. The stair reading unit also provides storage underneath, as well as shelving to hold books on each side. Adjoining book units provide additional space for books while a bulletin board provides a place for special announcements or children's exhibitions.



Color Themed Library Designs

New Generation Schools have also experimented with color themed libraries in orange, red, and wood tone. Such libraries have used color coordinated murals to create naturalistic settings to great effect.

An orange-themed library in Peam Chikong HS has become a vibrant center of learning within the local community. ➔



Library Placement: The placement of the library in a school is a very important consideration. When possible, the library should always occupy a place of centrality in the school to facilitate an activist role for the librarian. When the library is surrounded by classrooms, ICT Labs, and Science Labs, it is much easier for the librarian(s) to coordinate activities in the school and support new pedagogies such as project work, constructivism, etc.



↑ The picture above shows a two-story library connector of modern design connecting two academic buildings.

↖ The school plan to the left shows how the construction of a new academic building at a New Generation School was placed near an existing classroom building with the decision to create a library connector between the two buildings. The library connector includes a study loft for students and leads directly to the adjoining academic building with its ICT and science labs. This decision to create a library of such physical prominence achieved the purpose of amplifying the centrality of the library in the school, which facilitates research activities that occur in the ICT, science labs, and nearby classrooms.

Library Gardens: The emplacement of a library garden serves two purposes. Most importantly, it can greatly expand the sitting space in libraries where the demand for library services exceeds the supply. Secondly, library gardens can also help to address the problem of 'dead space' created by buildings of traditional design in which the back of a building forms a useless space between the building itself and a school fence. Library gardens can transform this dead space into a natural and attractive place in the school for children to read and have discussions.



☛ A Library Garden can extend the space available in a library by creating a natural reading area connected to the main library. Library Gardens can also solve the problem of 'dead space' that is created by the emplacement of a traditional building in close proximity to the school fence, as in the picture above.



↑ The 21st Century Library layout above has been configured to fit a regular 7 x 8 meter classroom. The design includes a small theatre, round book case unit, a wall-to-wall book storage unit and copious seating for students.



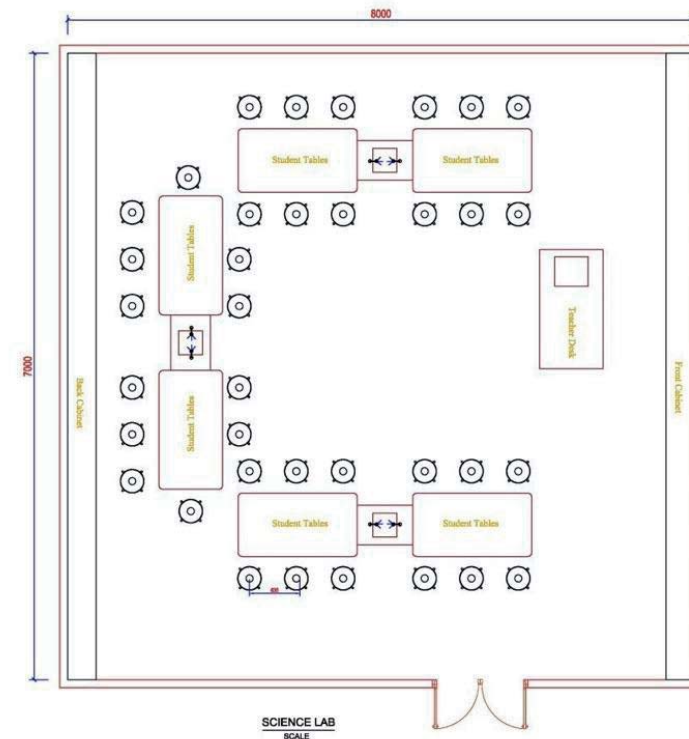
↑ The idealized furniture layout for a large 21st Century Library (see page 20 for floorplan) is illustrated above. This library occupies the space of two classrooms. Notice the use of a 'minimalist' design that employs a monochromatic color scheme (wood tone). In addition, different functional areas in the library (e.g., research station, rounded book unit for individualized study, etc.) appear to blend together but with the aesthetic use of a carpeted island in the middle of the room to help form a subtle boundary with the rest of the library. The main view is looking towards the back of the library with a door at the center to enter the Library Garden. The inset picture shows a view looking towards the front of the library with two points of access.

3.3 Science Facility Designs

The Science Labs in a New Generation School have been designed to afford the creation of 6 work stations that can each accommodate six students. This layout accords with Cooperative Learning principles in which the optimal size for a group is 4 to 6 students. Two workstations share a sink between them requiring the emplacement of 3 sinks plus one for the teacher at the head of the classroom. Creating groupings of students in this way very much helps to facilitate hands-on science activities, as part of the effort to enhance STEM instruction. The labs are also equipped with a built-in cabinet at the front of the classroom and one wall-to-wall unit at the back of the classroom.

Island Workstations: The clearly designated work stations described above are covered with a marble top to facilitate experiments that may involve the use of chemicals. Built-in cabinet units at the front of the classroom provide a whiteboard and bulletin boards to display project work while a wall-to-wall cabinet unit at the back can house scientific equipment, supplies, chemicals, and other materials to facilitate hands-on science instruction. The availability of copious cabinet space for educational supplies enables the school to adopt a subject classroom approach so that teachers do not have to carry around their own materials from room to room, as is usually the case in many Cambodian schools. The workstations are configured in a U-shape to facilitate easy monitoring and group presentations. A dark wood tone has been used to ensure appropriate color coordination with workstations that have black marble tops.

The floorplan of a New Generation School Science Lab with 6 work station islands (above); The use of work station islands within the lab helps to promote Cooperative Learning methodologies and helps to demonstrate the interdependence between physical designs and methodology (below). ➔





↑ The picture above is an illustration of a modern science lab design that uses a monochromatic color scheme and design configuration that facilitates 21st Century skills such as team work, experimentation, and presentation. The shared use of sinks in each group also enables an economical use of resources, yielding 6 workstations but only 3 sinks. The free space in the middle of the lab enables the teacher to move around the classroom freely, playing the role of facilitator rather than controller. This classroom design demonstrates well the interdependence of pedagogical methods and the physical layout of a lab.

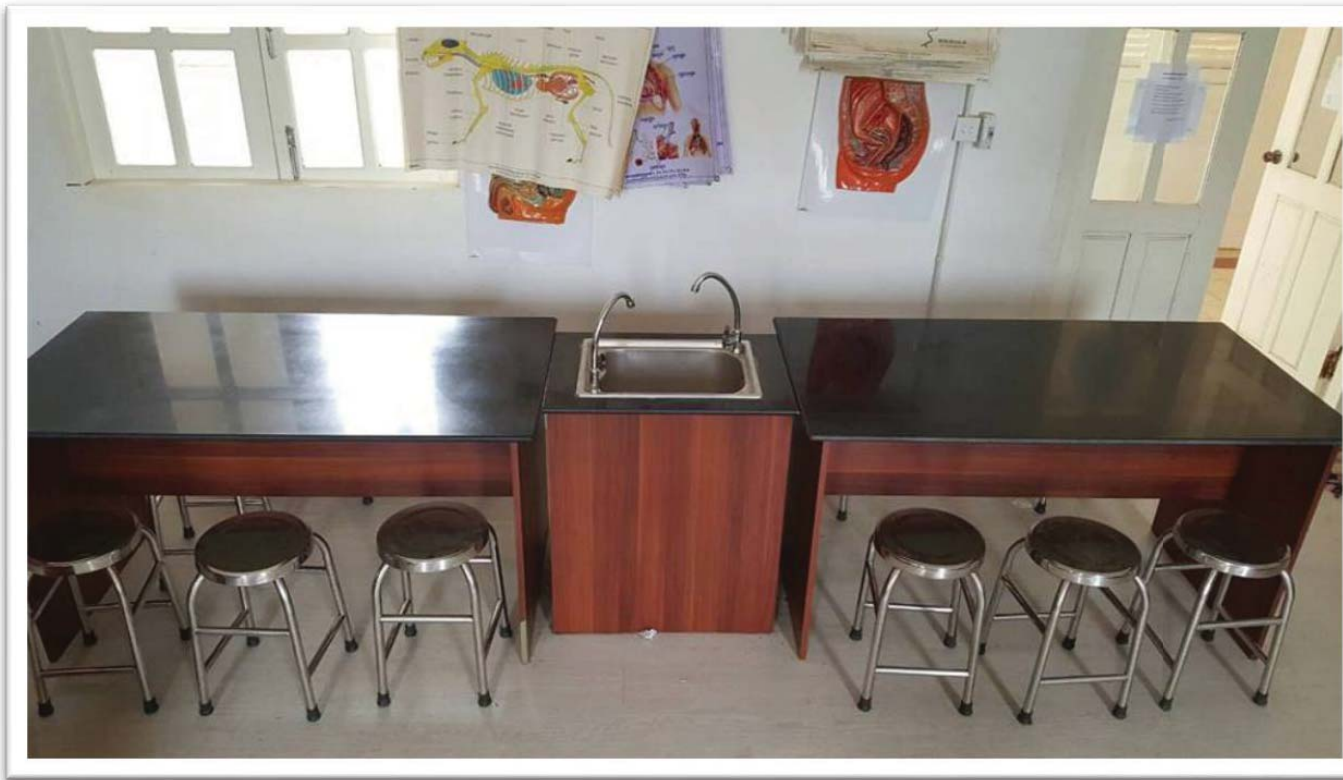
Furniture Configurations that Promote Hands on

Science: The operationalized examples of science learning shown here demonstrate the potential that can be achieved when re-designing classrooms in existing schools that formerly employed a traditional educational configuration. The employ of ‘island work stations’ combined with an aesthetic use of colors and the careful design of functional cabinets (e.g., bulletin boards, storage, etc.) can drive the learning methods that Cambodia’s schools desperately need to prepare its youth for the new century.



Multi-functional cabinets that include bulletin boards facilitate the display of student work while a wall-to-wall cabinet unit in the back of each lab can store huge amounts of science supplies to support hands-on science. ↗





Island Work Station

Description

Sits two groups of 6 students on either side of a sink with two faucets that can be used in common. The sink stand also includes a cabinet at its back that can be used for storage. This work station is designed for use with short stools made of chrome or wood.

Materials

- Work stations are made of heavy pressed wood frames and with Mahogany color formica veneer.
- Work station tops are made of black marble with high gloss to resist any chemical spills
- Sink is made of high-quality stainless steel.
- Stools are made of high gloss chrome with hard rubber leg caps.

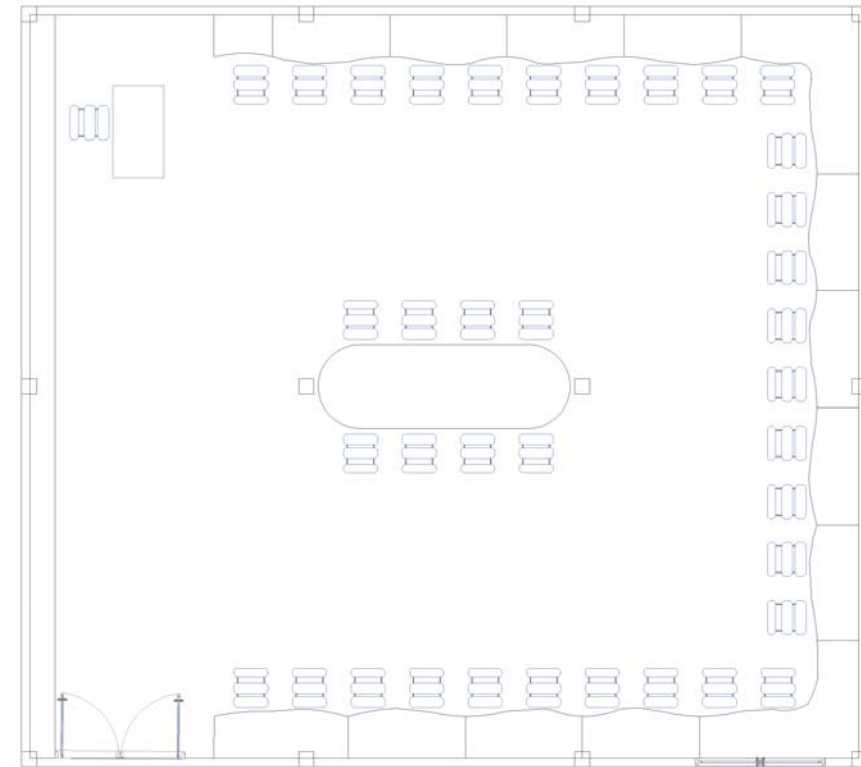
3.4 ICT Lab Designs

ICT Labs in many Cambodian schools generally mimic the layout of the traditional classroom with computer workstations arranged in crowded rows. This traditional design makes it difficult to network computers and limits teacher movement around the classroom. The ICT Lab design in a New Generation School setting tries to engineer a better use of internal space so that the teacher can move freely around the lab and review tasks that students are working on. Students for their part are expected to spin around on their chairs to face the front of the classroom during teacher explanations and then move back to their screens to work on assigned tasks.

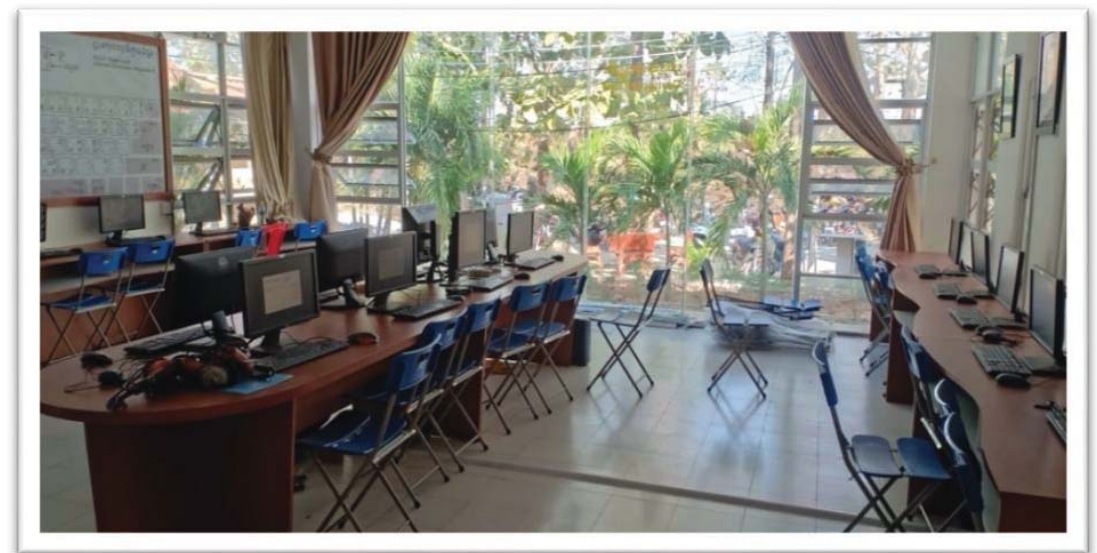
The networking of computer workstations is an important design feature in a New Generation School so that the labs can more easily utilize 'thin client' technology, which helps to reduce energy usage by a margin of over 80%. This technology also makes the labs more sustainable by reducing the need for maintenance and the vulnerability to infection by viruses. Thus, the physical design of the labs makes careful consideration of the most eco-friendly technology that should be used within them.

The ICT Lab in a New Generation School can accommodate 37 workstations and a teacher desk at the front of the room. Eight workstations are accommodated by a 'table island' in the middle of the room that requires electrical wiring under the floor. A wall-to-wall cabinet is also installed at the front of the classroom with bulletin boards, a white board, and a screen that can accommodate LCD presentations.

An ICT Lab at a school in Kampong Cham makes extensive use of glass panels to achieve a naturalistic setting for computer study. →



ICT LAB, 37students





↑ An idealized layout for an ICT lab in a New Generation School setting emphasizes the importance of an open area in the middle of the classroom to facilitate teacher monitoring, workstation configurations that facilitate easy networking, and a monochromatic color scheme.



The ICT Lab configuration used in New Generation School settings makes very effective use of space, which enables the lab to accommodate over 35 workstations. Pedagogically, this configuration promotes easy teacher movement around the classroom to support students while students themselves can concentrate more easily on assigned tasks without distraction when they are facing the wall. ↗





Given the centrality of technology in New Generation Schools, the ICT Lab is a facility of great importance. The labs are designed to be highly functional but also attractive as places of study for all students. This includes the use of Minimalist designs such as glass panels, attractive fluted furniture to lend some uniqueness to the ambience, and monochromatic color schemes. The lab at the school above also uses glass panels to project the gardens outside into the learning environment as well as forested wall murals that accent wood tone furniture. ➤

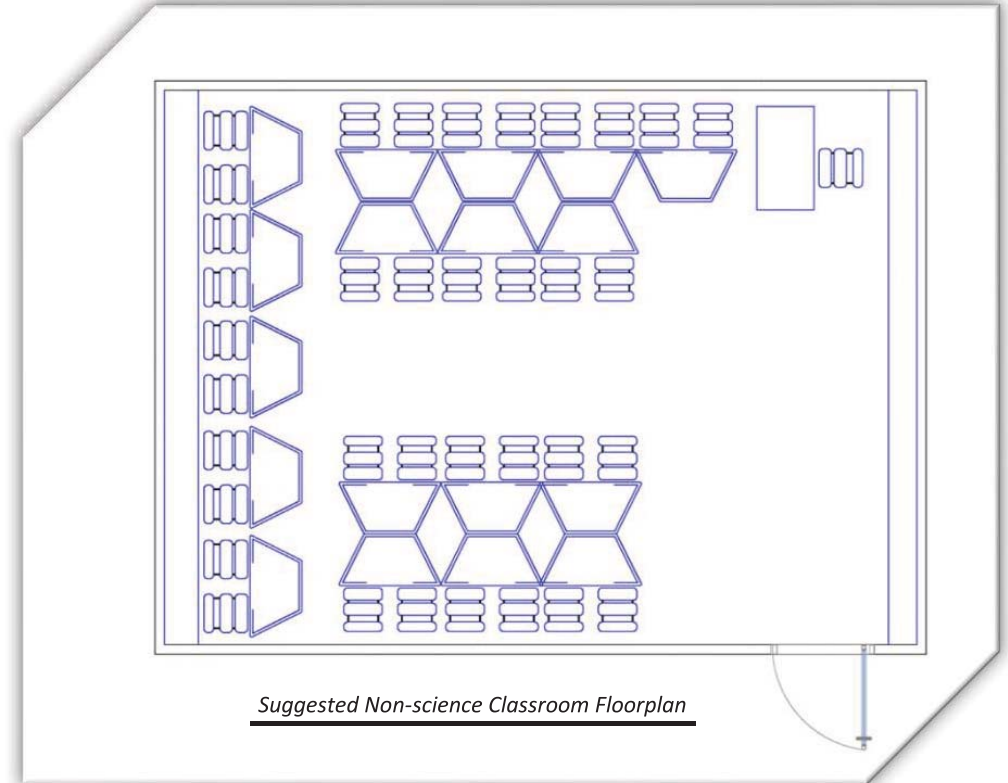
3.5 Non-science Classroom Designs

Classrooms used for the instruction of Mathematics, Khmer Language, English, History-Geography, and Morals are furnished with 18 desks with specialized shapes that can each seat two students. This enables up to 36 students per classroom, which is the maximum number of students suggested for a New Generation School; fewer students are recommended when possible.

Classroom designers have introduced alternative student desk shapes to New Generation School classrooms, which is intended to allow many different student grouping configurations. For example, desks may be trapezoid-shaped or semi-circular so that they can be placed together to form a round table. Once again, a U-shaped configuration of desks is often suggested to free up space in the middle of the classroom to facilitate easy movement of the teacher around the classroom as well as student presentations and group activities. Wall-to-Wall cabinets are provided at the front (bulletin boards and white board) and back (for storage of educational supplies) of the classroom, as is also the case for science labs.



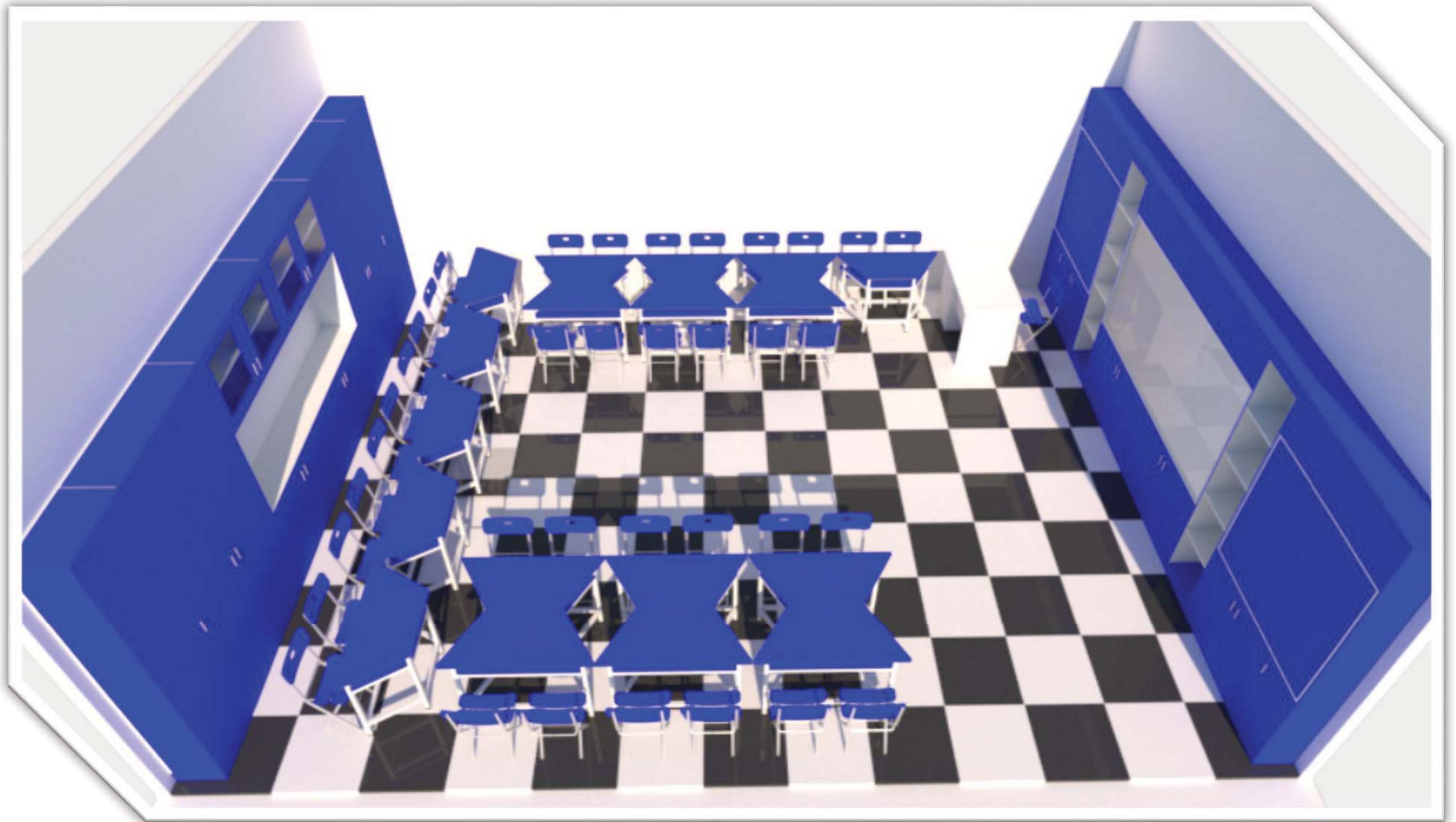
New Generation School classrooms may be color coded by subject (e.g., blue for social science, red for Khmer, etc.) as suggested earlier; alternatively, they may also use the



same wood tone as was suggested in the science labs.

Examples of non-science classroom layouts can be seen in both primary and secondary school settings. Built-in cabinets are multi-functional and provide storage, bulletin boards, and a whiteboard that may also double as an LCD screen while new desk shapes allow multiple arrangements of students to promote more student-centered learning. ➤





↑ The non-science classroom layout shown above demonstrates how some simple changes in classroom design can achieve major improvements in the learning environment. The new shape of student desks increases the number of possible variations in student groupings while the space created in the middle of the classroom enhances the ability of the teacher to move about between student groups. Bulletin boards at the front of the classroom provide a ready-made space for student exhibitions while the cabinets at the back provide copious storage for all the teaching aids a teacher might need. Finally, the monochromatic color scheme brings harmony to the classroom and adds to the aesthetic appeal of the learning environment.

School Architecture for a New Century

The transition from traditional classroom configurations to new ones has not always been easy and there has been much resistance from more conservative educators along the way. Nevertheless, the high potential of the new designs to promote more child-centered learning along with a renewed focus of aesthetically attractive learning environments has started to create a constituency of support among many teachers.



↳ *Convincing teachers to transition from the long wooden desks that are still commonly used in many Cambodian schools (see inset) has been challenging. Nevertheless, the ability of the new designs to promote project work, student presentations, group work, and games has been a compelling reason to move to these new classroom configurations and designs.*



The use of light-weight materials in making student desks for NGS classroom designs makes it very easy to move furniture around into different learning configurations that facilitate cooperative learning activities. ↗



3.6 Meeting Facility Designs

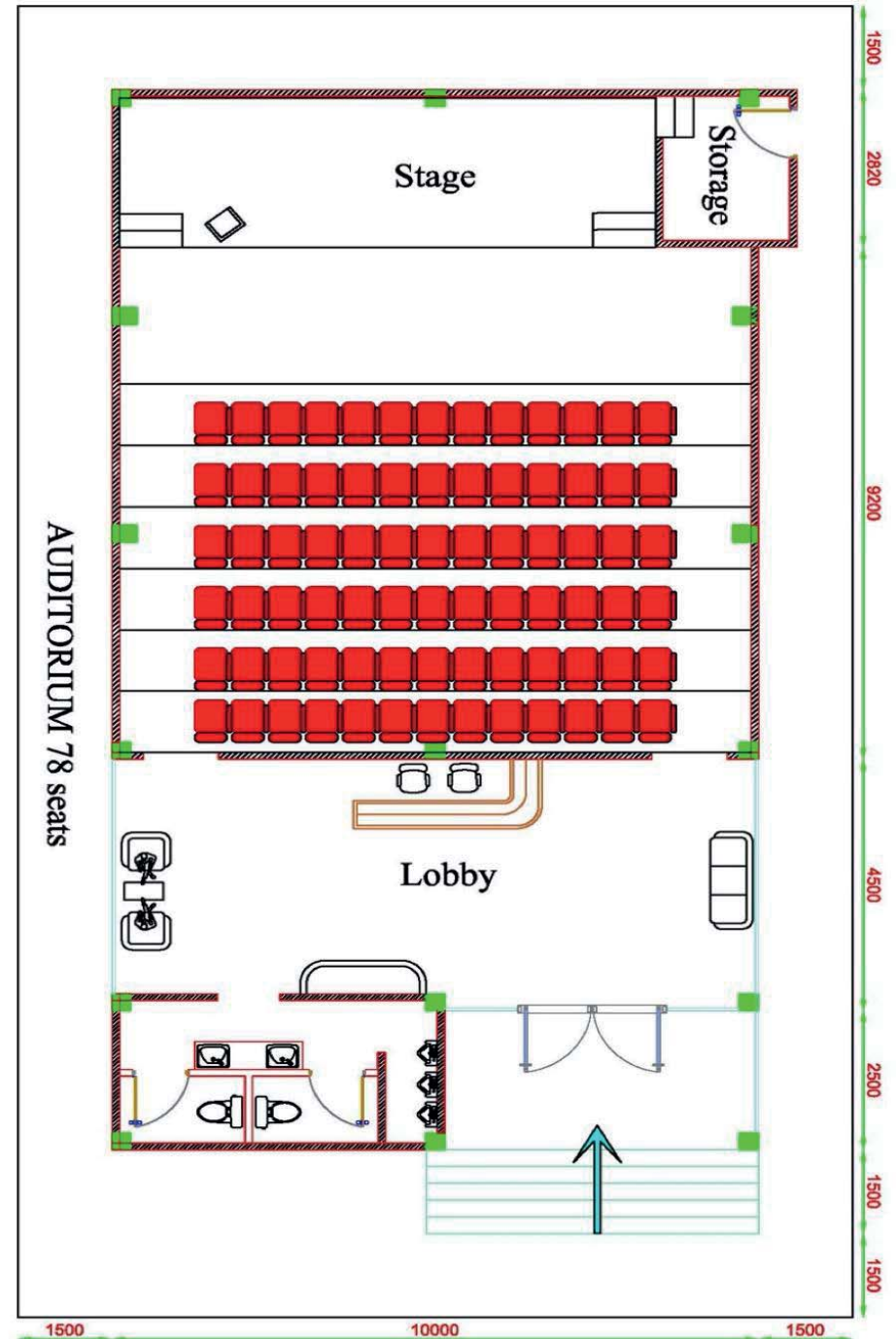
Most Cambodian schools do not have facilities dedicated specifically to the provision of suitable meeting spaces for the purpose of consultations with students, parents, and community members. In most cases, a classroom or the library is used to double as a meeting space for local stakeholders. Seating usually consists of heavy wooden desks normally used by students. Because of the importance of frequent communication among stakeholders in a New Generation School setting, considerable investment is made in providing suitable facilities for proper meeting facilities. Investments focus on achieving each of the requirements outlined in Box 3.2.

BOX 3.2: Requirements for an NGS Auditorium

- Raised Stage
- Seating for at least 75 persons or more
- Built-in Sound System
- Fully wired
- Built-in LCD Projector
- Climate Controlled
- Lobby Area to Receive Guests
- Off-stage Preparation Area for Performers and/or Storage
- Bathroom Facilities

When a New Generation School has existing facilities that can be upgraded into an auditorium, this is the preferred investment strategy. In some cases, however when no facilities are available, it is necessary to build a free-standing building, requiring considerable investment. Nevertheless, even a free-standing building can usually be built and furnished for less than \$65,000.

Floor plan for a modern school auditorium at Hun Sen Kampong Cham HS. ➔





Auditorium designs in New Generation School settings follow the same architectural principles used in other facilities. In general, very modern design styles are used with extensive use of glass, monochromatic color schemes, and natural settings.

Designers have also experimented with the use of geometric wall decorations as a very cost-effective means to create a modern but aesthetically appealing interior. In the case of new structures, such as the facility shown on this page, designers have introduced the use of *alucobond* roofing, which is an aluminium composite material that is long lasting and relatively inexpensive.

➤ A new auditorium structure above in Kampong Cham Province uses modern materials to give a very distinctive appearance that advertises the school as a place of 21st Century learning.



School Architecture for a New Century

The interior of this medium sized auditorium provides a very comfortable setting for meetings and discussions. The extensive use of glass panels on the sides of the building once again projects the presence of surrounding trees and the green lawns on either side. The building interior is carefully color coordinated using red as the dominant color scheme. A creative use of geometric wall art amplifies the coordination of colors and gives the room a very modern look. The use of geometric art in this way is extremely inexpensive and enables considerable savings. ➔



In cases where existing facilities are available in a school, investments to create auditorium facilities take the path of extensive re-design to achieve the modern ambience described earlier. Often, this re-design process can be very challenging, especially in the case of poorly configured, aging, and dilapidated settings. Nevertheless, it is remarkable what can be achieved even within budgets of \$15,000 or less.

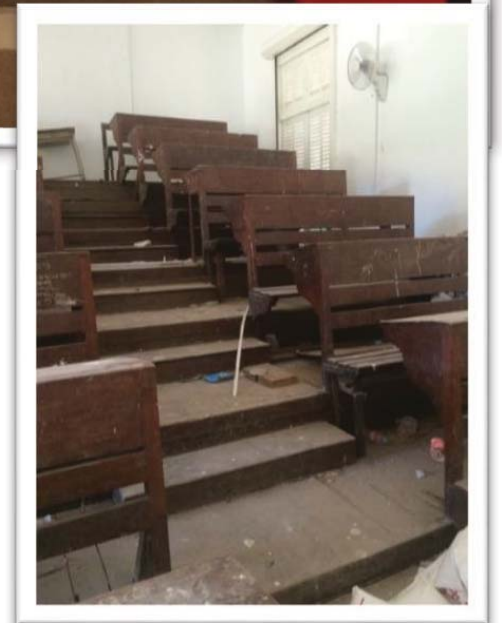


➤ The stunning use of red color both inside and outside of the new auditorium facility at Hun Sen Kampong Cham HS makes the meeting hall one of the most striking buildings on the school's campus. When parents attend meetings at this facility, they are more than a little bit surprised at the outward modernity of the school, which helps to build the credibility of the school among community member as a place of effective learning.

Modernizing Old Meeting Spaces



↑ NGS designers radically transformed a long, elongated meeting facility (see inset) at Prek Anchanh HS in Kandal Province into a very modern consultative setting (see next page and above). Designers changed the front back orientation of the room so that what used to be the sides of the meeting room became the new front and back of the meeting space. This change lessened the depth of seating, which enabled much closer proximity of the audience to the speaker at the front. The designers made additional changes such as creating a stepped stage for new seating up to the windows at the back and replaced the original vinyl ceiling panels with a circular, recessed plaster ceiling and modern lighting, which better highlighted the semi-circular configuration of seating.



The auditorium pictured above was carved out of an old 1950s meeting facility (see inset) left by the French colonial administration at Preah Sisovath HS in Phnom Penh. In spite of intense opposition from conservationists, the old wooden tables were removed and replaced with comfortable, modern seating. The wooden steps were preserved and repaired but covered with a neutral brown carpet that provided a comfortable place for sitting when the capacity of the auditorium was exceeded. Historical art was placed on the back wall to recognize the school's historical roots while maintaining stylistic color coordination with the new modern environment of the auditorium. ↗

↳ NGS planners at Prek Anchan HS in Kandal Province designed a radically new configuration for the school auditorium to provide an attractive meeting place for stakeholders that can be used for multiple purposes. The new facilities use synchronous color schemes and circular architectural themes to symbolize harmony. The front of the auditorium was replaced with glass panels to create a more modern facade and replaced the yellow mortar walls shown in the inset.



3.7 Other Support Facility Designs

As noted in Box 3.1, New Generation Schools include many supporting facilities such as a **Faculty Room, Student Council Room, Student Clinic**, and of course **Offices cum Meeting Rooms** for School Managers. Once again, proper design for each of these facilities can help to increase their functionality while also increasing their aesthetic appeal. At the same time, proper design and planning can avoid a situation where cabinets, tables, and chairs are simply dumped into a room designated with a particular function, leading to a chaotic jumble of different furniture and equipment. This section, therefore, seeks to give some advice and good examples about the layout and design of each of these facilities.

Faculty Rooms: In most Cambodian schools, teachers generally do not have their own space other than the classroom, which they must share with students. Coffee or tea breaks usually occur in the school director's office. For lunch, teachers either must go home or if the traffic prevents this, they must go and eat at a local restaurant or in the private food stalls around the school.

Most modern schools provide teachers with their own space where they can work privately, relax over a cup of coffee, and meet among themselves. Faculty Rooms often include kitchen facilities, comfortable sitting areas that act as a lounge, and a

private bathroom for teachers to use during lunch, breaks, or after hours. For this reason, Faculty Rooms in the New Generation School system are configured with these extra facilities in mind. When a school offers to teachers facilities such as this, it very much provides the necessary conditions for an active Professional Learning Community (PLC) where teachers in the same

subject or grade can support one another professionally by sharing materials and discussing educational issues of common interest. Such communities are an important part of the strategy that 21st Century schools use to promote continuous professional development.



➤ This Faculty Room at Preah Sisovath HS was carved out of an old store room. It provides multiple sitting areas for teachers in a wood tone along with kitchen facilities and a toilet. The use of mirrors in parts of the room helps to blend boundaries and add greater depth to the room while at the same time giving the room a bit of a touch of elegance.

Student Council

Room: New Generation Schools place a strong emphasis on giving students an important role in managing the school. Student Councils are organized in each school with their own elected officers. The council is, therefore, given its own meeting facilities within the school. By giving students their own special meeting facilities, the school demonstrates that students' role is indeed important in the school. The Council Meeting Room is also used by the Guidance Counselor the school to give advice to dents and act as a bridge between the Council and the school's administration.



The Student Council Meeting Room at Hun Sen Kampong Cham HS was built in a classroom building that was split into a downstairs unit with a loft above (see stairs). The level above the Council Meeting Room houses the Student Clinic. Because the school was so short of space, this re-design strategy successfully split a very large classroom into a Meeting Room, a Student Clinic, and the original Classroom, which is located on the other side of the wall cabinet shown above. Because of the low ceiling created by the loft above, designers used white wall paint and floor tiling as well as mirror panels at the far end of the room to amplify the sense of room size. Handsome wooden furniture made from formica provides a nice meeting table and cabinets with a whiteboard and copious amounts of storage space both in the cabinets as well as a small storage space under the stairs. ↗

Student Clinics: Although Student Clinics are not a required facility at New Generation Schools, they are becoming increasingly common. Clinics provide an element of safety for students when they attend school so that they can receive immediate attention if they get sick, have an accident requiring first aid, or encounter other minor health problems. Each clinic is staffed by a registered nurse who both provides medical services to students and faculty while also maintaining health records for all students. Each clinic comes equipped with a waiting area, beds, a nurse's desk, and cabinets to store medical supplies and equipment.



↑ The student clinic in this school at Hun Sen Kampong Cham HS (which is also attached to a New Generation Primary School) provides a waiting area at the top of the stairs leading to the clinic (above left) for children to wait to be seen by the nurse along with beds and a built-in cabinet unit (above right) for storage of supplies. The clinic occupies the loft area of a re-designed building over the Student Council Room. The clinic uses a monochromatic wood tone color scheme with parquet floors and formica cabinets.

School Offices cum Meeting Rooms: New Generation Schools place a strong emphasis on the development of efficiently configured office space where school managers can both work effectively and easily communicate with their staff and community members. Offices in New Generation Schools use glass panels to separate office work areas from meeting spaces but aim for an integrated configuration where the boundaries are somewhat blurred. This achieves the purpose of maximizing the appearance of space in office facilities that are usually quite small while at the same time maintaining some boundaries between them as well.

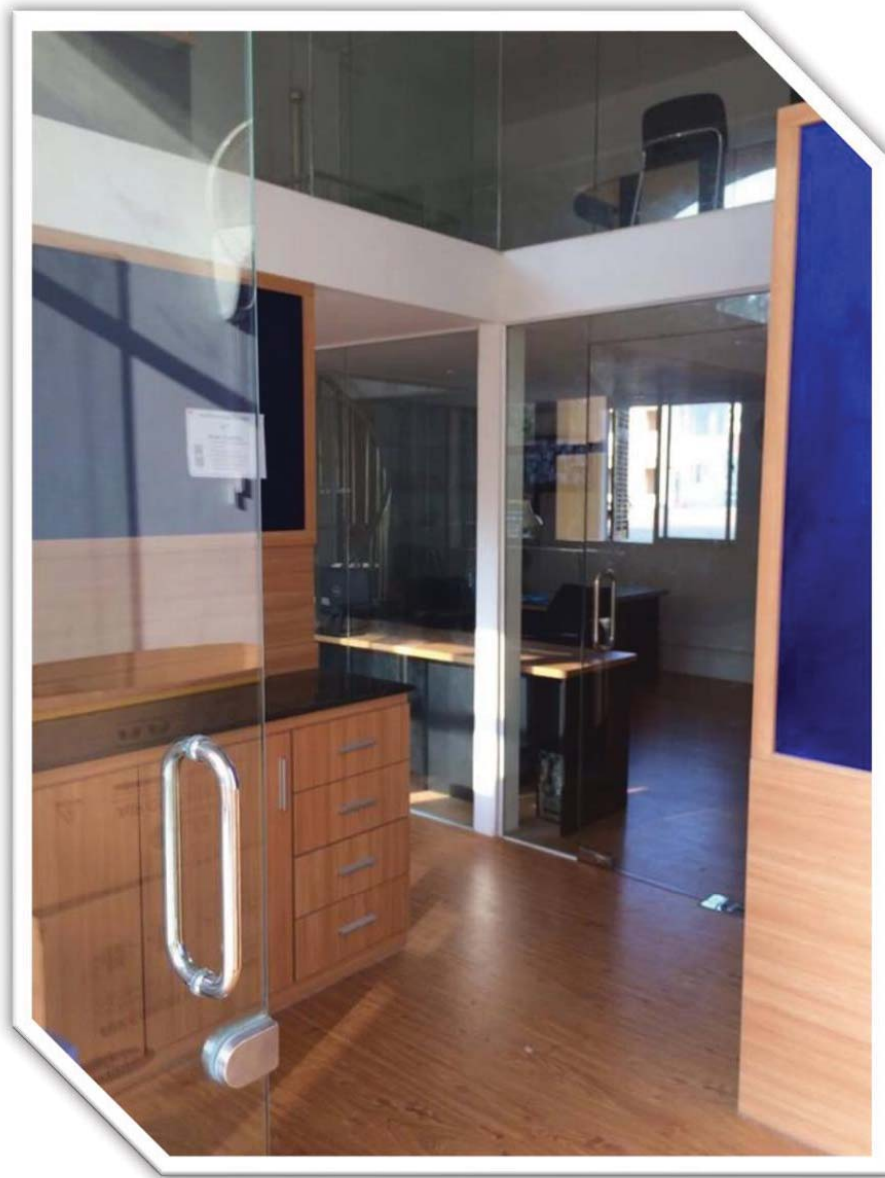


School offices in Cambodia are usually quite dark and use a jumble of different kinds of furniture that are often not very suitable for the kinds of staff meetings and other work that needs to take place (see inset for an example). The office at Akhea Mahasei PS was completely transformed from the inset picture to the setting shown above. Notice the uniform meeting space created from harmonious use of wood tone furniture and parquet flooring. On the far-right hand side, offices for the school director and vice director have been separated from the meeting space by glass panels but are nevertheless in close proximity. ↗

In cases where offices are located on a second floor, the use of glass can both serve to increase the size of the work space as well as help to project some of the natural greenery around the school into the building, as is often done in *Minimalist* design architecture. Most offices in Cambodian schools are very much walled off from the rest of the school so that directors seem very aloof from the what is going on around them. NGS office configurations seek to change this way of working by providing a clear line of sight to what is happening all around the school.



The meeting area above is set on the 2nd floor of the modern educational structure shown on the right. This school was fortunate in that it did not have to struggle to convert an old-style structure into a modern setting but rather could start from scratch in building an entirely new structure with modern sensibilities. The meeting room in the school appears bigger than it actually is because of the ceiling to floor glass panels that help to project the local forests into the meeting setting. The use of glass also allows administrators a clear line of sight of activities all around the school. The front-back axis of the building is north-south so that the glass panels do not invite direct sunlight from the rising or setting sun. ➤



➤ The sleek design of new offices at Preah Sisovath HS above shows the clever use of partitions that serve multiple functions such as a bulletin board (right) and a faculty pantry cabinet (left) to make coffee and store materials. The partition on the right hides a restroom while the one on the left creates a space for a small faculty lounge on the other side. The offices straight ahead and in the loft above use glass panels to increase the sense of depth even though the entire space comprises what was formerly a very small classroom.

As in other facilities, office furniture designs in New Generation Schools have a high degree of multi-functionality so that school managers can easily move from private conferences to small meetings with colleagues. Cabinets provide not only for neat storage of documentation but also white boards for meetings. Glass panels are used extensively so that offices are well-lit and provide high visibility of administrators to what is happening outside of the office. Partitions are used frequently to increase the functionality of spaces while guiding the line of sight in a way that increases the illusion that spaces are bigger than they actually are.

Office designs shown here demonstrate the use of multi-functional furniture and glass panels to increase the efficiency of school administration. ↙



4. NEW & RE-DESIGN CASE STUDIES

Efforts to re-design Cambodian public schools within the New Generation School System have not been uniform. Each school comes with its own special challenges and problems, requiring a varied response to address local constraints. The present section seeks to document some of these challenges in the form of specific case studies that may give educators special insights into how to re-design their own schools into 21st Century learning facilities. Accordingly, this section recounts the unique experience of four secondary schools in three provinces including Phnom Penh, Kampong Cham, and Svay Rieng. Another case study relating to the establishment of a Graduate Center linked to the New Generation School system is also presented. This last case study is interesting because it discusses an entirely new design for an academic center emplaced at the National Institute of Education (NIE) in Phnom Penh.

The case studies provided here describe the specific context of each school or

institution and also the core challenge that they have faced historically as they seek to modernize their facilities. For example, some schools are located within urban or suburban areas while one is quite rural, leading to very different sets of challenges. Indeed, there



were initially some serious questions about whether modern school designs could be deployed in any form to rural areas of Cambodia, even with the funding support through the New Generation School System. Happily, such investments appear to be working (cf. Svay Rieng Case Study), which offers significant hope for many of Cambodia's rural schools. Other challenges discussed in this section relate to achieving a balance between modernization and conservation, harmonizing older structures with new ones, and coordinating investment among different donors who are supporting the same school. Each issue is discussed critically and how the school went about modernizing itself.

Some background on each school is also provided in this section to give the reader some sense of the school's size, how old it is, and who the best contact person is. Readers are encouraged to contact schools that are of special interest to them to organize visits and learn more about how they modernized their educational facilities.



4.1 PREAH SISOVATH HS:

Modernization versus Conservation

Preah Sisovath HS is the oldest secondary school in Cambodia. It was founded in 1873 during the French Protectorate period and moved to its current site in 1905. The campus to this day is still dominated by structures that use Second Empire Architecture that was popular at the end of the 19th Century. This history made the goal of modernizing facilities at the school very challenging, since conservation laws forbid changes to the exterior of buildings while most

assrooms themselves follow a 19th Century standard of 7 x 7 meters each. French engineers at the time of the school's construction did not use reinforcing metal in support columns, which rendered the idea of knocking out internal walls well-nigh impossible. In addition, the original blueprints for the school have long been lost so that present-day engineers have no way of knowing what is supporting the upper

floors. It was against this backdrop that MoEYS began the process of modernizing this historical institution so that it could meet the educational challenges of a new century.



Looking for a Starting Point: Renovations at Preah Sisovath HS were daunting not only because of the many strictures against radical re-design of educational facilities but also because much of the school had fallen into a state of serious disrepair. Renovations unfolded in several waves over a three-year period, focusing initially on *core facilities* such as the library, science and ICT labs, as well as the auditorium. These successful renovations introduced the use of modern materials for the first time at the school such as colorful formica finishes, glass panes,



Conservation of What? When education reformers arrived at Preah Sisovath HS, they found many entrenched local attitudes about maintaining the school in its original turn of the century state. This often meant repairing (rather than replacing) old outdated furniture and maintaining the ambience of classrooms, stairwells, and other facilities in their original colonial yellow color. Given the decrepit state of these facilities as shown in the pictures below, this presented a major challenge for architects and engineers assigned with the task of redesigning the school in a way that would make it suitable for 21st Century teaching and learning techniques. Thus, one of the major tasks confronting the re-design team was not only dealing with the decrepit state of the infrastructure at the school but also changing the attitudes of teachers and administrators working there to accept the need for considerable change within school facilities while maintaining the original Belle Epoch exteriors.





and chrome; the resulting improvements helped to build a constituency among many educators for additional changes.

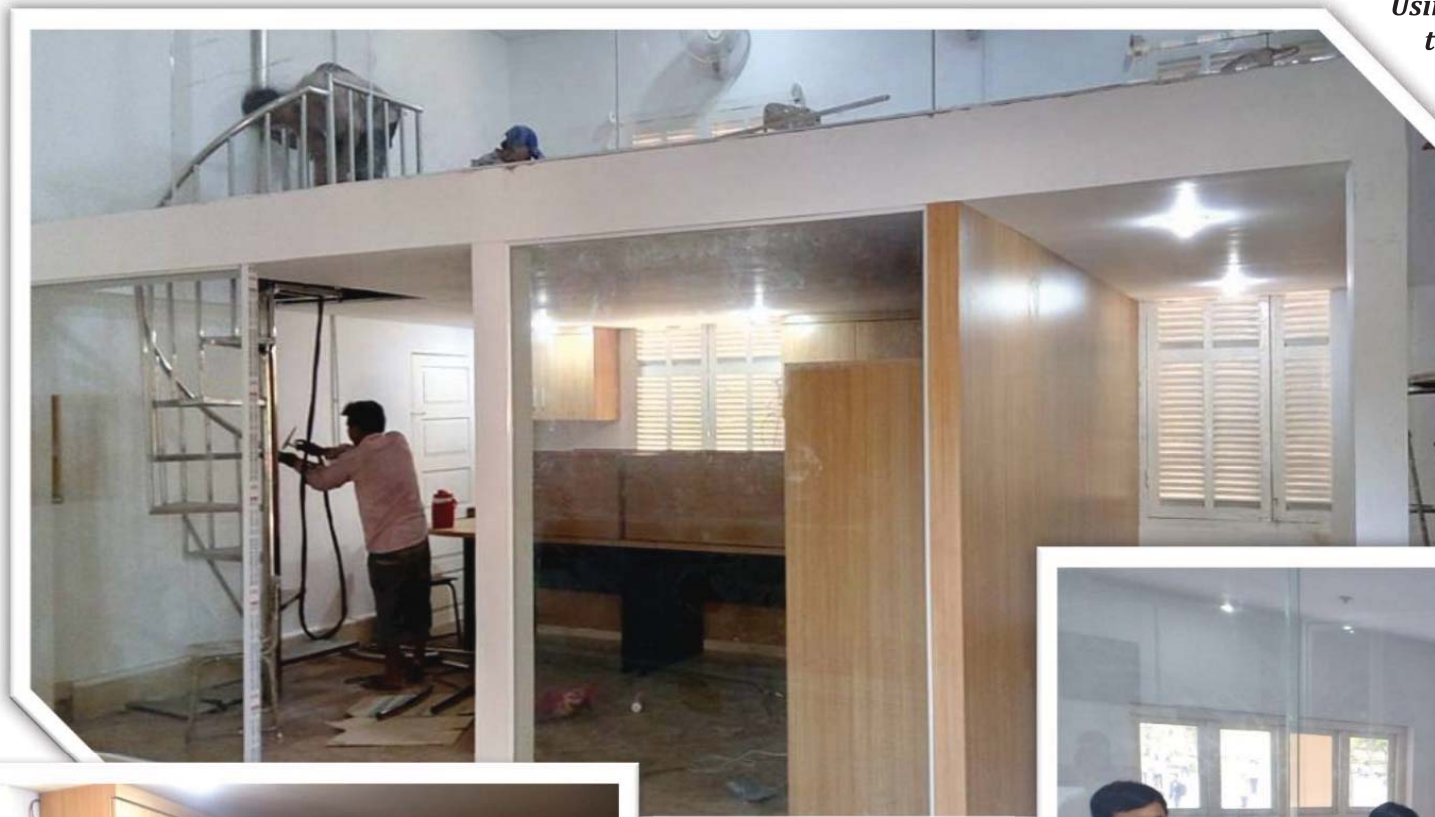
In some respects, the old-style features of the school such as its high ceilings actually provided some advantages for MoEYS' re-design efforts. These high spaces facilitated the construction of picture galleries and lofts, which greatly increased the space available for educational facilities. Given that many rooms in Preah Sisovath HS were built to a very small standard, as was common in 19th Century educational facilities, the introduction of lofts for meeting rooms, offices, and study areas helped to resolve some of the challenges posed by small, cramped facilities.



☛ The renovations to the library at Sisovath used a monochromatic red color theme against a white background that stood in stark contrast to the old drab library (see inset). The high ceilings provided space for a Gallery of Famous Cambodians including the school's namesake, King Sisovath, and enabled designers to build a second level loft with writing tables (above right).



↑ The 21st Century Library at Sisovath was the first library in the NGS System to introduce specialized educational spaces such as a research station (with 4 state of the art Apple Computers), an audio-visual theatre (see inset), a study loft, and other specialized spaces to accommodate student learning.



Using Lofts to Aesthetically Optimize the Utilization of Space:

Preah Sisovath HS introduced many interesting design configurations to create office and meeting lofts that have helped expand the cramped space at the school. Chrome spiral staircases minimize the use of space and provide a modern tone to the lofts. Some of the loft facilities that have been emplaced include meeting rooms, faculty rooms with kitchen facilities and offices. Lofts are climatized and use glass panels to separate functional spaces while also blending these spaces together.



← Pantry area under a loft forms part of a Teacher Faculty Room.

Upstairs meeting room loft for teacher technical meetings. →



Investing Heavily in Science & Technology: The first wave of investment at Sisovath HS also focused heavily on upgrading science and technology facilities. The largest rooms available at the school, and there were some large facilities, were dedicated to these subjects. Usually, most development projects will only provide a single lab to a school. Designers at Sisovath HS introduced the principle of allocating labs according to the number of classes using them. This principle was subsequently replicated at all New Generation Schools, providing for one science lab per four classes and one ICT lab per 9 classes.

Accordingly, Sisovath HS received three ICT labs and 7 science labs.



➤ New ICT and Science Labs were introduced to Preah Sisovath HS in large multiples that set the school apart from any other public schools in the city. Labs were organized to specialize in specific subjects, leading to the creation of Biology Labs, Chemistry Labs, and Physics Labs. Labs were organized according to Minimalist Design principles discussed earlier. ICT labs utilized thin client technology to conserve energy and were configured in a way to vastly increase the number of available work stations in comparison to the old ICT lab (see inset).



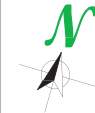
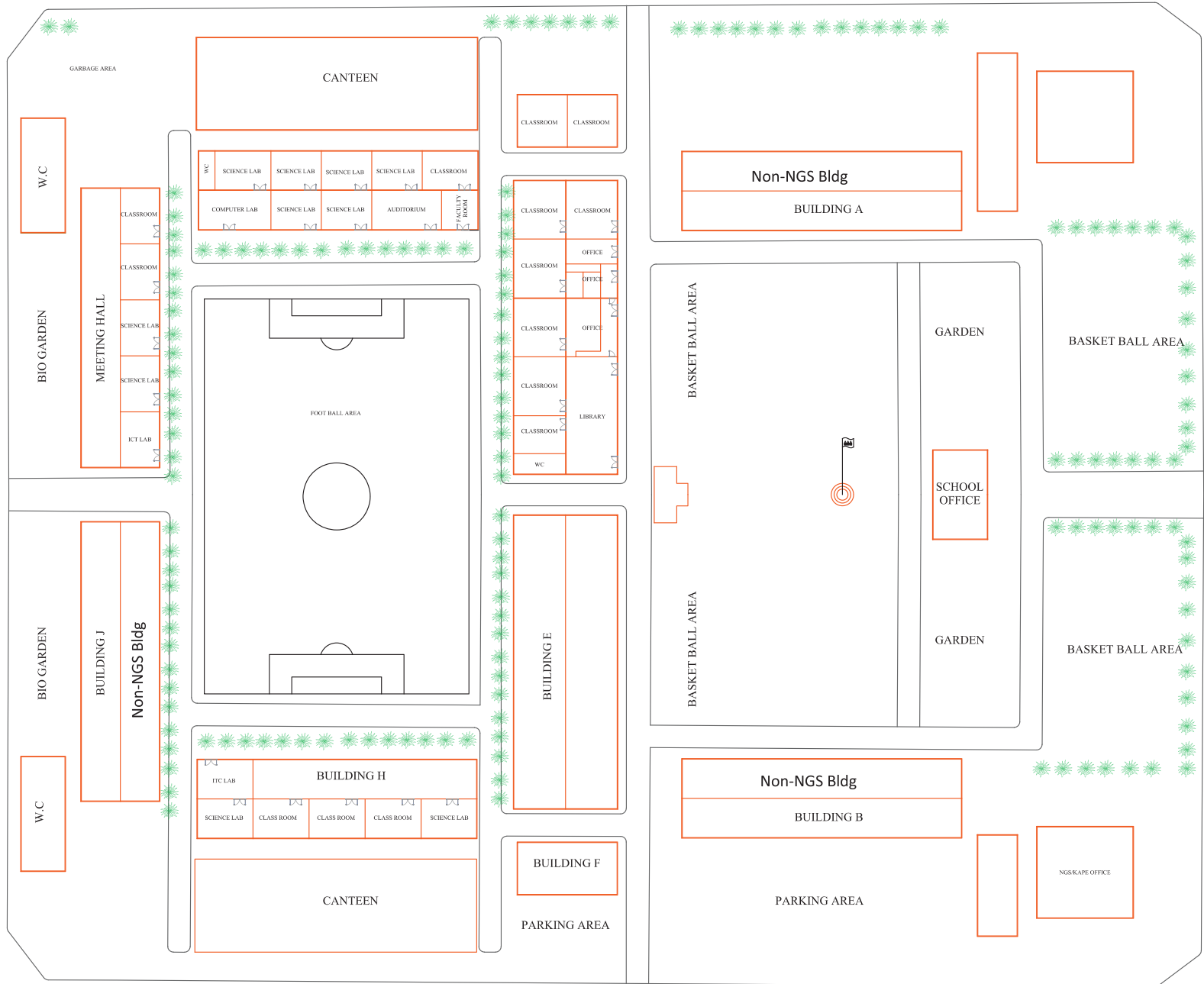
Later Waves of Renovation: In spite of the conservative undercurrent of feeling at Sisovath HS, the high quality of renovation and their creative ability to adapt the school's 19th Century features to a new century created a momentum of support for accelerated change. Within three years' time, Preah Sisovath HS had become transformed from an antiquated educational facility to one of the best regarded institutions in the capital city.



↖ **Color Coded Classrooms** at Preah Sisovath HS replaced many of the drab and decrepit classrooms that were common at the school (see inset). Old wooden tables were replaced with more comfortable chairs and desks that are more suitable for Cooperative Learning approaches. Bright color schemes were introduced into classrooms such as red (Khmer Language), orange (English Language), and blue (Social Science) to make classrooms more attractive. Sisovath HS was the first school to introduce color themed subject classroom, which were later adopted by other New Generation Schools.

⬆ The emplacement of other supporting facilities soon followed at Sisovath HS such as the auditorium shown above (see inset for previous room state) as well as student club rooms, a student clinic, modern office facilities, faculty rooms, teacher meeting facilities, and other features of a truly 21st Century educational institution.

Preah Sisovath HS School Layout Plan



Enrollment: 1,004 Students
Number of Teachers: 68 Persons
Number of Classes: 28 Classes
Date of Establishment: 1905
Contact Person: Mr. Kam Sann, NGS Manager
Email: samkamsann@gmail.com

PREAH NORODOM Blvd

4.2 HUN SEN KAMPONG CHAM HS: *Freedom for Experimental Design*



Hun Sen Kampong HS was the first New Generation School in Cambodia. It was a new secondary school that was carved out of the Demonstration School at the Teacher Training College in the province. The Demonstration School at that time was a dying primary school that had reached a level of decrepitude where it had lost nearly all of its students. This created an

opportunity not only for the renovation of decaying, traditional structures but also the design of entirely new modern structures that could more freely incorporate the latest trends in educational design. In the absence of opposition from conservative educators, the new structure emplaced at the school made extensive use of glass to increase the sense of space within learning spaces, varied the shapes and sizes of windows in a departure from more traditional designs, and provided gardens on the upper floor as a work space for students. Large windows on the lower level can be opened like sliding doors, which increases the amount of air and light that can penetrate classrooms.

The use of glass at the front of the building (see inset) where administration offices are housed provides a 360-degree view of activities outside of the school, which greatly facilitates oversight.



✦ *This modern educational structure in a public Cambodian school was among the first of its kind. It makes extensive use of glass, upstairs gardens (inset), and a back to back configuration of classrooms with modern ventilation techniques to increase the ability of the building to accommodate the maximum number of rooms possible (11 rooms) but in an aesthetic manner.*



☛ **A Metaphorical Learning Ship:**
The new academic structure at Hun Sen Kampong Cham HS provides a unique learning environment for students and teachers that sets it apart from all other schools in the province. Viewed from a distance, the building almost looks like a ship, creating a metaphor for a 'learning journey.'

Instead of opting for a wall-to-wall classroom approach like most classroom buildings in Cambodia, designers decided to reserve the space that would normally have been a middle classroom for an upstairs garden instead. This space provides a visual center of gravity in the building for upstairs offices on the right and classrooms on the left.

The stairwell that leads up to the garden area (see inset) is lined with glass panels on each side and gives a spectacular 360-degree view of the facility as one ascends to the top of the stairs. (see next page). As one descends to the building's lobby, a circular window at the end of the landing gives a unique perspective of the space outside and the sense of being on an ocean liner. Indeed, the use of different window shapes that include both rectangular and circular windows as well as different pathways for movement within the building almost gives one the sense of being on a ship that is setting out on a learning journey.

See Annex 1 for Building Floorplan



Blending Boundaries: The new academic building at Hun Sen Kampong Cham HS is designed in a way to give teachers and administrators in office areas a dramatic 360-degree view of the front, side, and back of the school. This not only helps school staff to indirectly monitor student behavior but also gives a feeling of both openness and freedom for teaching and learning. This office design stands in marked contrast to most school offices that are often closed off visually from the rest of the school.

Building Placement: Designers were very careful in the placement of a new two-story academic building so that it formed an L-shape with existing, more traditional structures on either side, which afforded the creation of a park-like space at the back of the school. As a two-story structure, the building also provided an anchor at the far end of the quad.

The creation of a quad at the back of an existing classroom building eliminated a common problem in many public schools whereby



children throw their trash outside of the back window. By converting the back of the school from a rubbish dump into livable space, children were prevailed upon to dispose of their trash properly.

☛ *The renovation of existing classroom buildings (see inset) introduced some novel features such as replacing the blind wall at the end of the building with a glass window to let in more light as well as the conversion of the back of the classroom building into a park space for student leisure.*

Classroom Transformations: Classrooms in many schools throughout Cambodia generally use opaque wooden doors and window shutters, which often has the effect of creating very dark and dingy inner spaces where children must learn. Hun Sen Kampong Cham HS was first among New Generation Schools to introduce the concept of glass doors and windows and oil based

white walls that are easy to clean.

These modifications in classroom design greatly help to make learning environments brighter and more cheerful.

Because New Generation Schools are always connected to the electrical grid, each classroom has four wall fans to help keep students cool during the hot afternoons. Once again, classroom buildings have been configured with a north south axis to minimize the penetration of too much sunlight.

Students meditate in a newly designed classroom using a monochromatic color scheme of black and white. ↓



↖ The dark and dingy classroom in the inset shows the appearance of the learning environment before the renovations shown in the main picture. The renovated classroom replaces heavy wooden desks with bright yellow furniture organized into groups. Wooden shutters and doors have been replaced with glass and the whole classroom is bathed in white with oil-based white paint, which is easy to clean.

Library Innovations:



➤ Hun Sen Kampong Cham HS developed the first experimental library in the NGS System that included some unique design features. For example, designers created recessed seating for students that is actually a pit built into the library's foundation. By building the library 'downwards', it was possible to create seating for three or four more times the number of students who could normally have sat on a horizontal surface. The seating was carpeted to enhance comfort and attractiveness. This seating area provides an ideal setting for educational videos, story-telling, or other group activities.

The library was also the first to introduce extensive use of glass panels along with integrated landscaping to project greenery into the library setting (see inset). These glass panels can slide open providing a strong cross draft to keep the library cool.

Finally, a climatized reading loft (above) greatly increases the space in the library and provides an aesthetic space for individual reading and writing as well as small group discussions.

See Annex 1 for Library Floorplan

ICT Labs with an Aesthetic Ambience

↳ Hun Sen Kampong Cham HS received investment for two ICT labs that were placed in the new Academic Building. The labs were configured in a way to ensure that they would not only be functionally effective but also aesthetically attractive. The labs were lined with ceiling to floor windows at the back while the walls were covered in forest murals to complement the natural environment outside as well as the monochromatic wood tone furniture used throughout the lab.



School Layout for Hun Sen Kampong Cham HS



Enrollment: 381 Students
Number of Teachers: 33 Persons
Number of Classes: 12 Classes
Date of Establishment: 2011
Contact Person: Mr. Soeung Vann,
 Director
Email: vann@kapekh.org

4.3 PREK LEAP HS:

When Old Development Meets New



↑ *Architectural modernization efforts at Prek Leap HS began by moving to a design that made extensive use of modern materials such as glass panels, modern tiling, formica furniture, and a new color scheme using a creamy grey color with white trim. However, these efforts have clashed with the construction of new structures that use traditional design features such as wooden slat doors and windows as well as traditional wooden desks, and colonial yellow. This has created an element of 'disharmony' in the school's design.*

Prek Leap HS was the second New Generation School to be established in Phnom Penh. Unlike its older cousin at Preah Sisovath HS, Prek Leap is located in the city's outskirts on the other side of the Tonle Sab River. Thus, the demographic surroundings of the school are more semi-urban. Prek Leap HS was first established in 1983 and originally comprised 3 two-story buildings that use standard design principles from the middle of the 20th Century. Thus, the buildings are post-colonial but still rather outdated. This has once again required a strategy

of re-designing old style facilities in a way to make them more suitable for modern methods of learning.

Over a period of several years, three of the original buildings at Prek Leap HS have been modernized using a re-design process commonly used as part of NGS investment. This involved introducing new materials used in modern design such as glass, monochromatic floor tiling, formica furniture, chrome, and other modern materials. The school also adopted a new neutral color scheme to set it apart from other more traditional schools.

As demand for the improving educational services at Prek Leap began to increase, putting a strain on existing infrastructure, the city administration was able to procure additional investment for a new structure. However, the donor funding this investment was not fully aware of the new designs being promoted in the school. This situation can sometimes lead to 'new' investment in old design, as mentioned earlier, and this sadly is how the investment at Prek Leap HS has unfolded. Thus, one of the greatest challenges for the redesign of Prek Leap HS has been harmonizing investment for modernization with investment that maintains the *status quo*. This case study, therefore, highlights some of the key challenges of donor coordination in changing educational design.



↑ A wall mural in the library at Prek Leap HS creates a natural back drop for study. Such 3D murals are readily available in Cambodia and are a very inexpensive way to give learning places a handsome appearance.

Unique Innovations: Prek Leap HS has been very successful in adapting NGS design innovations pioneered in other locations to its own situation. In this respect, the school has made an important reputation for itself in how it has developed its library facilities, setting a new standard among other New Generation Schools.

The Library Gardens pioneered by Prek Leap HS have in particular been an important contribution to library design in Cambodia. They were the first of their kind in the public schools.



☛ The library facilities at Prek Leap HS have been particularly effective in achieving optimal utilization by students. The availability of mobile devices, research stations, and a wired environment have made the library one of the best exemplars of 21st Century learning in the NGS System.



Library Gardens at Prek Leap:

Libraries in Cambodian schools are often challenged with limited space. One solution first piloted at Prek Leap HS has entailed the introduction of 'library gardens.' These are 'green' extensions of the library, often placed in an open space at the back of the library. Once again, they reflect a *Minimalist* principle of projecting natural greenery into the learning environment. These facilities not only enhance the reading environment in the school but also solve a problem of limited space when the library building itself cannot be expanded any further.



The example of a library garden above at Prek Leap HS shows how an unused and unsightly alley at the back of this school library (see inset) was transformed into a new space for reading and discussion. For security purposes, the alley was closed off at either end with a small fountain and a wall so that the only point of entrance or exit to the garden was through the library itself. The library garden at this school not only solved a problem of needed space but increased the aesthetic desirability of the library.

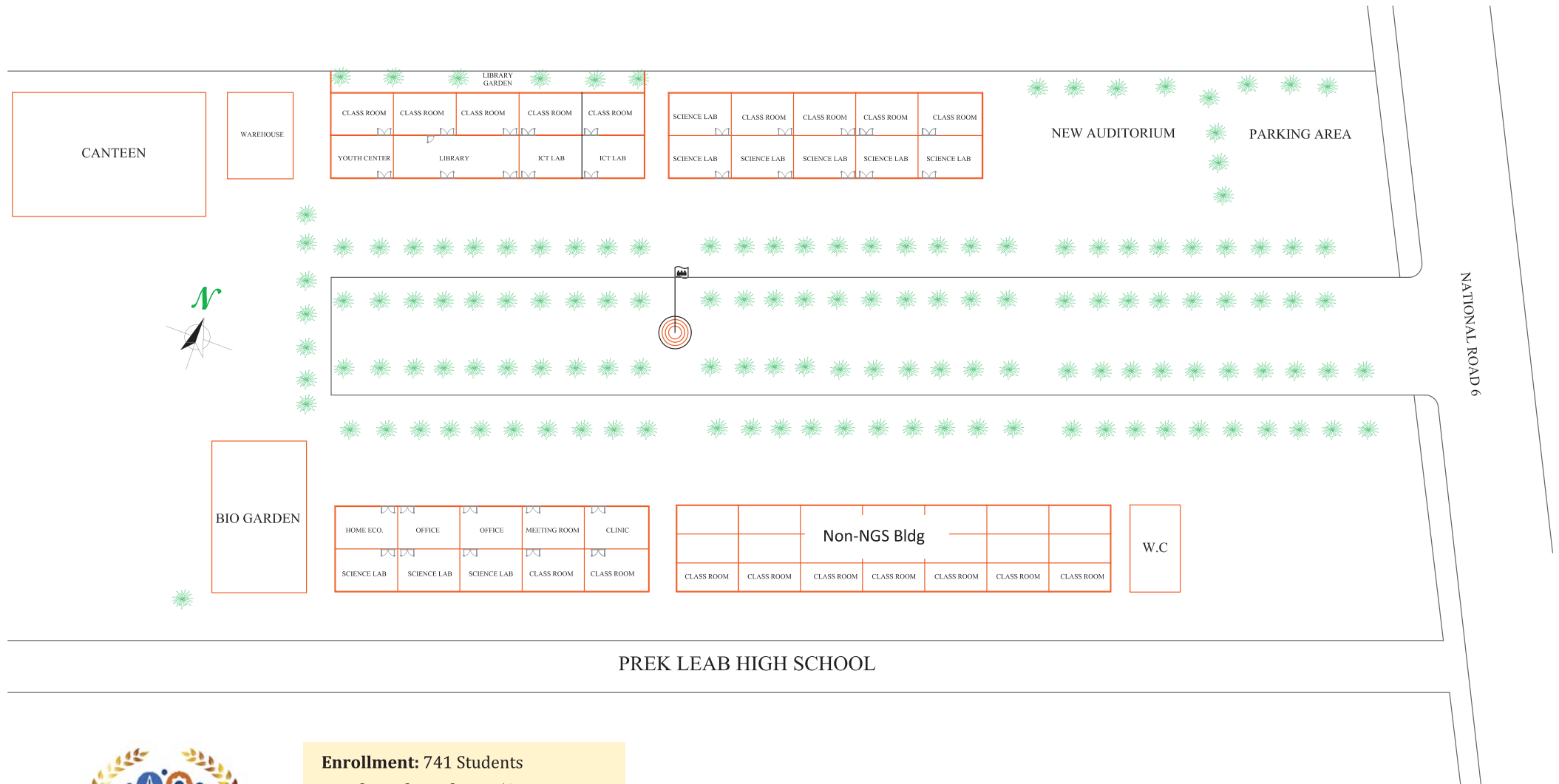
Designs to Promote Life Skills Education



Prek Leap HS has focused heavily on creating new classroom designs to promote life skills education in such subjects as Home Economics, Agriculture, and other areas. Recent investments have modified designs used for science labs so that they may also be applied to Home Economics with the goal of promoting hands-on learning. The classroom comes equipped with sinks, stoves, and a refrigerator as well as large student work tables for both writing and doing real life skills projects. The Home Economics Lab can sit over 30 students and maintains a central area in the middle of the room for teacher monitoring and student presentations.



School Layout for Prek Leap HS



Enrollment: 741 Students
Number of Teachers: 52 Persons
Number of Classes: 24 Classes
Date of Establishment: 1983
Contact Person: Mr. Chhom Sopheak, Director
Email: Chhomsopheak1@gmail.com

4.4 Kok Pring HS:

The Challenge of Modernization in a Rural Setting

Kok Pring HS is unusual among New Generation Schools because it is located in a very rural area. Most New Generation Schools have either been established in urban or suburban areas but rarely in a rural community. Thus, investment in Kok Pring HS' infrastructure entailed some degree of risk. As in the case of most New

Generation Schools, the main challenge was re-designing existing facilities to meet the needs of a modern learning environment including the emplacement of multiple science labs, ICT labs, a 21st Century Library, and modern meeting and office facilities for school managers and teachers.

The establishment of NGS facilities at Kok Pring HS was fortuitous in that it coincided with planning by local authorities to expand the electrical grid and internet facilities, thereby solving one of the biggest challenges of setting up a modern educational

facility in a rural area,

since both of these

things are essential

for a modern school.

In addition, the

rural setting of

the school provided

ample space for many

innovations in

gardening and

the layout of

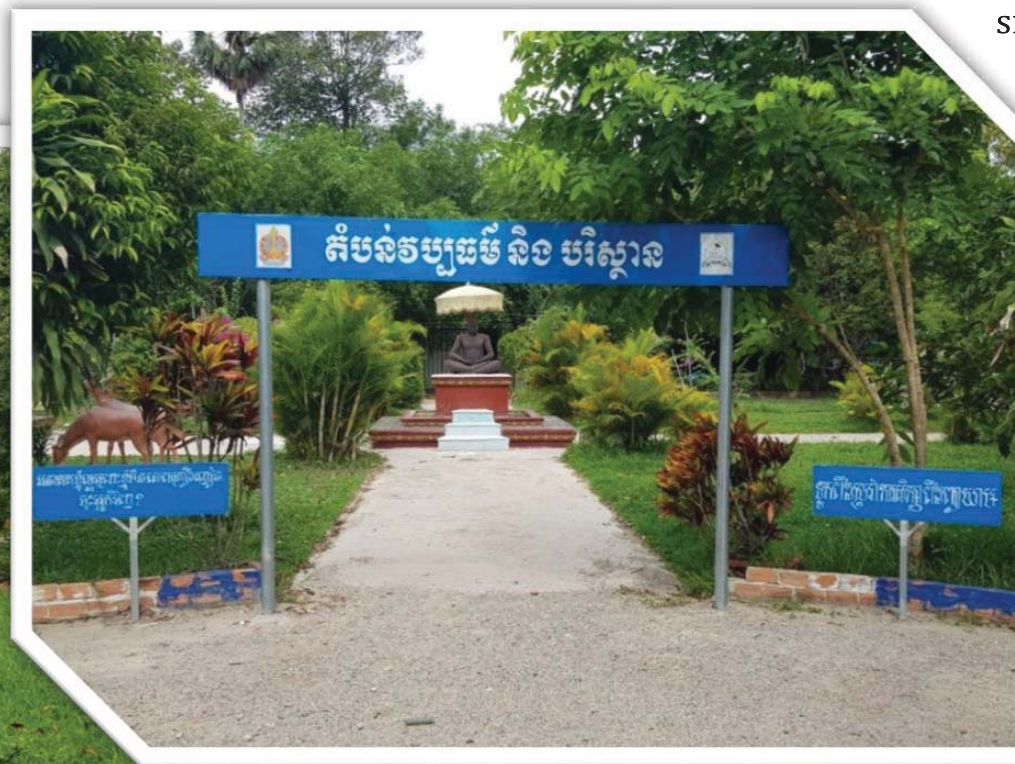
the school grounds.

This included setting

up cultural parks and

bio-gardens (see

inset).



➤ *Impressive gardens at Kok Pring HS are one of the distinguishing features of the school. On the left, a garden leading up to the library in the background sets a nice tone for study while the garden on the right displays cultural artifacts in a natural setting.*



Successful Innovations: One of the most successful innovations at Kok Pring was its ability to re-design a traditional free-standing library building so that it better conformed to modern learning needs. This required building a more modern extension to the original building that provided space for audio-visual facilities, research stations, and more individualized reading spaces. Some of the same techniques used in earlier established NGS libraries were also introduced to the rural setting at Kok Pring HS such as multi-functional furniture, color-theming, and extensive use of glass panels to project some of the beautiful gardens around the school into the library.



There was considerable criticism of the re-design process at Kok Pring initially because many thought that the use of modern materials such as glass and formica would be quickly ruined by rural students who had never encountered them before. However, these fears were happily not realized given the high quality of management at the school, which quickly oriented students to the special design of the school's facilities and how to use them.

☛ A red-themed library was established at Kok Pring HS as one of the first steps in modernizing the school. The new library was designed to create a bright and attractive area for students to read and undertake research activities that utilized m-learning services.



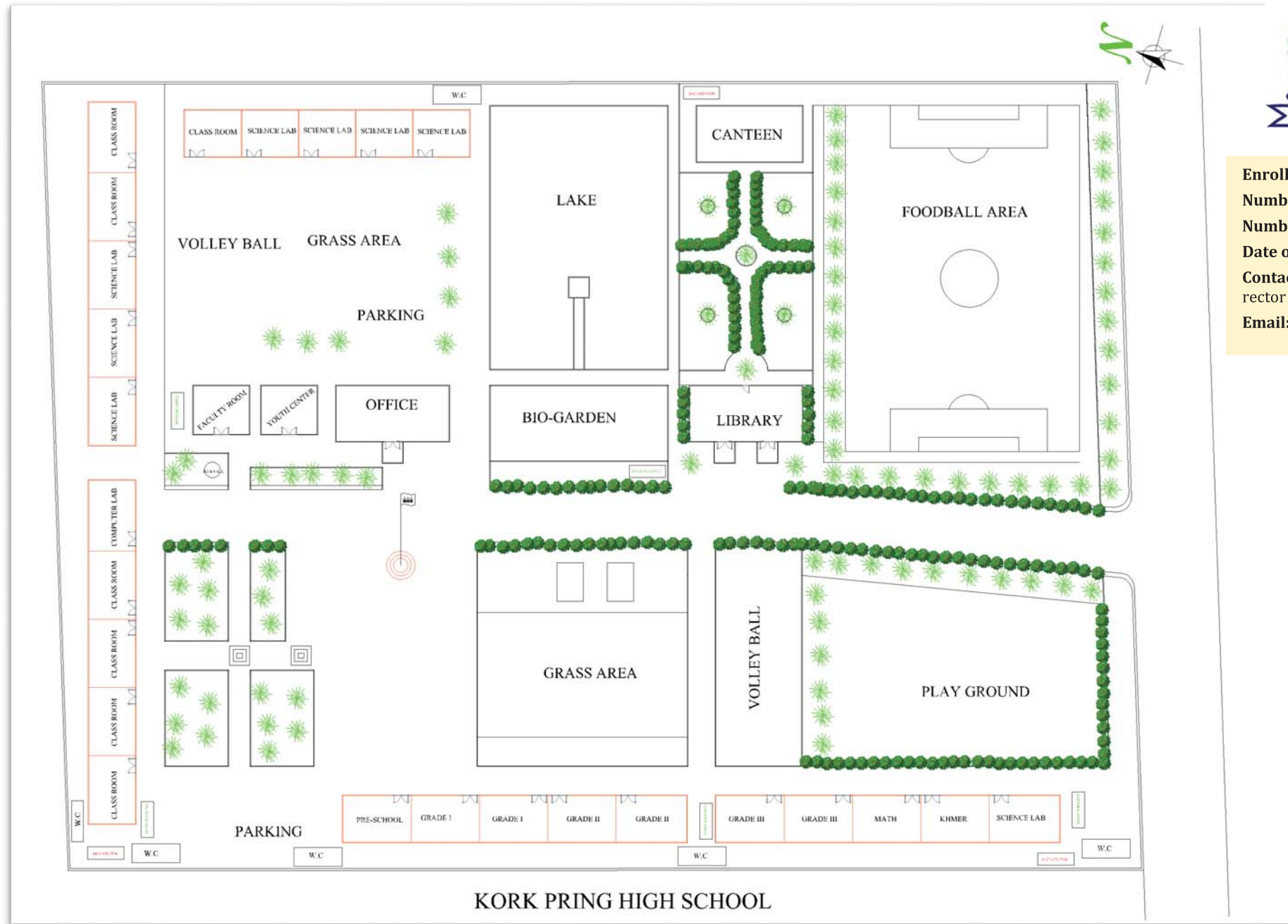
☛ A small viewing theatre in the Kok Pring Library gives rural children an opportunity to observe educational films and documentaries. The viewing pit builds on an idea developed in Kampong Cham and was actually built downwards into the foundation of the new extension building. Once again, the decision to build a new extension onto the old library building provided an opportunity for new design ideas that would not have been possible in the existing structure. This design feature greatly increased the seating capacity of the library. The cabinet unit for the television set is custom-made and seamlessly follows the contours of the wall along with built-in seating units.

A science lab at Kok

Pring HS built to modern specifications provides hands-on science experiences to rural children. The lab seen in the picture to the right follows the specifications used in other New Generation Schools including the use of island work stations, multi-purpose cabinets with bulletin boards for student project work, and an open space in the middle of the classroom for activities. ➤



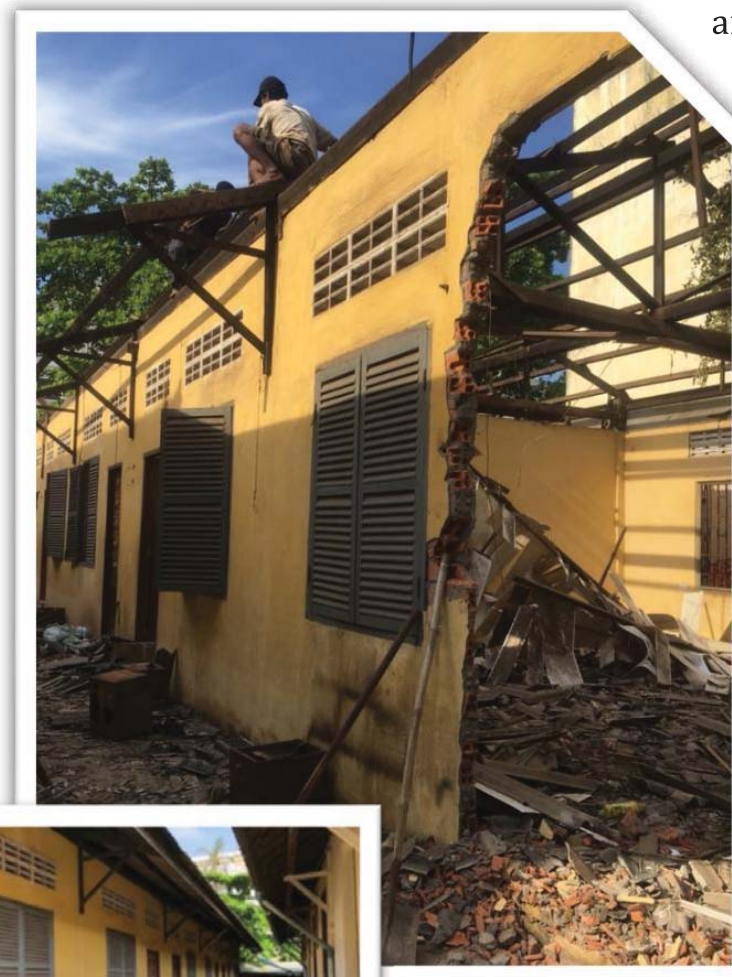
School Layout for Kok Pring HS



Enrollment: 369 Students
Number of Teachers: 26 Persons
Number of Classes: 11 Classes
Date of Establishment: 2009
Contact Person: Mr.Kong Narin, Director
Email: kongnarinngs@gmail.com

4.5 New Generation Pedagogical Research Ctr. A Modern Graduate Facility at NIE

In 2019, MoEYS committed to expanding the NGS system to higher education as a means to train teacher mentors as part of a new Master's Degree Program. At the end of the degree program, the mentors are posted to New Generation Schools to support Cambodia's first school-based mentoring system. In order to achieve these aims, the MoEYS created a *New Generation Pedagogical Research Center (NGPRC)* at the National Institute of Education (NIE), which was tasked both with training mentors



and conducting research to improve mentoring practice. The facility housing the NGPRC was intended to be both modern and attractive. However, the original building provided for the Center by NIE was too decrepit to be re-designed and needed to be demolished and replaced with an entirely new structure. This provided a rare opportunity for 'new design' as opposed to re-designing an archaic structure, as happens in many NGS sites.

↑ Original building of a traditional design on the site of the NGPRC being demolished.

← Site location of the New Generation Pedagogical Research Center on the NIE Campus in Phnom Penh. The site was quite small and presented multiple challenges to create a modern structure that would meet the needs of a modern higher education program.



⚡ Design Challenges: *The small and narrow building site allocated to the graduate center posed many challenges. The architect who designed the Center had no choice but to create an elongated structure to fit the desired space but mitigated this choice of shape with a glass-sided structure and an open balcony area at the top of the second floor. The open balcony helped to open up the building both from an internal perspective as well as when viewed from the outside. The extensive use of white color further helped to create an airy and open feeling in every part of the building.*

See Annex 1 for Building Floorplan



← **The Final Product:** *The New Generation Pedagogical Research Center makes a very dramatic statement about its commitment to modernity. The monochromatic use of white makes a sharp contrast with the blue sky, which is further strengthened by the use of black marble tile at the front. The final design made a tactical decision to change the building's entrance location to the side of the structure to avoid the traffic from the walk path in the front of the building. The Center marks a major departure from the shoddy, traditional structure that it replaced (see inset) and will hopefully provide strong advocacy for further improvements in the design of buildings at the National Institute of Education.*

One of the primary arguments against the use of modern design is its high cost. However, MoEYS has shown that this is not always the case. For example, the two-story NGPRC structure built at the National Institute of Education came in at about \$80,000, which is probably what it would have cost to build a single-story yellow mortar structure with three or four rooms. Thus, the NGPRC experience demonstrates that replacing traditional design with modern architecture is not necessarily more expensive.

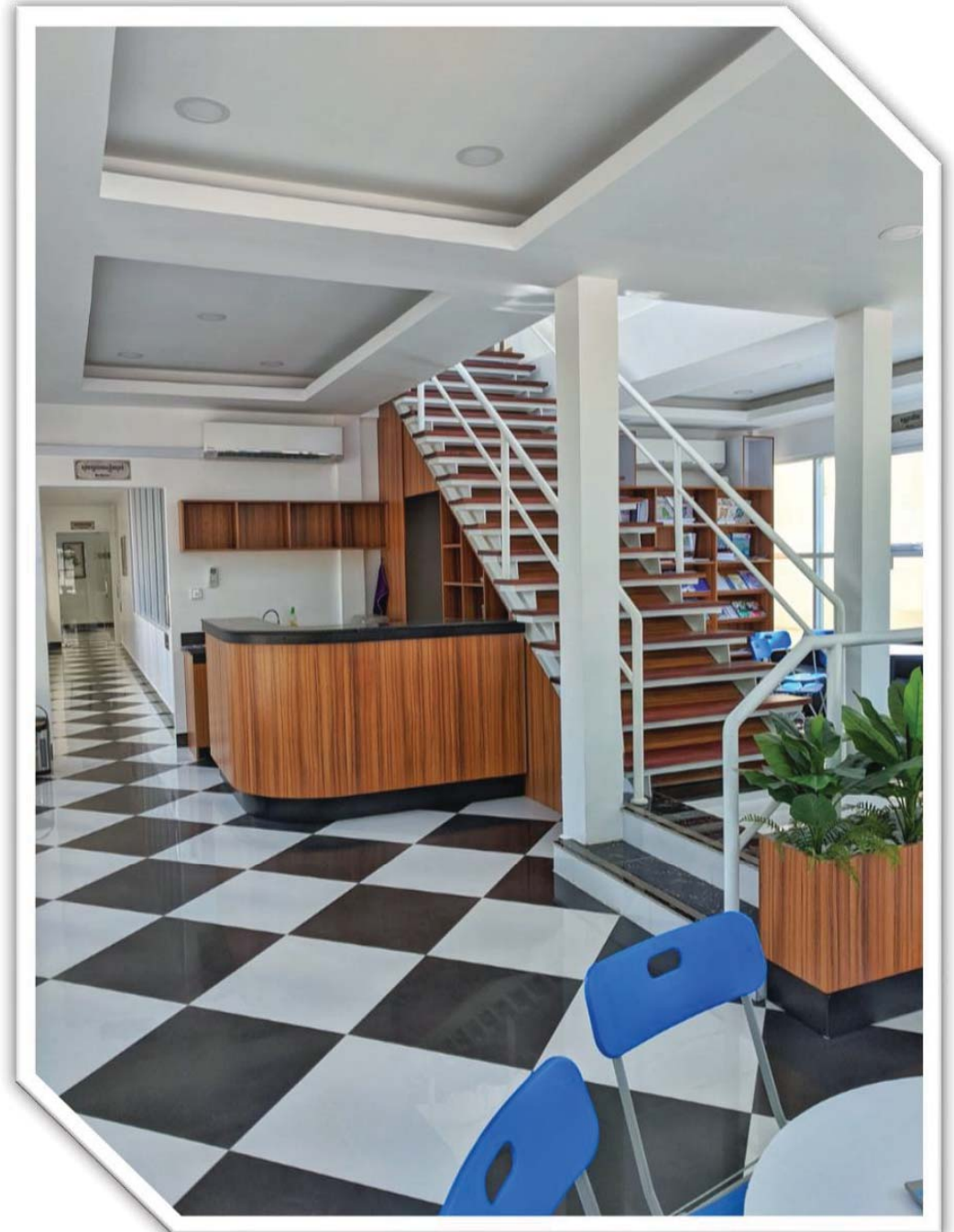


Design Style for a Brand New Structure: MoEYS selected a *Minimalist Architectural Style* for the new structure that would house the NGPRC. This led to the use of a monochromatic color scheme of white on black throughout

the entire building. The building design made heavy use of glass to amplify the sense of size even though the structure is quite narrow (only 7 meters wide). White window frames and railing reminiscent of an *Art Deco* style have been employed at the front of the building to create a well-lit interior that is also inviting to passersby outside.



↖ Exterior of the NGPRC with Art Deco Style railing on the second floor and well-lit downstairs lobby with entry to the upper floors and seminar rooms down the long corridor on the left. →



Interior Layout of the Structure: Students enter the Center through a **Lobby**, which is furnished with white-color snack tables and a nearby coffee vending area. The lobby stairwell leads to an **Upstairs Patio** and **Study Area** that is landscaped like a hanging garden. Once again, one of the elements of 'Minimalism' is to foster building styles that cause a blending between inside and outside areas so that users have a sense of close proximity to nature. Accordingly, the building exhibits an extensive use of plants and trees both inside and out.

The area under the lobby stairs has a **Small Library** that contains a specialized collection of all the reading assignments outlined in the Master Degree syllabus of

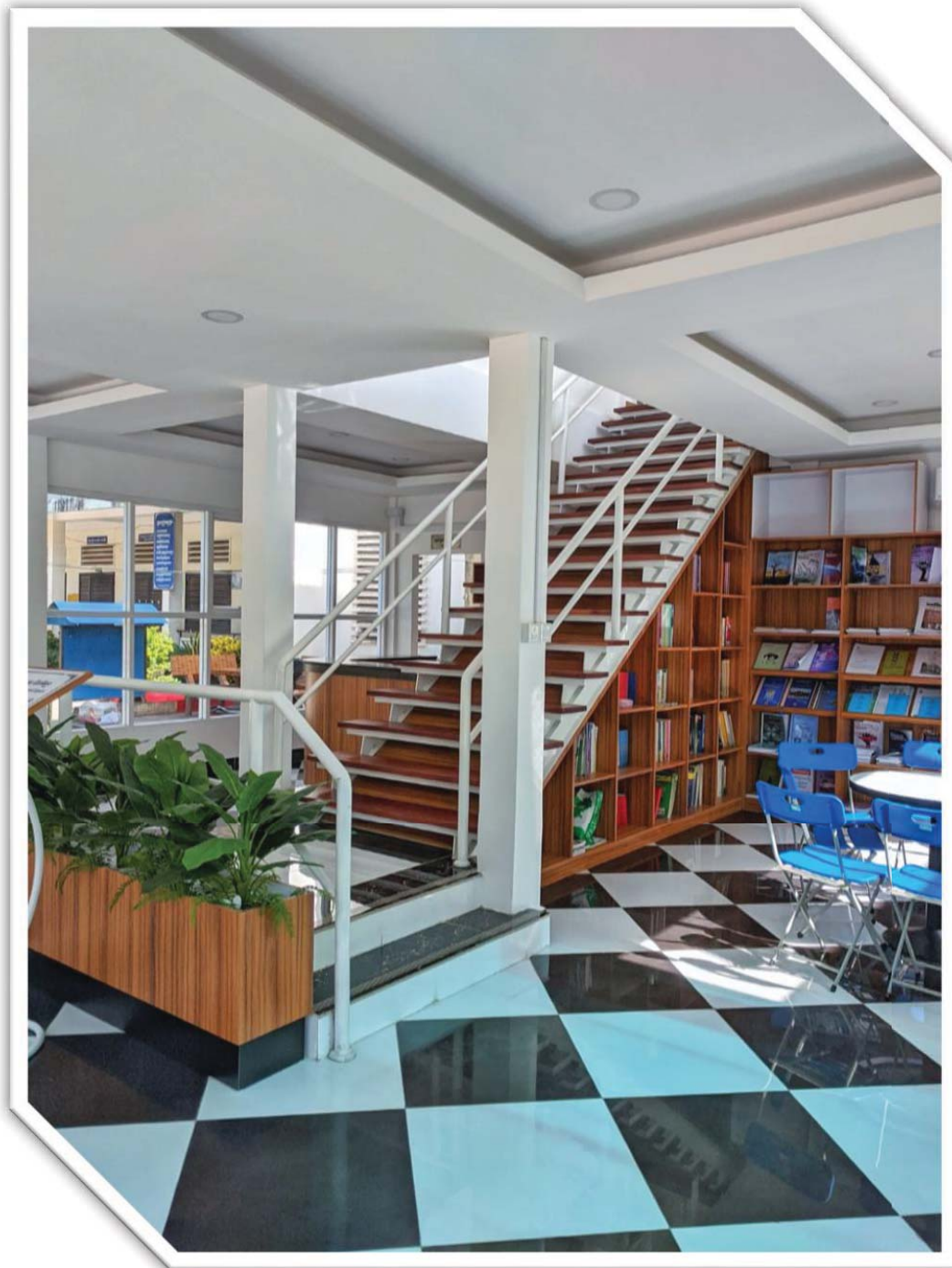


which there are many hundreds. The adjacent lobby provides extra space for reading as well as relaxing during coffee breaks.

↑ *An airy and well-lit lobby area provides a multi-functional location for relaxing, individualized work, and even group work. The glass panel design along the perimeter of the building helps to give the illusion that the lobby is larger than its actual size, which helps to counter the very small building site provided to the Center. The amplification of depth is further realized by the use of recessed ceilings in various parts of the building.*

← *A highly specialized library is built into a small alcove that makes a very efficient use of space by utilizing both the space along the wall and under the stairwell.*





☛ *The Center Lobby uses a uniform wood tone for all cabinets and the stairs, which provides a nice contrast to the black and white tile flooring.*

In most traditional classroom buildings, movement from room to room is achieved through an exterior veranda requiring one to walk out of the building to move into the next room. In the NGPRC, a long, white corridor provides for easy movement throughout the ground floor and uses a 'forced perspective' technique (heightened by the diagonal placement of tiles) to give the illusion of building size even though the site is actually quite small. ↓



A glass-lined **Corridor** along the western side of the building on the ground floor leads to two **Seminar Rooms** where students meet. Seminars are limited to 12 or 13 students and are designed in multiple ways to facilitate discussion-oriented learning. The seminar rooms can be entered from the interior hallway and also has exits that lead into a Garden Area with seating that can be used for small group work and discussions. At the end of the hallway, there is a **Common Study Lounge** that is



used by students for group discussions or individualized study. A set of Restrooms for men and women is included at the far end of the structure but in close proximity to the seminar rooms and common study area.

☛ *Color-themed seminar rooms provide a modern setting conducive to many kinds of educational activities including large and small group discussions, role plays, ICT demonstrations, and others.*



← A red-themed seminar room at the NGPRC uses comfortable seating arranged in a U-shape on a carpeted, stepped platform to facilitate discussions. The room is designed for about 10 to 15 seminar students and provides an elegant setting for discussions and group work.

The upstairs part of the structure houses a **Faculty Room** and **Conference Room**. The Faculty Room seats the Training Coordinator, Mentor, and 4 Lecturers with a special space set aside for the Centre Manager. Internal walls separating different spaces are made of glass, once again to maximize the sense of size for those sitting inside. At the far end of the



upstairs area is a large meeting room that can accommodate all trainees and faculty for meetings that occur periodically at least once a month.

☛ Faculty offices have a 360-degree view of the NIE campus and can accommodate up to 7 persons. The offices are in close proximity to the Main Conference Room for Center-wide meetings.

The Center's meeting room can accommodate up to 30 persons and features a large sectional meeting table that can also be configured into small groups in the event that workshops are also held at the Center.



A student lounge area at the back of the Center provides a place for degree candidates to relax and/or work on group projects. The Lounge is decorated simply with plants and geometric wall art and can accommodate approximately 20 students. ↗

The Center's Faculty Room (above right) at the top of the stairs uses modern furniture to maximize the number of Center staff that can sit in the office. Glass panels that look out onto the Center's balcony create an open area while the balcony itself provides a place where faculty members can take a coffee break or get a quick change of scene. ↗



In all, the New Generation Pedagogical Research Center creates a learning space for graduate students that is both modern and attractive. Its internal features and layout are characterized by a thoughtful design that is the product of much discussion among educators who understand the importance of new educational architectural ideas. By emplacing this modern structure on the campus of the National Institute of Education, the Ministry hopes that the use of new educational architecture ideas employed at the Center will also help to inform other upcoming changes in physical plant and curricular

programming that are planned as part of new investment for NIE. It is also hoped that the Center's unique design will be a good form of advertising and promotion that will attract young educators who are interested in learning about modern methods of teaching and learning.





5. FUTURE DIRECTIONS

From Re-design to New Design: New Generation School Reforms have introduced exciting new trends in educational architecture in Cambodia's public schools. For the first time, these reforms have created an opportunity for public funding to support new innovations that depart from tired old school designs, which are no longer relevant to the new economy. Nevertheless, it is the hope



of education reformers that NGS designs will not become crystalized and standardized across all New Generation Schools. This would only repeat a mistake of the past where all schools were expected to conform to but one design standard. Rather, it is an important expectation that educational archi-

tecture in Cambodia will continue to evolve and remain dynamic to better address educational needs, as the new century unfolds.

One of the limitations in promoting a new architecture for Cambodian public schools has been the need to 're-design' existing structures that were intended for a different age. In some respects, there is only so much one can do with an existing structure. The case of Preah Sisovath HS discussed earlier provides an extreme example of how limiting antiquated school facilities can sometimes be. The freedom allowed for the construction of an entirely

☛ *Proposed but as yet unrealized designs for a New Generation School that would be built from scratch. NGS designers hope that the future will hold more opportunities for 'new' school designs as opposed to re-design of existing structures. The design above is configured so that classrooms can be entered from all sides of the building, which departs from traditional classroom buildings where the back of a school is a dead space for discarding trash.*

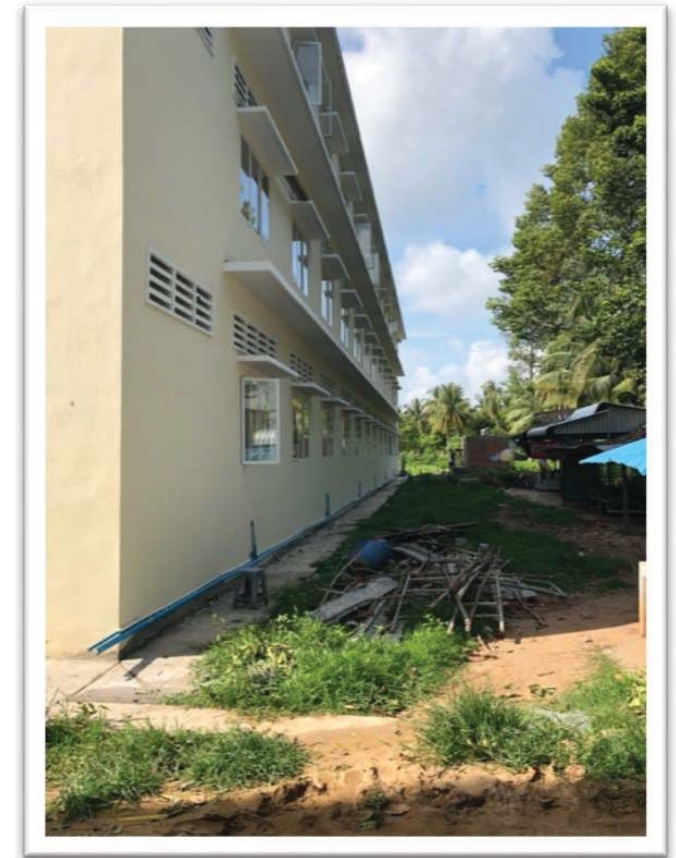
new and experimental structure that occurred at Hun Sen Kampong Cham HS is a rarity. It is, therefore the hope of NGS designers that the future will offer more opportunities for 'new' structural designs rather than continuing exclusively with past trends for renovation and re-design.

Solving the Problem of Dead Space

One of the biggest challenges in traditionally designed classroom buildings in Cambodia is the problem of the 'dead space' that they create. This mainly refers to the front-back configuration of traditional buildings in which the space in back has no functional relationship to anything, except as a place for children to throw their rubbish. As the picture to the right shows, the



space behind traditional classroom buildings really cannot be easily used when all the rooms in the structure are facing the other way. As more and more schools gain access to electricity, it should be easier to use exhaust fans to ensure that classrooms get enough ventilation without the need to place window panels on both sides of a long, narrow building. This should enable the consideration of new building configurations in which every room in a building faces the front around the entire perimeter, so that all the space around the structure can be used for a constructive purpose. This would require placing hallways or atriums at the center of a building, which could of itself offer many possibilities for creative design.



The back side of a three-story traditional building is shown above. Traditional classroom buildings have a problematic front-back configuration that discourages the effective use of the space in back of the building. ↗

← *By placing classrooms into buildings that are well ventilated, it should be possible to move to new building configurations such as the one shown on the left where every room around the perimeter of the building faces to the 'front.'*



space. The enclosed courtyard is also ideal for pre-school settings where very young children require intensive oversight.

← The circular building shown is another New Generation School building design ready for implementation pending resource availability.

Another way of dealing with the problem of 'dead space' involves the use of circular building designs in which the exterior of the school faces onto well maintained lawns while the inside faces onto an interior courtyard. This design is well-suited to urban environments or even rural settings in which the school has a shortage of





The colorfully decorated interior courtyard of a circular school building provides for a much higher security environment for very young children, especially in environments where there is considerable traffic from an urban setting or for a school in a rural setting that is near a highway. Large windows along the exterior facilitate a well-lit interior and an engaging backdrop for learning. ↗

The Problem of the Standard

Cambodian Classroom: Recent re-design efforts in Cambodian schools have had to work within the constraints of the standard 7 x 8 Meter classroom, which provides 56 square meters of space for teaching and learning. According to international standards, each student in a classroom should have 2.5 square meters of personal space at any one time. With only 56 square meters available in a standard classroom, this would mean that Pupil Class Ratios (PCR) should be limited to 22 or 23 students per room. Even though NGS policy standards have taken the radical step of limiting PCR levels to a maximum of 36 students (small by Cambodian standards), this would suggest that NGS classrooms are still not meeting an international standard. Indeed, meeting this standard would actually require a classroom size of 90 square meters, or an increase from the current classroom size of 61%, or alternatively reducing PCR levels in a New Generation School to considerably less than 36 to 1. If NGS designers were allowed the resources to design new structures, this would be one of the core issues that would be addressed. For the time being, however, re-design efforts must work within the constraints of the 56 square meter classroom.

Experimentation with New Facilities and Beyond:

Most Cambodian public schools continue to operate without some key facilities such as auditoriums, student clinics, and



A new design for an auditorium at Prek Leap HS is already on the drawing board with amenities similar to what was achieved at the new auditorium at Hun Sen Kampong Cham HS. The new design fits the actual location on site. ↗

canteens among others. Similarly, pre-school designs (where New Generation School programming currently does not make investment) could also be vastly updated to introduce young children to technology and new techniques in learning from a

very early age. For example, many preschools now use the concept of 'exploratory ramps' to facilitate both individualized and group study among very young children (see next page).

NGS designers have sought to make sure that the facilities identified above make their way into all New Generation Schools either through new construction if possible, or re-design of existing facilities when it is not possible. Plans for such facilities are already on the drawing board in several NGS sites, pending the availability of resources.

Unlike much development investment in Cambodian schools, these designs do not follow a rigid standard but rather are unique to accommodate the actual sites in which they will be located. This will continue to be the philosophy of NGS school design, to make sure that each public school within the New Generation



Plans for a new Canteen at Preah Sisovath HS were recently completed and await to be implemented. The new facility is long overdue and would provide seating for over 1,000 students as well as modern, climatized facilities for conferences and meetings in the upper levels. ↗



School system is unique and able to effectively serve its community's actual needs.

◀ A new design for preschool introduces the idea of a classroom comprised of 'exploration ramps' where children can learn individually or in groups under the supervision of a teacher (see bottom inset for the design prototype). A large screen television and tablets would provide opportunities for the use of educational technology while a full wall forest mural in the back creates a natural setting for learning.

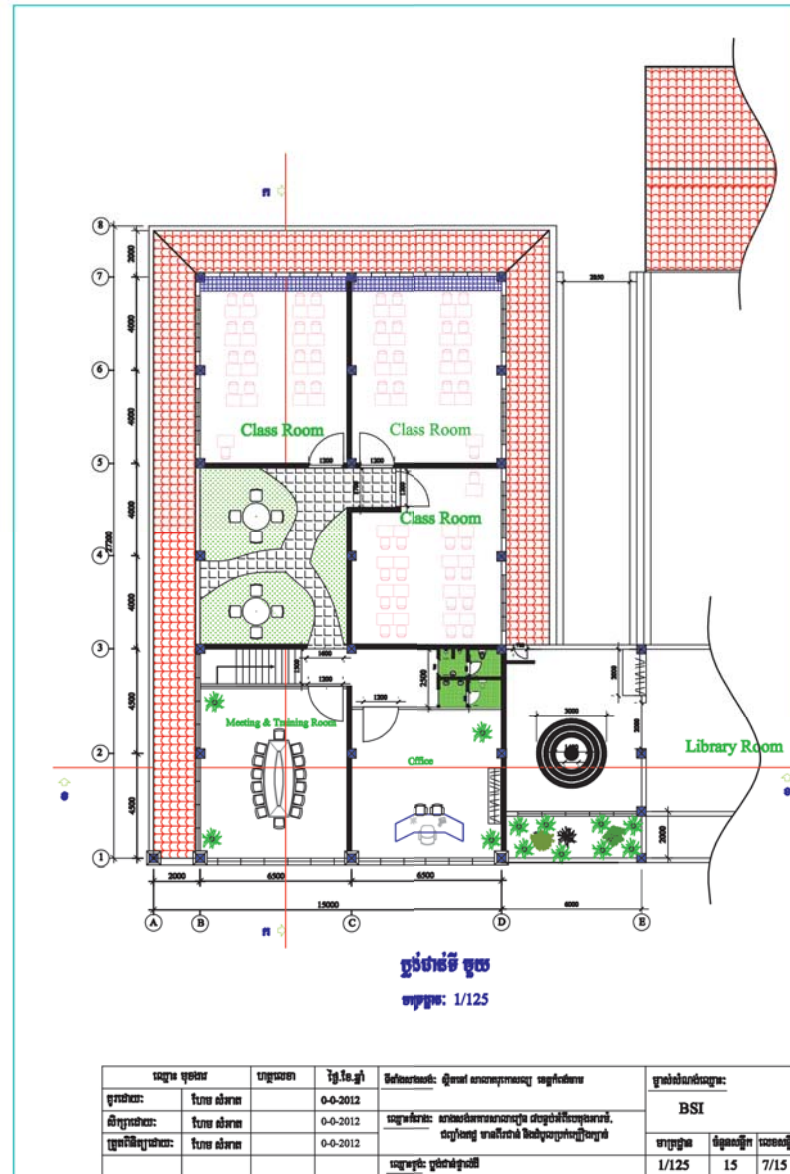
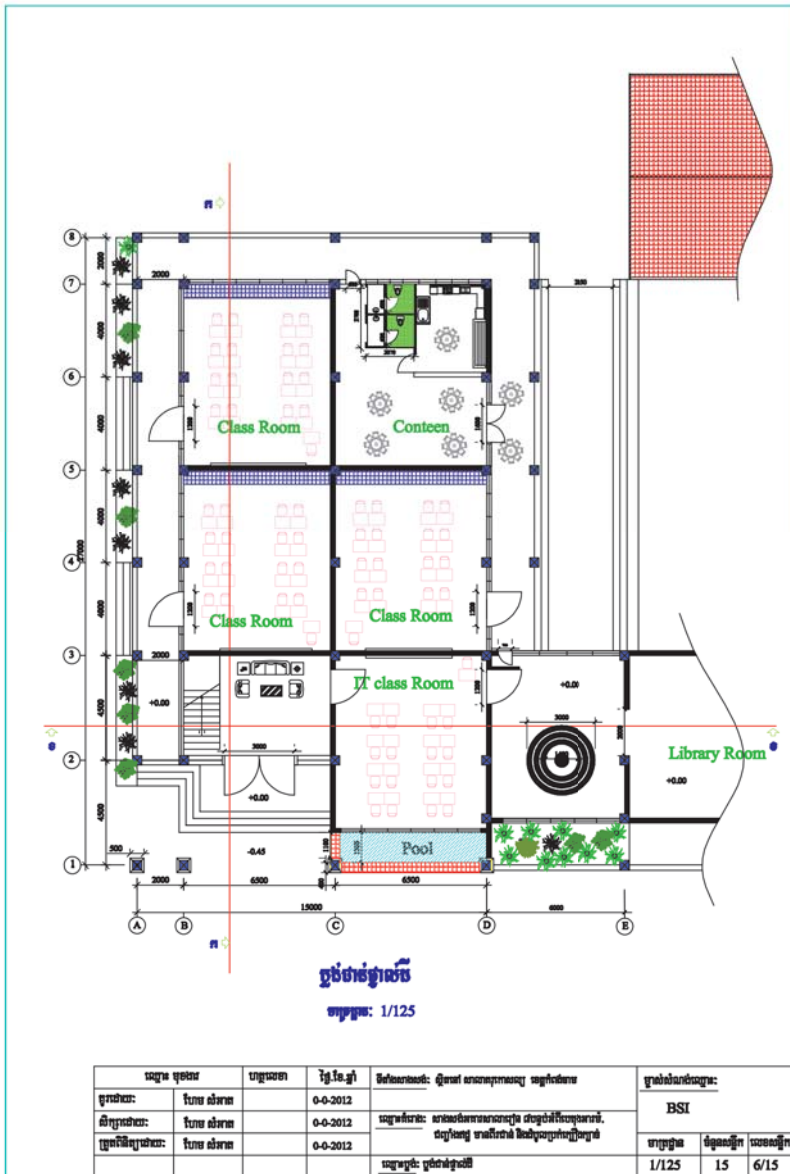


6. SUGGESTED READING

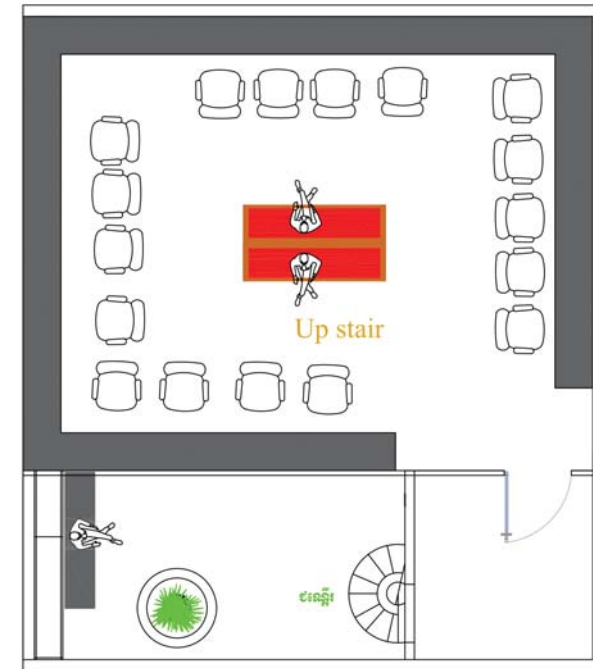
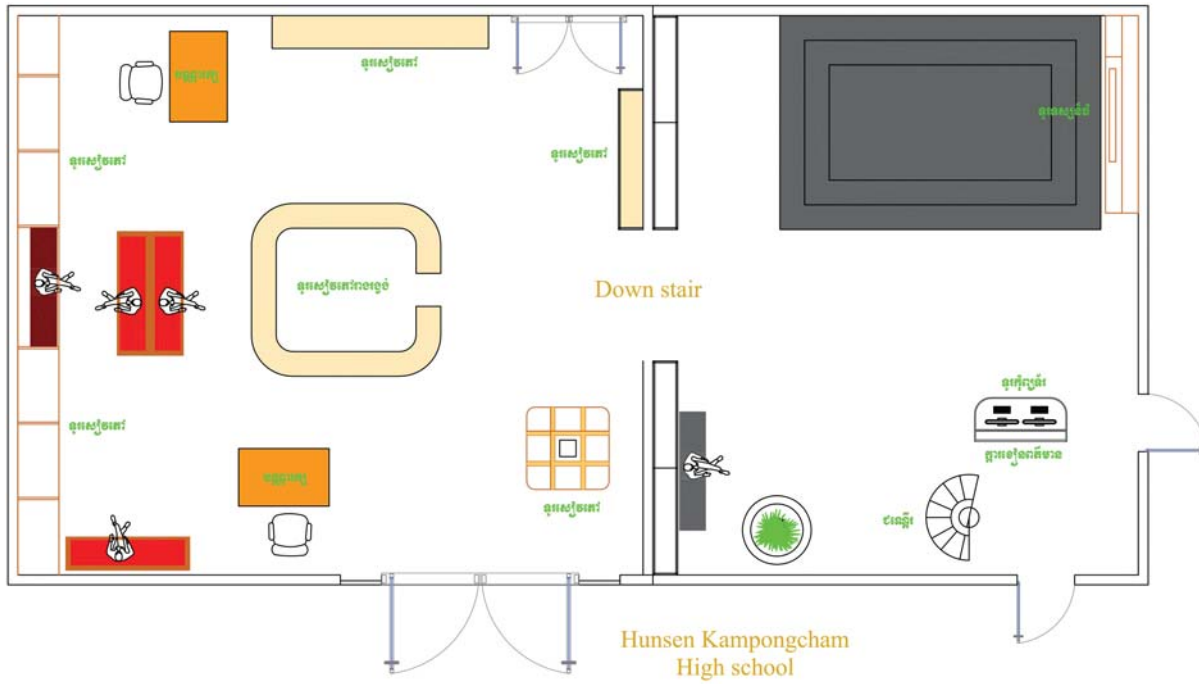
1. American Institute of Architects (2002) *Educational Facilities*, Mulgrave, Victoria (Australia): Images Publishing.
2. Inez, M. (2014) *Minimalist Living*, Singapore: Page One Publishing, Pte.
3. Kramer, S., (2019) *Building to Educate*, Berlin: Braun Publishers.
4. Siddiqui, A.I., (2010) *The Library*, New York: Princeton Architectural Press.
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ANNEX 1: Sample Building Floor Plans

Floor Plan for Learning Center at Hun Sen Kampong Cham HS



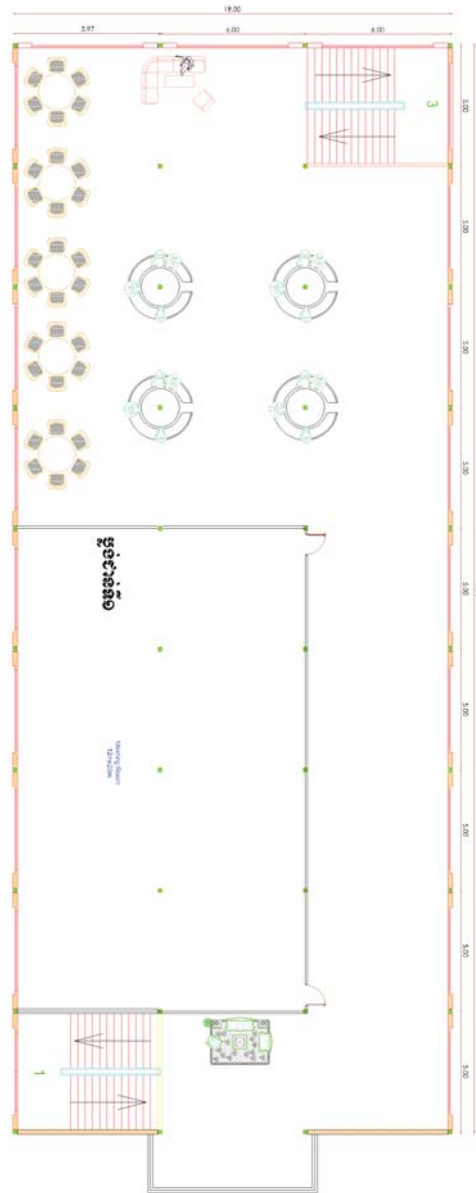
Floor Plan for 21st Century Library at Hun Sen Kampong Cham HS



Floor Plan for Canteen at Preah Sisovath HS



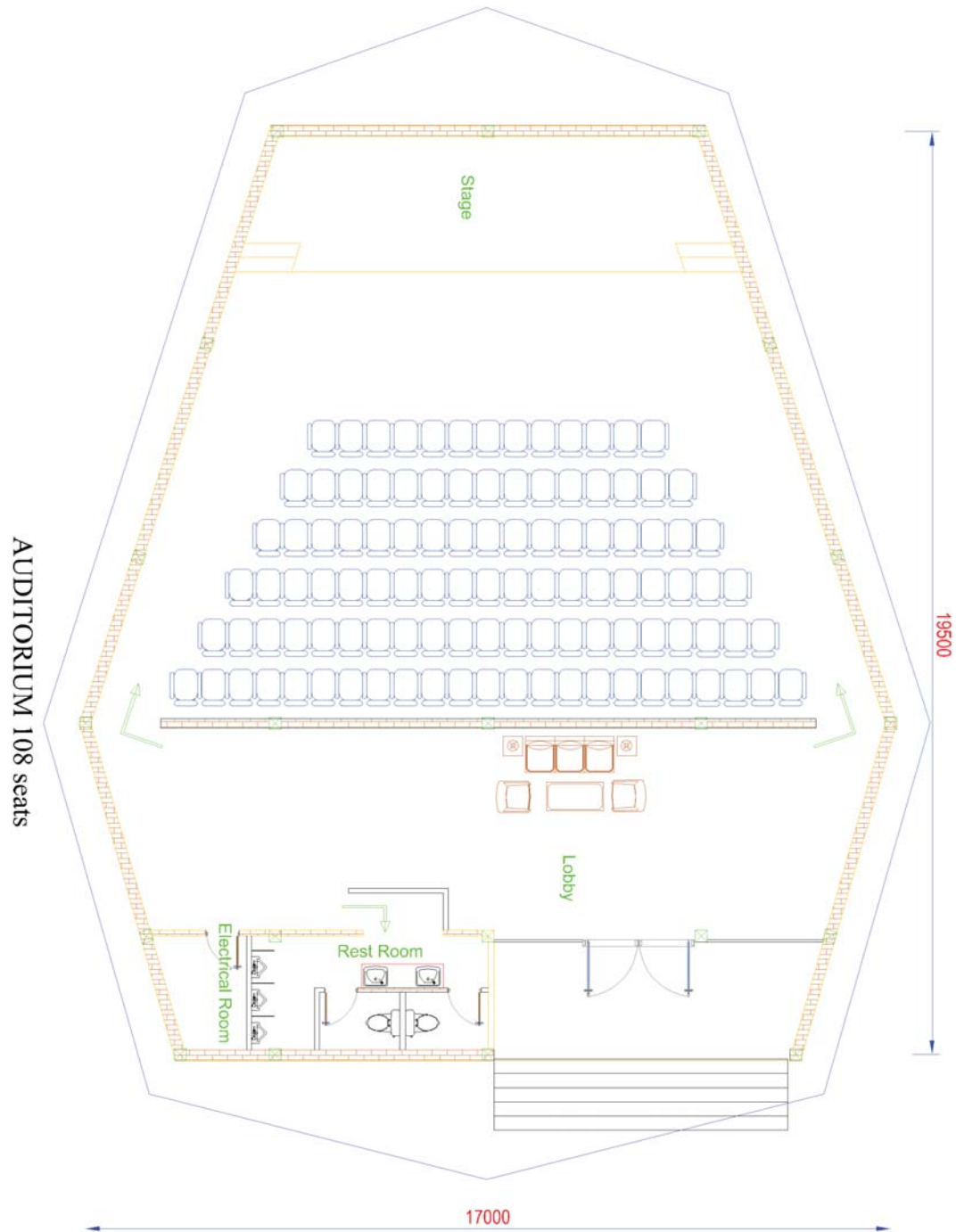
Lower Level



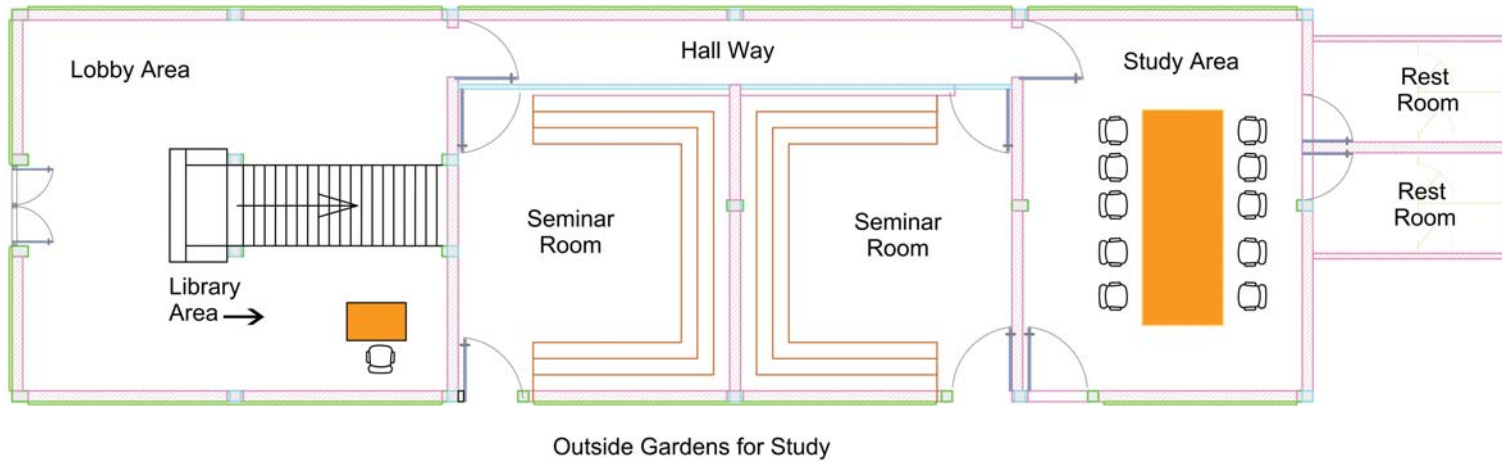
Upper Level



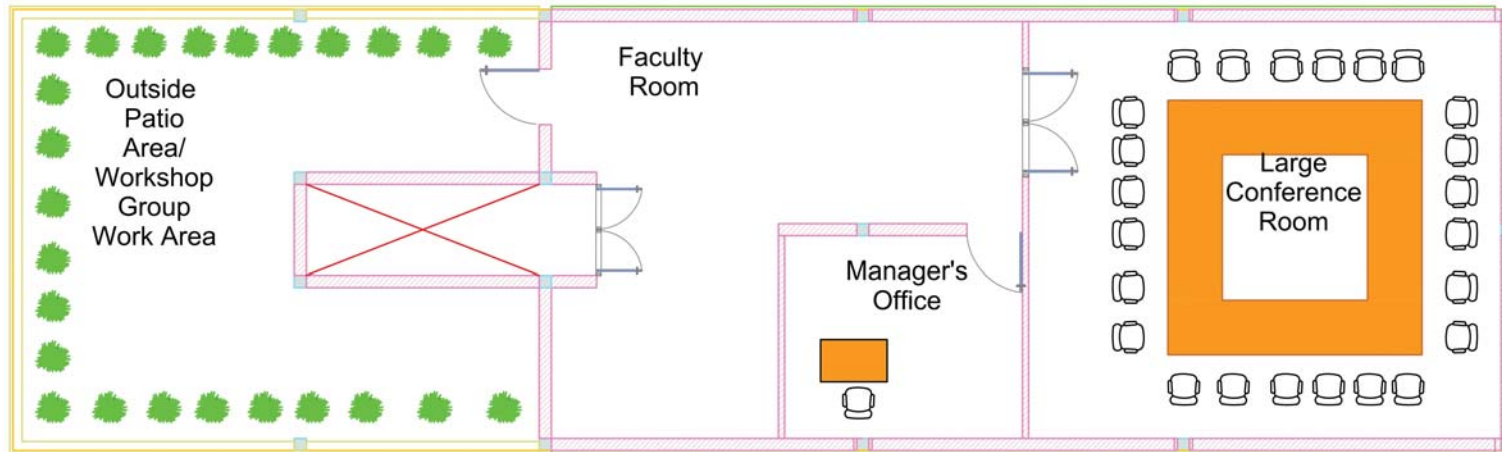
Floor Plan for Auditorium at Prek Leap HS



Floor Plan for the New Generation Pedagogical Research Center at NIE



Floor plan downstairs

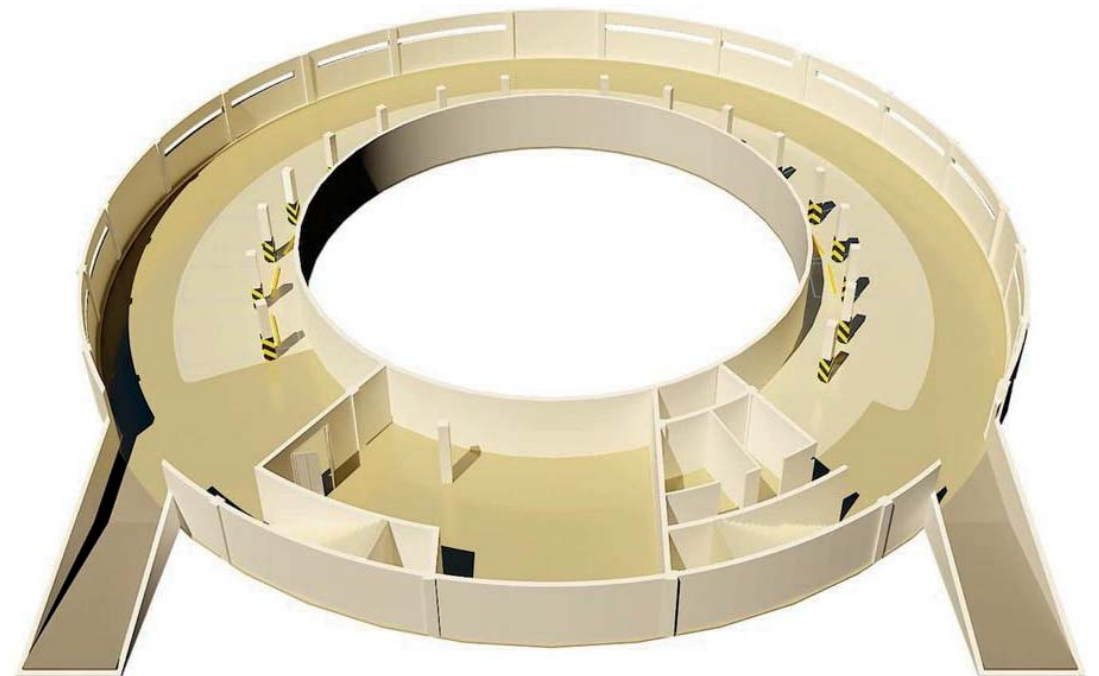


Floor plan upstairs

Floor Plan for a Proposed New Generation Preschool Building of Circular Design







Upper Level






Basement Level (Car Park)



ANNEX 2: Furniture Specifications




Unit Name	Description/Dimensions	Estimated Cost	Illustration
TV Cabinet Location: Library	The TV Cabinet has a Bulletin Board at its back and has the following dimensions: Length: 2.4 m Height: 2.4 m Width: 0.4 m	\$772	
Open Storage Cabinet for Student Back Packs Location: Library	This Storage Cabinet Unit is adjoined to the TV Cabinet and has the following dimensions: Length: 5.2 m Height: 0.8 m Depth: 0.4 m	\$424	



Unit Name	Description/Dimensions	Estimated Cost	Illustration
Library Study Table Location: Library	This Study Table can accommodate 8 students and has the following dimensions: Length: 2.4 m Height: 0.75 m Width: 1 m	\$204	
Research Cabinet Console Location: Library	The Research Console can hold 4 iMac computers (2 on each side). It has the following dimensions: Length: 1.2 m Height: 2.4 m Depth: 0.8 m	\$515	
Audio-Visual Theatre Seating Location: Library	Theatre Seating is located around the TV Cabinet and has the following dimensions: Length: 9.5 m Height: 0.75 m	\$1,062	





Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Full Wall Cabinet Unit</p> <p>Location: Library</p>	<p>This custom-made cabinet is bolted to the wall and has 6 shelves with a seating unit in the middle. It has the following dimensions:</p> <p>Length: 7 m Height: 2.4 m Depth: 0.4 m</p>	\$1,580	
<p>Round Cabinet Unit</p> <p>Location: Library</p>	<p>This unit has 5 shelves with double-sided display. It can hold 5,000 books. The Unit has the following dimensions:</p> <p>Height: 2.4 m Diameter: 2 m Shelf Width: 0.4 m</p>	\$1,351	
<p>Student Seating Unit</p> <p>Location: Library</p>	<p>A Standard Seating Unit has the following dimensions:</p> <p>Length: 1.5 m Height: 0.75 Depth: 0.6m</p> <p>6 Units are generally placed in each NGS Library</p>	\$138 (per unit)	

Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Circulation Desk</p> <p>Location: Library</p>	<p>The Circulation Desk has the following dimensions:</p> <p>Length: 3 m Height: 1.1 m Depth: 0.55 m</p>	\$580	
<p>Wall Divider:</p> <p>Location: Library</p>	<p>This piece helps to divide the space in the library and adds to its aesthetic appeal. The divider has built-in lighting at the top and is usually placed at one of the entrances to the library. It enables the creation of space for an administrator's desk or a discussion area for students. It has the following dimensions:</p> <p>Height: 2.43 m Length: 1.7 M Depth: 0.35 M</p>	\$545	




Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Story Telling Unit</p> <p>Location: Library</p>	<p>Story Telling Unit (1): This furniture unit has 7 rows of seating for young children for purposes of individualized reading or story telling. The unit can seat about 15 to 30 children. The sides of the unit form a cabinet for book display and storage, thereby serving a multi-purpose function. A large door on one side of the unit provides access to an area under the sitting space for the storage of large boxes or pieces of equipment. It has the following dimensions: Height: 2.5 m Length: 3.0 m Width: 2.4 m</p>	\$920	
<p>Circular Seating Unit</p> <p>Location: Library</p>	<p>This unit is located around a supporting pillar and has the following dimensions: Bottom: (H:0.35, D:2 m) Top: (H:0.8, D:1.3 m)</p>	\$500	

Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Wooden Floor Tile & Carpet</p> <p>Location: Library</p>	<p>The library floor is designed with wooden parquet flooring and earth tone carpeting.</p> <p>Baha Carpet: 5 mm thickness/ gold color/ 48 sq.m</p> <p>Wooden floor: 64 sq.m</p>	\$2,046	
<p>Student Desk for Non-science Classrooms</p> <p>Location: Classrooms</p>	<p>Student Desks are made of a steel frame (30 x 30 x 1.5 mm) and are spray painted with a white gloss. Each desk has the following dimensions:</p> <p>Length:1.1 m Width: 0.55 m Height: :0.75m.</p> <p>Blue: Soc. Science Red: Language Black: Math Orange: English</p>	\$44	 


Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Student Chair for Non-science Class-rooms</p> <p>Location: Class-rooms</p>	<p>This is a plastic chair with light metal frame of various colors (Vietnam Product Code 190). Chair Color is matched with Desk Color</p>	\$12	
<p>Teacher desk for Non-science Class-rooms</p> <p>Location: Class-rooms; School Principal's Office</p>	<p>Teacher Desks are white with a color strip around its top edge matching the color of the classroom. The Teacher Desk has the following dimensions:</p> <p>Length:1.10 m Width: 0.65 m Height: 0.75 m</p>	\$95	
<p>Front Cabinet Unit</p> <p>Location: Class-rooms</p>	<p>Front Cabinet Units include a white board at the center and two bulletin boards on either side with storage space at the bottom. The unit has the following dimensions:</p> <p>Length:7 m Height: 2.4 m Width: 0.35 m</p>	\$658	 

Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Class-room Storage Cabinet Unit (Back)</p> <p>Location: Class-rooms</p>	<p>Storage Cabinet Units are wall-to-wall units with extensive storage space for educational supplies. They will be provided to all class-rooms except the ICT Lab. Its dimensions are:</p> <p>L: 6, H: 2.4, W: 0.35 m</p>	\$848	 
<p>Student Lab Table with Sink Unit</p> <p>Location: Science Lab</p>	<p>Lab Tables are made of MC ply wood and covered by formica laminated sheets. Table tops are made of black marble with a thickness of 18 mm. Each NGS lab is equipped with 3 table sets each of which has two tables and a sink. The table unit has the following dimensions:</p> <p>Length:1.5 m Width: 0.8 m Height: :0.75 m</p> <p>The sink unit has the following dimensions:</p>	\$351/set	 

Unit Name	Description/Dimensions	Estimated Cost	Illustration
	Length: 0.7 m Width: 0.5, Height: 0.75 m (includes two faucets)		
Student Lab Stools Location: Science Lab	Stainless Steel Lab Stools can be locally made. They have the following dimensions: Height: 0.45m Diameter: 0.3 m	\$15	
Teachers' Science Lab Desk Location: Science Lab	Teachers' Science Lab Desks will enable teachers to do classroom demonstrations of experiments. They are equipped with a black marble top, a sink, and storage underneath. They have the following dimensions: Length:1.5m Depth: 0.8 m Height: 0.75 m	\$329	

Unit Name	Description/Dimensions	Estimated Cost	Illustration
Student Computer Lab Tables Location: ICT Lab	Computer Lab Tables with fluted edges are emplaced along the perimeter of the ICT Lab. They have the following dimensions: Length: 23 m Depth: 0.6 m Height: 0.75 m	\$2,130	
Central Computer Lab Table Location: ICT Lab	An oval Computer Lab Table is emplaced at the center of the lab and seats 8 persons. It has the following dimensions: Length: 3 m Width: 1 m Height: 0.75 m	\$350	
Conference Room Furniture	A set of Conference Room Furniture will include a long Conference Room Table and a Cabinet with built-in White Board and Storage similar to what is used in classrooms. The Conference Room Table will have the following dimensions: Length: 5.5 m Width: 1.4 m Height: 0.75 m	\$1,118	

Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Conference Room Chairs</p> <p>Location: Conference Room</p>	<p>30 Chairs of the specifications shown are provided to the Conference Room.</p>	\$50	
<p>Teacher Storage Cabinet</p> <p>Location: Teacher Lounge</p>	<p>This cabinet is located in the meeting lounge and will have the following dimensions:</p> <p>Length: 6 m Depth: 0.35 m Height: 2.4 m</p>	\$848	
<p>Faculty Pantry Cabinet</p> <p>Location: Teacher Faculty Lounge</p>	<p>A Pantry Cabinet provides a place for teachers to make lunch and coffee and has the following dimensions:</p> <p>Length: 5.5 m Depth: 0.4 m Height: 2.4 m</p>	\$1,684	

Unit Name	Description/Dimensions	Estimated Cost	Illustration
<p>Office Cabinets</p> <p>Location: School Principal's Office</p>	<p>Multi-functional cabinets are provided to each school office. The cabinet has the following dimensions:</p> <p>Length: 3 m Depth: 0.35 m Height: 2.4 m</p>	\$480	



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