CAMPUS ON THE SABARMATI

IIT GANDHINAGAR

STUDENT HOSTELS

DESIGN EVOLUTION

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Bobby Desai

Sudhir K. Jain

Harish P. M.

Jaison Manjaly

Marjorie Greene

Mouli Kethineedi

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NOTE:

Most of the text, drawings and graphic material in this publication were prepared by HCP Design Planning and Management Pvt. Ltd. and presented to IIT Gandhinagar in 2012. It is hoped that this publication will be of interest to design professionals as well as others interested in campus planning and development, and that it will also serve as a useful educational tool for students and young professionals.

FOREWORD

Once created, universities may last not just decades, but centuries. Hence, it is a rare privilege for anyone to participate in the process of creating a new university. Establishment of the Indian Institute of Technology Gandhinagar (IITGN) has enabled all of us associated with the Institute to innovate in creating curricula, organizing governance, and nurturing a unique culture and ethos of the Institute. The philosophy of education has been to push traditional boundaries with an emphasis on multi-disciplinary approaches and crosscutting thematic areas.

Just as the Institute endeavours to think out of the box for its academic programmes and governance, it has also been doing so for development of its 399-acre campus on the banks of the Sabarmati River. It is our firm belief that the physical environment makes a huge contribution to shape the processes of learning and knowledge creation. The campus has been conceptualized keeping in mind the long-term objectives as well as the present needs and immediate future. The guiding principles of the campus development have been

- An ambience that attracts visitors and conveys to them that they are on a university campus unlike any they have visited before.
- Functional convenience for the academic community for mutual interaction, learning and research.
- Low energy and resource consumption, as well as minimal upkeep and low maintenance costs.

The engagement of a large number of professionals and academics in brainstorming and in executing the design and construction has enabled us to introduce numerous innovations in the development of the campus. This publication is one in a series that explains the complex decision making, design, and construction process for the new campus. The publications in this series have been made possible because of several visits of Marjorie Greene to IITGN as a Scholar-in-Residence. She worked to systematically compile the various materials presented here, collaborating with IITGN colleagues as well as our architects and consultants.

ABOUT THIS PUBLICATION: This publication showcases the architectural design of the Hostel Complex in Phase I of campus development, building from goals and objectives set forth in the Masterplan. The architects selected for this challenge were HCP Design Planning and Management Pvt. Ltd. who led a large team to complete this vital component of campus development.

Sudhir K Jain
Director and Professor
Indian Institute of Technology Gandhinagar

EXECUTIVE SUMMARY

Understanding the Campus

The site for the IIT Gandhinagar campus, 399 acres in area, is located on the banks of the Sabarmati River. The topography of the site, as well as its regional context, dictated much of the campus design, including the Hostel Complex.

Evolution of the Masterplan for the Hostel Complex

The Masterplan for the campus provided the overall framework and design context for each of the campus components, including the Hostel Complex. A competitive selection process was used to select the architects for the hostels, with HCP Design Planning and Management Pvt. Ltd. winning the competition. These architects then developed their design approach with the intent to create a unique, attractive space and to create a functional space.

The design of the hostels was worked out in a very democratic fashion, with active participation from faculty and from students. The hostels were designed to be non-conforming, thought-provoking spaces. The buildings are not oriented in rigid squares or along a grid line but rather in ways that suggest breaking of certain patterns.

Designing the spaces to create community was at the core of the design philosophy and approach. The central court is the principal organising element around which the hostel buildings are arranged. It is a strong concourse with visual and physical connections to the river and the Central Vista. Within each hostel there are also courtyards that serve as neighbourhood public spaces.

Hostel Masterplan and Cluster Design Components

A primary pedestrian street serves as a unifying feature and circulation spine for the cluster of buildings that form the Hostel Complex. In India the street has always been a public space for people to meet and gather. Drawing from traditional references of the region, the pedestrian street has been designed to connect the hostel buildings as a varied route and a showcase of activity.

The courtyard of each building has been designed to be its life and soul. These courtyards can be customised with art, sculpture and landscape elements to reflect the student residents in each.

Various room sizes and furniture arrangements are possible. The design of the one and two person rooms was reconfigured after initial discussions

to account for potential additional growth of students on campus.

The dining building or mess for the hostels has been placed at the centre of the Hostel Complex, where it is a hub of activity during mealtimes. It has been designed specifically to cater to the harsh climate of the region, using a Passive Downdraft Evaporative Cooling (PDEC) strategy.

Key design principles also included the orientation and placement of buildings to take advantage of the prevailing winds and to maximise mutual shading; the design of windows to consider orientation, minimise solar penetration and take advantage of prevailing winds; the use of street elements to give urban scale, shade and identity; and the use of trees for shade and spaces for contemplation.

Building fenestration also took into account building orientation to maximise shading. On some floors the windows were placed at an angle to reduce the glare from the sun, and on other floors the orientation of the building to its neighbour meant that the windows would never receive full-on sun.

Confined Masonry Construction

The hostel buildings have been built with the confined masonry construction typology. This is the first application of engineered confined masonry construction in India for a large-scale project involving public buildings. Confined masonry is a building technology that uses the same basic materials found in unreinforced masonry construction and RC frame construction with masonry infills, but with a different construction sequence and system, and better performance in earthquakes.

Landscape Design

The landscape strategy reflects the concept of streets as the activity center. The key principles adopted for the landscape works include the differentiation of primary and secondary streets, accessible entrance foyers and courtyards, separate courtyards for each building, using planters as privacy screens, segregating services onto the secondary streets and periphery, using native species for the plantings, and providing large foliage trees for shading.

ACKNOWLEDGEMENTS

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1 *Understanding The Campus*

The site for the IIT Gandhinagar campus, approximately 399 acres in area, is located along the banks of the Sabarmati River. The topography of the site as well as its regional context dictated much of the design found in the various campus components, including the Hostel Complex. Water is a predominant feature of the site and its surroundings. The length of the western boundary of campus is formed by the Sabarmati River. While in general, the land slopes towards the river, a large area locally slopes towards either of the two seasonal ponds that anchor the Central Vista, or one of the several ravines within the site that ultimately drain into the river. Also, the site had large mature shade trees that were left on the site.

Much of the site, before construction, was level agricultural land

Seasonal ponds

Legend:

- Drainage slope
- Existing trees
- Ravines or "kotars"
- NMPB Arboretum
- Ponds
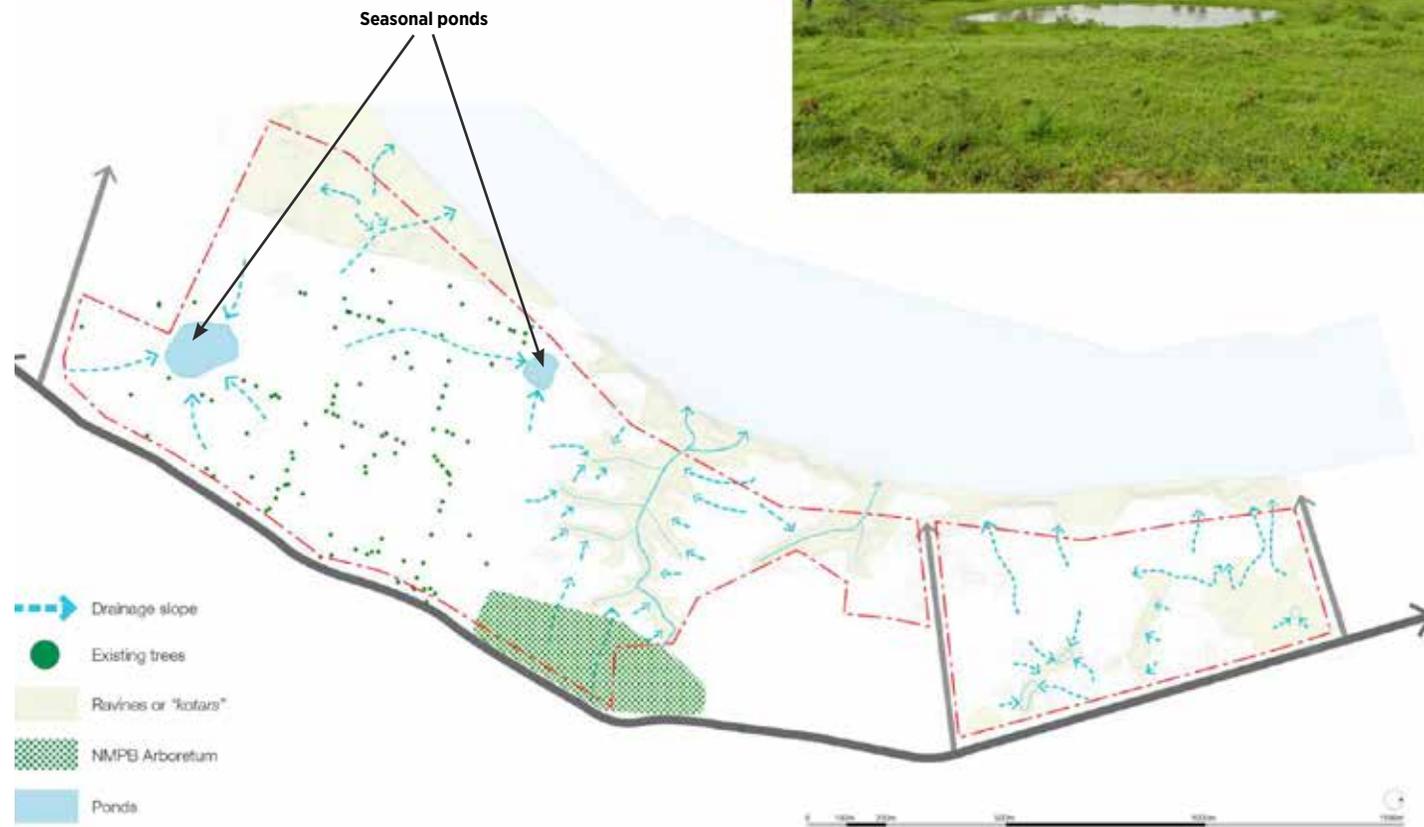
Local slopes drain into one of two seasonal ponds on site

The site prior to construction

Proximity to the Sabarmati River offers diverse, seasonal vistas and opportunities for connections to the river bed

The large, flat land with distinct tree lines suggests the layout of site activities

View of hostels from one of the seasonal ponds

2 *Evolution of Masterplan for Hostel Complex*

A competitive selection process was used to select the architects for the Hostel Complex, with HCP Design Planning and Management Pvt. Ltd. winning the competition. In addition, the landscape architect for the campus Masterplan provided peer review and guidance for the landscape design for the Hostel Complex. The Masterplan for the campus, described in a separate publication in this series, Planning the Sustainable Campus, provided the overall framework and design context for each of the campus components, including the Hostel Complex.

The Hostel Complex forms the background to all campus activities. The experience of living there becomes part of the legacy that the students will take with them at graduation and design of the space directly affects this experience. In the view of the hostel architects, good design is a solution for all practical problems, where spatial organization and circulation is governed by logistical, economic, ergonomic, operational and aesthetic considerations. Honest design with a clear underlying logic is that which is robust and elegantly constructible.

Aerial view of the campus as it is expected to look when completed. Brown buildings are Phase 1 Hostel buildings

2.1. Underlying Philosophy of Hostel Design

The design of the hostels was worked out in a very democratic fashion, with active participation from faculty and from students. Similar to the academic philosophy for the new campus that places an emphasis on fostering meaningful cross-disciplinary interactions, the hostels were designed to be non-conforming, thought-provoking spaces. The buildings are not oriented in rigid squares or along a grid line but rather in ways that suggest breaking of certain patterns. The spaces are meant to suggest that IITGN students are independent, democratic, rule-breaking innovators. Not only does the site plan for the hostels include rule-breaking placement of buildings and paths, but also the buildings themselves have been designed to each have a unique identity. Each building has a different configuration, a different number of rooms, and a layout that opens out differently into public spaces.

The spaces have been designed to draw students out of their rooms and to foster interactions. There are not that many common rooms in each hostel building but rather each building opens onto common spaces that facilitate interaction. The hostel design does not encourage students to sit by themselves. Unlike some other university campuses where students may spend time only knowing people in their own hostel, the IITGN design was developed to force students to get to know each other. There is a common mess, with two dining halls, for all the students and no individual mess in each hostel building. The mess is located at one end of the hostel blocks so that students must walk through the central pathway to get their meals. Some of these design principles came from lessons learned from experiences at the older, established IITs.

2.2. Design Approach

To summarise the design approach of the Hostel architects, their intent was

2.2.1 To Create A Unique, Attractive Space

- *That responds to context, fitting seamlessly into the Masterplan*
  - optimizing site orientation, while maintaining uninterrupted views towards the river and Central Vista

- *That blends the indoors and outdoors creating in-between spaces that alleviate the harsh climate of Gujarat*
  - blending buildings and the landscape together, creating a holistic campus
  - with unique landmarks and spaces that the students cherish

- *That integrates art with architecture and landscape*
  - creating visual interest, neighbourhood nodes
  - value addition, a splash of colour, a bit of whimsy

2.2.2. To Create A Functional Space

- *That promotes interaction*
  - nodes that encourage the free exchange of ideas, innovation and creative thinking
  - spatial planning that encourages social and academic interactions

- *That pays meticulous attention to details of daily life*
  - innovative means that increase comfort and convenience of the users
  - increases the ease of maintenance and aesthetics

- *That is sustainable in its entirety*
  - promotes material and service innovations
  - is socially cohesive and has economy at its heart

- *That evolves continuously*
  - cyclic process of designing, consulting and decision making, narrowing down a range of alternatives to achieve the best set of solutions from a balanced perspective
  - flexible and adaptable design to suit the changing needs, times and site conditions

2.3. Design Brief

The IIT Gandhinagar student housing campus is being designed for an eventual population of 4800 students. The hostel blocks have an average occupancy of 200 students each and are arranged along a series of streets. These streets bind together the phased development of the campus, but more importantly they are a place to meet, relax and work.

When designing the overall form and distribution of the hostels, detailed consideration was given to orientation, prevailing winds, and the campus Masterplan stipulation to maximize the opportunity for mutual shading of buildings.

Some elevations clearly cannot benefit from mutual shading. These areas are exposed to the harsh elements, and have been designed to provide protection and respond to their specific orientation and location.

The environmental studies conducted by the architects resulted in a design matrix of elevational elements, which, when combined on the basis of orientation and level, creates diversity and location-specific elevations. This approach, together with the overall hostel block designs, results in exciting and individualistic hostel blocks each with its own identity and character.

Using the street concept as a basic design tenet meant that the ground and first floors provide the urban feel of traditional streets in terms of scale, activity, shading and variations in form.

There is a legible hierarchy between all the elements of the design from:

- The scale of the primary and secondary streets,

- The form and orientation of the hostel buildings,

- The locations of the Mess Halls,

- The entrances to the hostel blocks,

- The location of social facilities along the streets,

- The window and façade design of the individual hostel rooms, based on location and orientation.

The campus and its buildings offer a variety of public and private spaces, public spaces that take their form and scale from traditional Indian chowks and streets, where social interaction is encouraged. The hostel buildings have their own surprising open social spaces at different levels, which will promote a sense of belonging in the residents. The buildings have their own individual faces and character, whilst, importantly, responding to the harsh Ahmedabad climate.

2.4. Design Parameters

- Proximity and juxtaposition of each block

  » Six unique buildings or blocks bind together to form the Hostel Complex of the IIT Gandhinagar campus.

  » Each block emphasises its uniqueness, creating a unique spatial experience in itself.

  » The internal meandering street patterns add dynamism and an ever-lively feature to the campus.

- Visual connectivity

  » As one travels through the Hostel Complex, the streets open out to various interactive spots. The trees along the avenues surprise users by framing views at the end of each perpendicular street.

- Universal accessibility

  » Ramps are provided throughout the blocks to ensure universal accessibility.

- Response to micro climate

  » The southern edge of the parcel has a continuous green belt with taller trees to cut off the harsh glare of the sun.

- Hierarchy of streets

  » Three categories of streets have been developed, i.e., the main street, secondary streets and plazas.

- Hierarchy of spaces

  » The internal streets open out to informal sitouts and further connect to individual units.

  » Every individual building encloses a courtyard that acts as a multi-utility space and informal meeting spot for the students.

  » All the common rooms in hostel blocks open out to the courtyard. These informal spaces add life to the parcel block.

- Bicycle paths and sufficient bicycle parking pockets encourage the students to use bicycles - an environmentally-and people-friendly transport mode. The hostel block ensures bicycle parking on three accessible sides of the parcel.

  » Multiple access points provide ease of access to any block from either side of the parcel.

- Landscape strategy

  » The hardscape and built-in furniture has been selected for its durability, and ease of maintenance without compromising the comfort level of the end users.

  » The streetscape including tree-lined paths encourages informal interaction, creating lively connecting links and pathways between the individual units throughout the complex.

- Common amenities

  » Common amenities such as the library, cafeterias, student administration office, and laundry add to the efficiency and compatibility of each block.

  » All the amenities are easily accessible from all the blocks in the complex.

2.5. Hostel Masterplan Constraints And Opportunities

The core of the IIT vision is to instill in students the values of education, research, and the spirit of continuous engagement and contribution towards the socio-economic transformation of the country. IITGN enriches this tradition with its own foresight; incorporating sustainable technological solutions into its curriculum and in daily campus life through forums such as annual technical event Amalthea; fostering engagement with the large community through volunteering initiatives such as NYASA; and supporting an active extracurricular life through cultural festivals such as Blithchron. The architects' design approach was grounded with IITGN's vision, through both the tangible--the place--and the intangible--the spirit--in creating a hostel complex that is ever-evolving yet rooted.

The architects proposed imbibing the character of a traditional Indian street in the design of the complex to unify all the elements. Hostel buildings are arranged along a series of streets that offer a variety of public and private spaces. The buildings each have their own individual character.
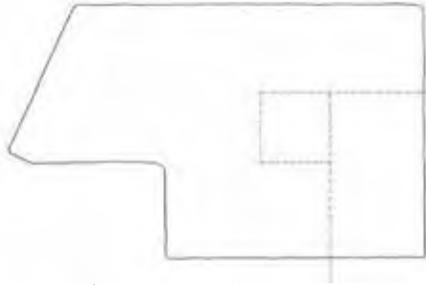
Masterplan constraints

Investigating cluster organization
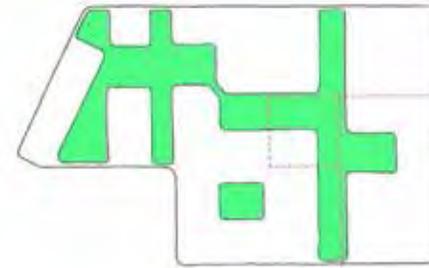
Primary connected open spaces
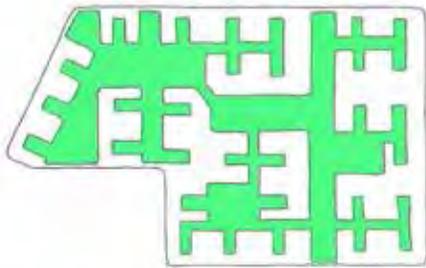
- Primary connected open spaces
- Linking landscaped entrance spaces

- Primary connected open spaces
- Linking landscaped entrance spaces
- Organising the accommodation in clusters
- Establishing connectivity and orientation of entrances
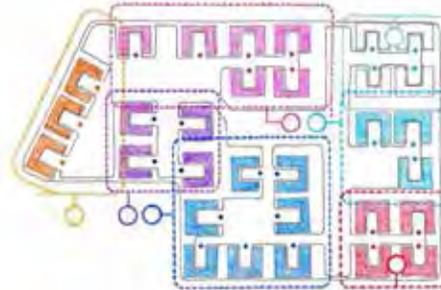
Entrances and neighborhood clusters

2.6. Urban Design Controls

The Masterplan provided the architects with certain guidelines in the form of Urban Design Controls. These formed the basis of several core designing principles.

These guidelines have been roughly summarised diagrammatically on the next page.
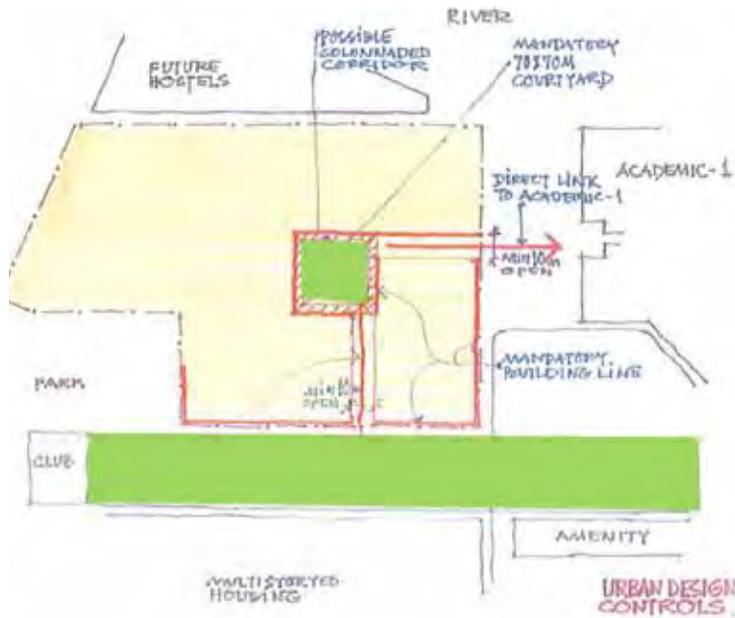
Masterplan Urban Design Control diagram
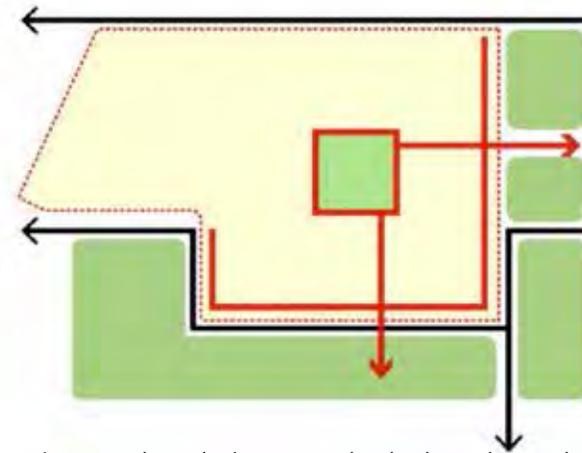
As per urban design controls, the hostel parcel must have a central court with a direct link to the landscaped Central Vista and the Academic Complex.
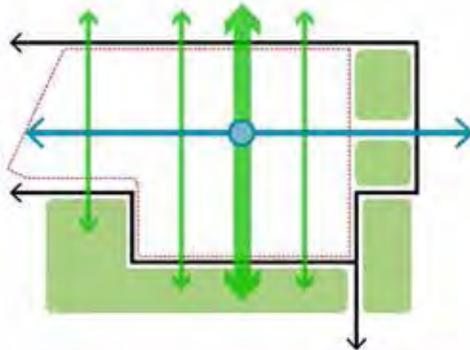
The central court is the principal organising element around which the hostel blocks are arranged. It is a strong concourse with visual and physical connections to the river and Central Vista. The central court has a direct pedestrian connection to the Academic Complex.
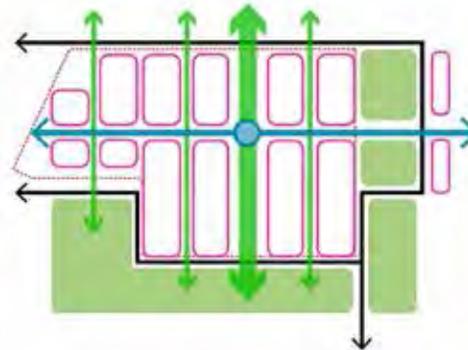
The hostel blocks touch the edge of the central court, Central Vista and northern boundary defining the shape of the parcel. A continuous line of hostel blocks define the long edges of the central court. The shorter edges open onto the River Promenade and Central Vista respectively.
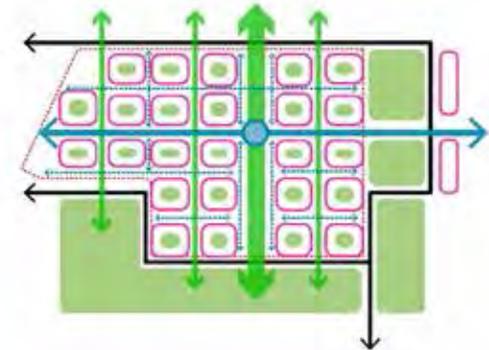
A courtyard building typology was followed for the individual hostel blocks. These courtyards are personalized public spaces for each building. They improve the microclimate of the building. The hostel blocks are connected by shaded pedestrian streets which form a secondary public space.
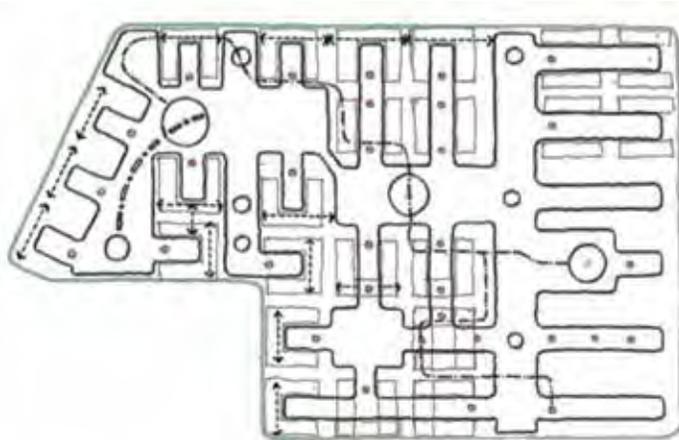
Investigating movement patterns and connectivity

Distinct landmarks
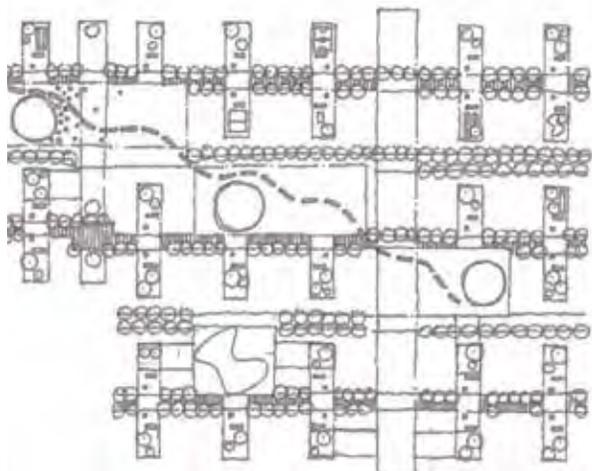
Connectivity and organisation concept

The connected green landscape

View of completed hostels

2.7. Evolution of Hostel Masterplan
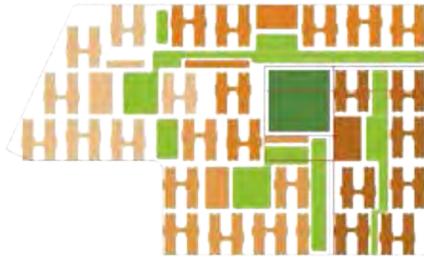
Linear block _ Option 1
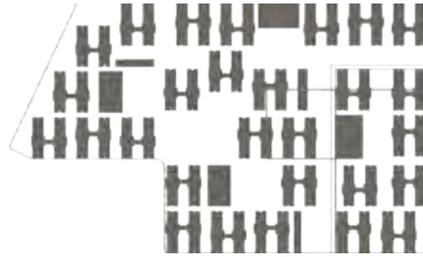
Linear block _ Option 1
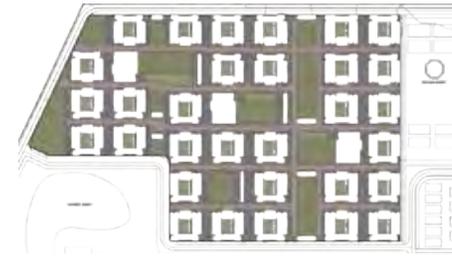
Stage - 01
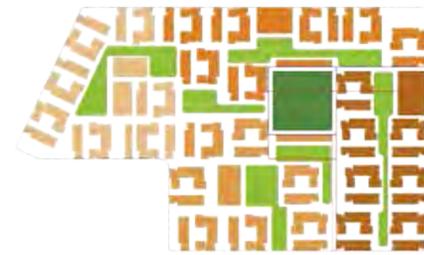
U shape block _ Option 2
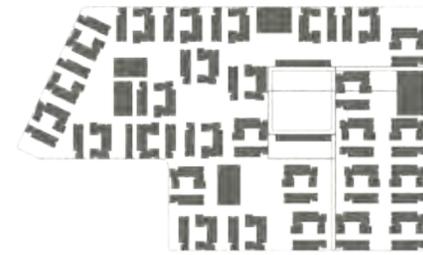
U shape block _ Option 2
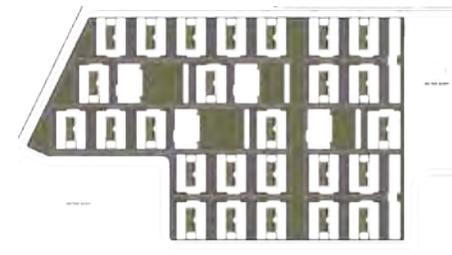
Stage - 02
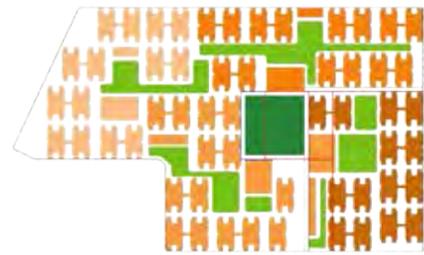
Point block _ Option 3
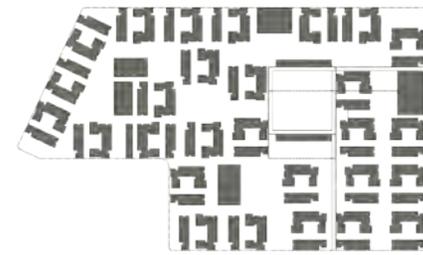
Point block _ Option 3
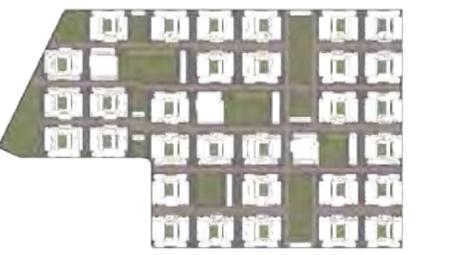
Stage - 03

Three different block types across all phases _ Option 4
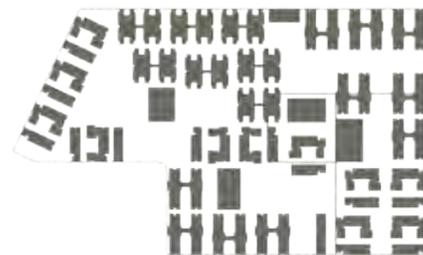
Composite Block _ Option 4

Stage - 04

2.8. Hierarchy of Public Spaces

A hierarchy of spaces enables the transition from private, semi-private to public, and to the campus-wide public space to take place with ease.

- The unit is a private controlled space for the student to study and to be in solitude.

- The courtyard is a semi-private space at the neighbourhood scale for each hostel block.

- The pedestrian street is a secondary public space, connecting all the hostel blocks and dining hall, housing movement and activity.

- The central court is a grand concourse, a campus-wide public space. It maintains clear views towards the Central Vista and river. It is an axis around which the hostel blocks are organised. It is envisioned that both sides of this green will be eventually lined with hostels and a dining hall on either side.
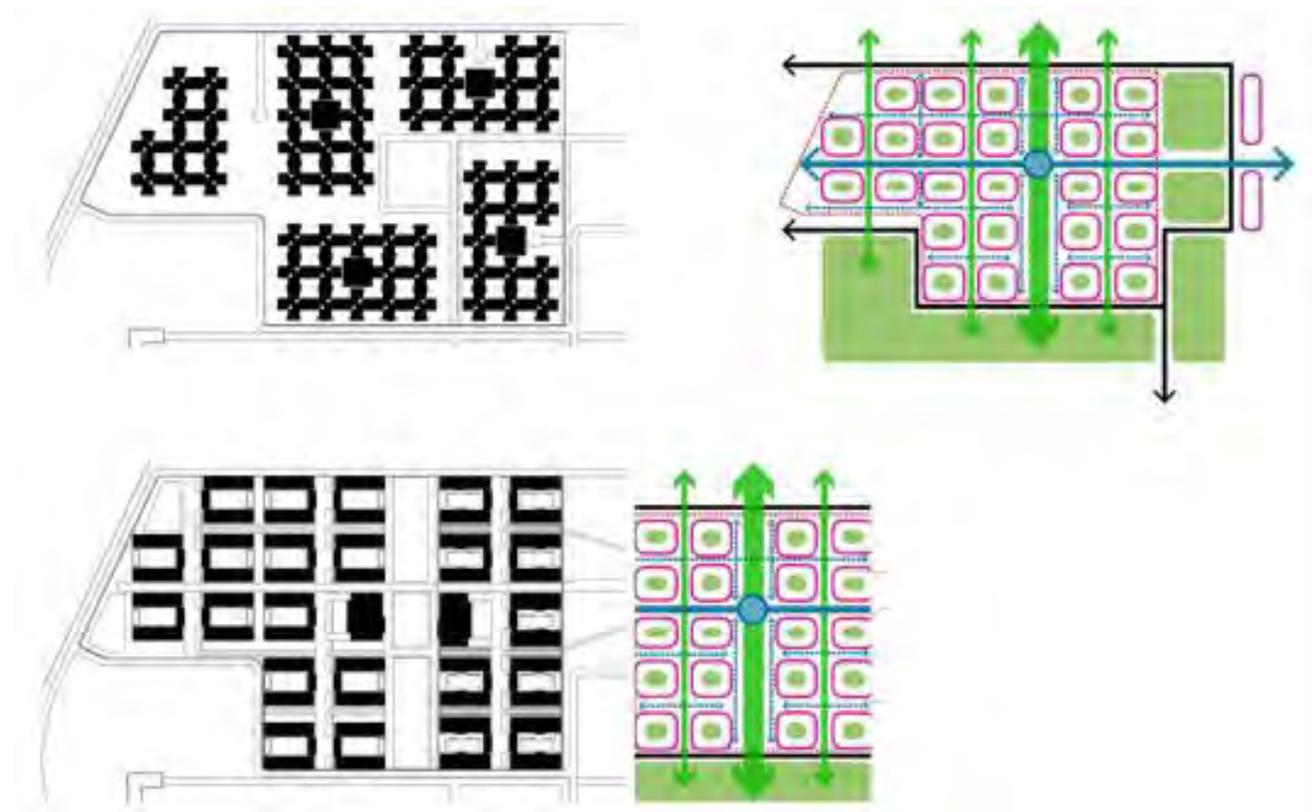
3

Hostel Masterplan And Cluster Design Components

3.1. Hostel Masterplan Phase 1A (1200 Students)

Ultimately the campus will accommodate 4800 students. Phase IA includes just the six buildings circled in the figure below.

Phase 1

Hostel Buildings in Phase 1

GROUND FLOOR   FIRST FLOOR   SECOND FLOOR   THIRD FLOOR

EAST

WEST

NORTH

SOUTH

Building fenestration as per orientation of the buildings

3.2. Key Design Principles

Several simple strategies were used in the design process to provide a sustainable and comfortable environment:

• Orientation and placement of buildings to take advantage of the prevailing winds and maximise mutual shading

• Window design to consider orientation, minimise solar penetration and take advantage of the prevailing winds

• Street elements to give urban scale, shade and identity

• Trees to provide shade and create spaces for contemplation.

Careful thought was given to the orientation of the buildings and the design of the windows to maximise shading in the hot summer sun. A shadow pattern study was conducted at different times of the day over a year period to determine the best orientation for the buildings. The architects also judiciously designed the placement of the windows to take advantage of the shadows cast by neighbouring buildings. On the first and second floors of the east and west walls of the buildings, the windows were oriented straight out, because they will always be in the afternoon shadow of the neighbouring building. The second and third floors of the same buildings, however, have windows that are recessed at an angle so the sun will not shine directly in. These floors do not benefit from the shadow of the neighbouring building.

17

09 am   12 pm   03 pm   MARCH
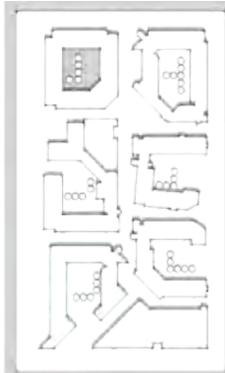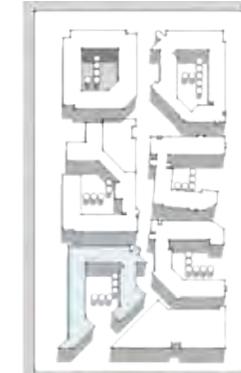
09 am   12 pm   03 pm   JUNE

09 am   12 pm   03 pm   DEC

The orientation and closeness of the buildings helps to achieve mutual shading

Shadow of neighbouring building used to shade the ground and first floor windows. The windows on the third and fourth floors angled to avoid the direct rays of the sun

Energy Efficiency

The efficient use of energy was a key design criterion. Shading and lighting studies were conducted to help orient buildings on the site and in relation to each other. Windows were designed with deep recesses and orientations that maximised shade. A passive cooling system (Passive Downdraft Evaporative System) was designed for the mess, to be used primarily in the four hottest months. Hostel energy consumption is monitored each month, and a competition among the hostels is held to see which is the greenest.

Street view – Old city Ahmedabad

3.3. Elements of Hostel Masterplan
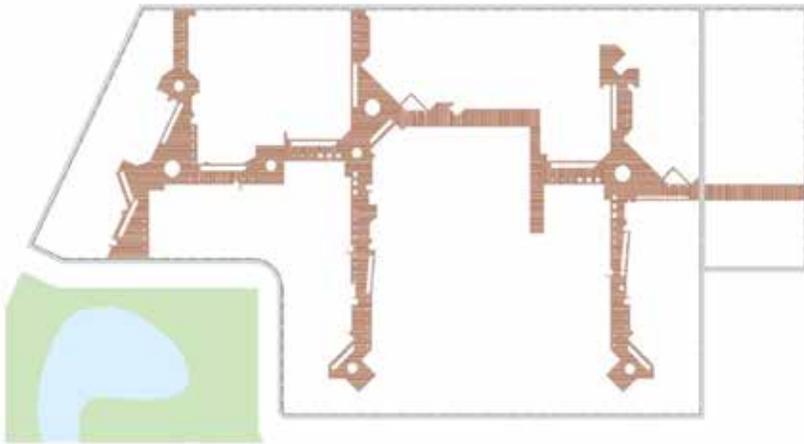
Accessing the site _ Primary Connectivity
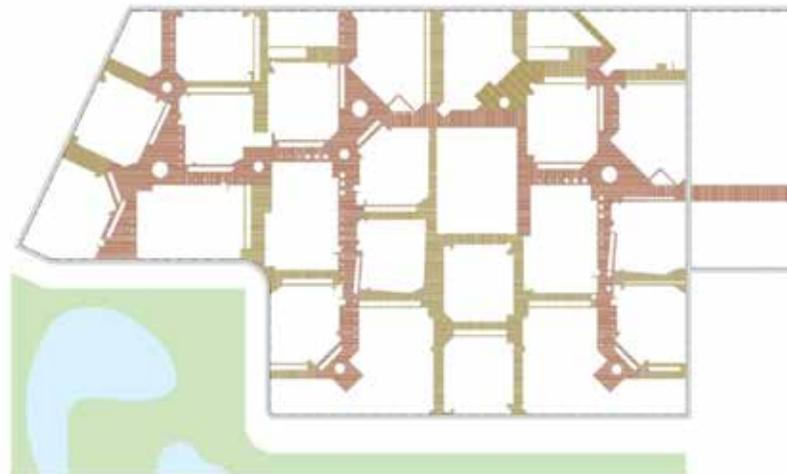
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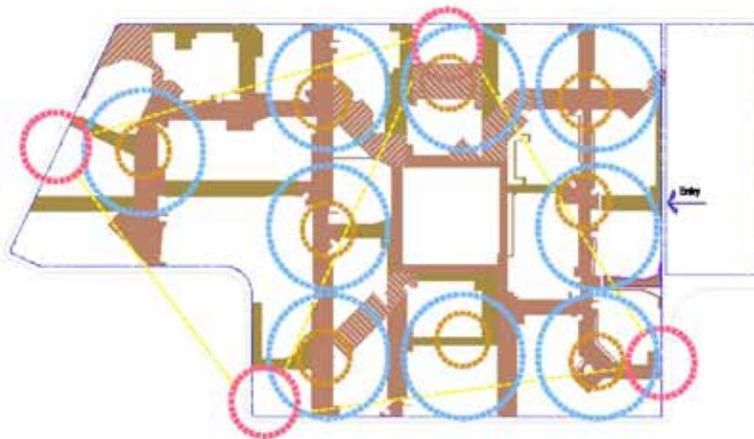
Central Hubs

Green Spaces and Permeability

Masterplan: Elements

3.4. Activity Plan at Cluster Level

Entrance to hostels

Recreational hubs

Dining / Mess

View of main street in Hostel Complex

3.5. Cluster Plan – 1200 Students

3.6. Site Plan and Features

Postgraduate Hostel

Courtyard, Undergraduate Hostel

Amenities
At cluster level, these small amenities open onto the streets and form nodes of activities

Central Court
A campus level public space around which the hostel buildings are arranged. The central court maintains uninterrupted visual and physical connections to the Central Vista.

Link to Academic Complex

Undergraduate Hostel

Girls Hostel
The required number of rooms for girls in phase one can be accommodated in one building. The girls hostel is positioned with proximity to the central court and its edge towards the academic complex and Central Vista. When the campus reaches its full strength it would make sense to group all the girls hostels together.

Link to Academic Complex

Secondary Pedestrian Street
Bicycle parking for adjoining hostel buildings

Pedestrian Street
Main circulation entry connecting at the hostel bluildings and dining hall

Undergraduate Hostel

Postgraduate Hostel

Dining Hall
Connects the pedestrian street to the residential zone

IITGN believes in ownership of the campus by the students. Students were involved in the design process and the multiple iterations that the constantly changing designs required. All hostels are managed by students through the hostel maintenance committee. In each hostel, a resident caretaker follows up on all routine maintenance issues, and the warden is ultimately responsible for hostel administration. Each student is issued basic furniture including a chair, study table, cot and mattress at the beginning of the academic year. Students in all hostels have access to a common room, laundry and canteen facilities within their respective hostels. In addition, there are pantries on each floor of the hostels with refrigerators, microwave ovens and induction stoves. There is a general store within the hostel premises to provide the students with basic necessities like stationery, toiletries and snacks.

3.7. Streets And Pathways

Pedestrian Street

In India, the street has always been a public space for people to meet and gather. Drawing from traditional references of the region, the pedestrian street has been designed to connect the hostel buildings as a varied route, a showcase of activity.

This street is the outdoor activity and circulation spine of the Hostel Complex, Students can sit under the shade of a tree to read a book, take a stroll at night to enjoy the cooler air and traverse the street to get to their destination.

This street can be connected to the pedestrian network of the campus, to sustain and promote a walkable campus.

Contours on site

Street pattern – Old city Ahmedabad

Street pattern – Hostel buildings

Street view – Old city Ahmedabad

Street view – Hostels

3.8. Courtyards and Hostel Buildings

Courtyards in the hostel buildings are neighbourhood public spaces, each with their own personal character.

The everyday activities of the hostel buildings revolve around these courtyards culturally and physically.

Shade-giving trees and landscape aid in passive cooling of the hostels.

The courtyards are designed to be the life and soul of each building, a space to showcase the uniqueness of its inhabitants.

These courtyards can be customised with art, sculpture and landscape elements to best suit user preferences.

Courtyards

The open design of the hostels contributes to their charm and comfort, letting in both light and air. However in heavy rains, particularly if accompanied by winds, there has been standing water in many of the common areas. This requires housekeeping to constantly clear the water, itself not a practical solution. The drainage system for the area needs to be improved.

View 1: Common facilities and landscaping create interaction points

View 2: Multiple storeys and shifting corridors as elements enabling interaction between street, buildings and courtyard

View 3: Central Square opening towards Café and Student Library

View 4 : Introduction of plazas along the streets with raised platforms and sunken courtyards giving diversity to social spaces

Circulation	
Double rooms	
Sick room	
Pantry	
Toilets	
Electrical room	
Canteen	
Printing	
Laundry	
Shops	

Campus Celebrations

Student life in the hostels is vibrant and lively. There are frequent events at the Panchayat Circle as well as multiple festivals, events and celebrations of all sorts. Organising and celebrating over sixteen activities throughout the year, some of the highlights include: Amalthea, an annual technical summit that showcases some of the IITGN work as well as offers a platform for others in academia and industry to come and interact; Jashn, a three-day cultural fest with art, music and dance; Hallabol, an all-night sports event that includes staff and faculty participation; and Winter Carnation, an IITGN mela (assembly) where the IITGN family collectively enjoys regional food, music and dance. Winter Carnation has proven to be a broad platform for interaction among students, faculty and staff.
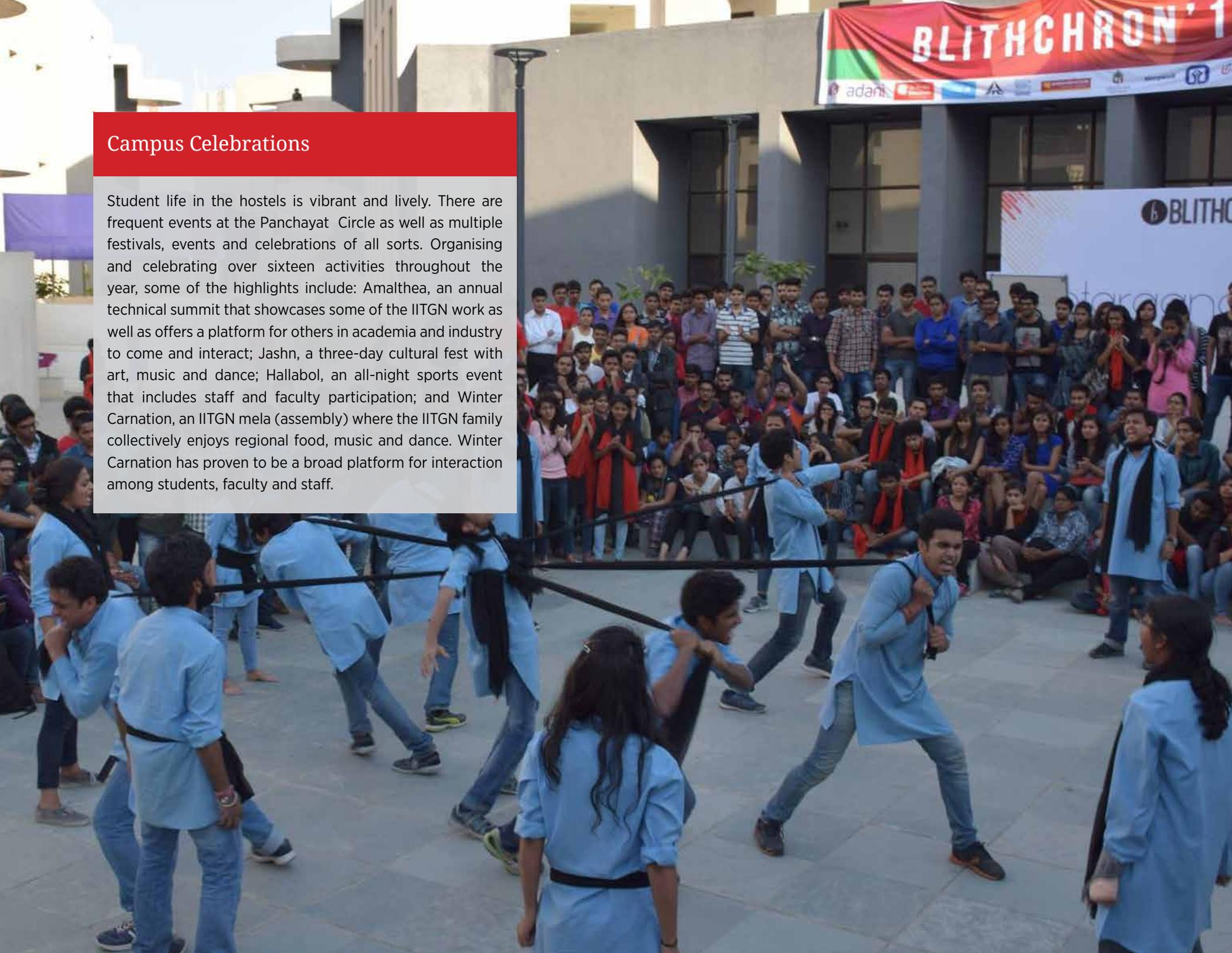
3.9. Site Model

3.10. Room Layouts and Flexible Configurations

Various unit sizes and corresponding furniture arrangements are possible. The preferred unit size and furniture layout have an economical use of space but can be customised according to user preferences. The design of the one person and two person rooms was reconfigured after initial discussions to account for potential additional growth of students on campus.
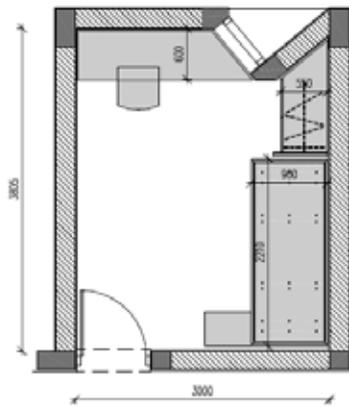
Single room with inclined window with entry from other side
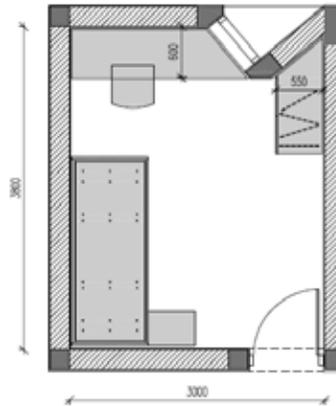
Single room with inclined window with entry from same side
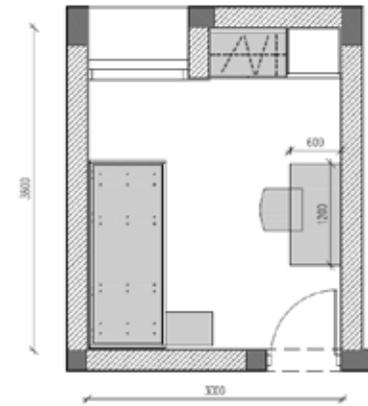
Single room
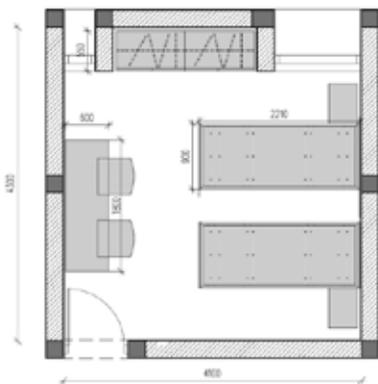
Double room with different entry door
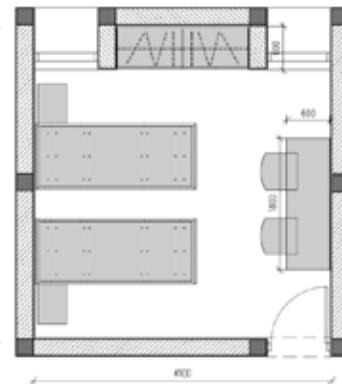
Double room with different entry door
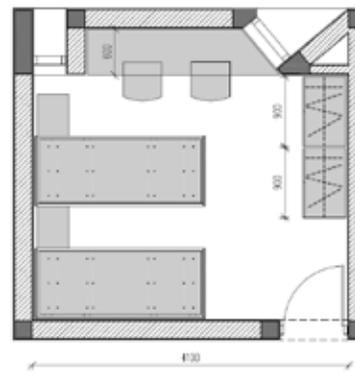
Double room with inclined window and entry door same side
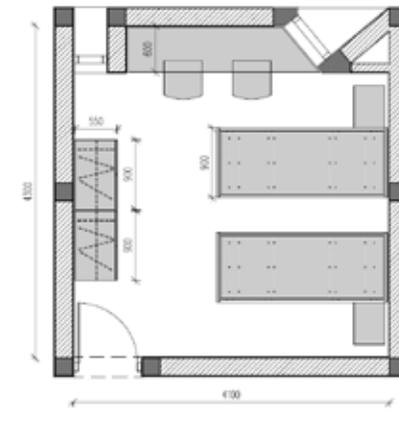
Double room with inclined window and entry door opposite side

This was a key lesson from older IITs, that at some point in the future the numbers of students may grow beyond planned numbers due to factors outside the control of the IITs. IITGN planners asked the architects to prepare drawings to show how furniture arrangements could be modified to accommodate additional students. So the arrangement for what is now a one person room can be modified to accommodate two people if necessary; the two person room can accommodate three, if necessary. This meant making sure doors, windows and closets were placed in such a way that additional furniture would fit in each of the rooms. Two beds are now in many of the rooms originally designed for one bed.

During the design process, the Institute focused on designing the hostels with single rooms (and some double rooms), to afford everyone maximum privacy. But once the construction began, students realised that several people in a room made for a more convivial atmosphere, and led to better friendships and more opportunities for interaction. Student input into the design of the Phase II hostels has led to triple bed rooms also.

Architect's drawing to show how a single room could be configured for double occupancy
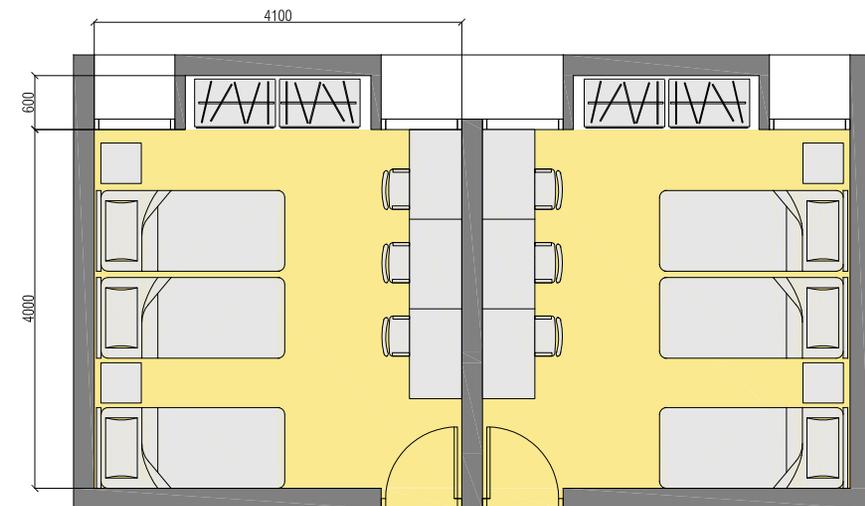
Architect's drawing to show how a double room could be configured for triple occupancy

3.11. Arrangement Modules

Hostel years are years of character building, developing students into exemplary young professionals. The built environment is a significant part of every student who passes through these halls of learning. Students often look back on their hostel life with fond memories and nostalgia.

The built environment of the hostel is designed to be conducive for studying, discussions, leisure, recreation, as well as every day activities that take place simultaneously. Several groupings of the units are possible.
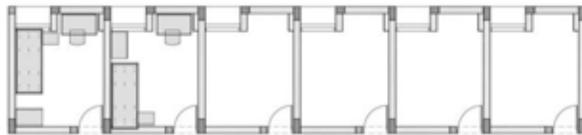
The clusters can be arranged along a doubly loaded corridor. This allows for a maximum number of rooms on every floor.

The rooms on each side of the corridor protect it from direct heat gain. The cooler corridor aids in cross ventilation.

The doubly loaded corridors define the sides of the courtyard

Toilets

The main entry to the hostel block, with the staircase and lift for vertical circulation

Girls' Hostel Block
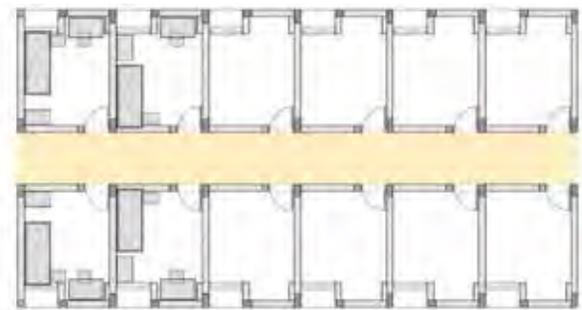
Arranging units of the same type around a common courtyard is the most functional and economical arrangement for a hostel. This arrangement provides the students a hierarchy between their individual space and a common space.

3.12. A Hostel Plan

Double Occupancy Units
Provide space for quiet contemplation and study

Toilets

Courtyard
An everyday gathering space, for social and academic interactions.

Balcony
Spillover space from the pantry/ common room overlooking the courtyard, a spread of vertical activity

Common Room

Corridor
Doubly loaded with units on both side, carry the activity around the building

Single Occupancy Units
Provide space for quiet contemplation and study

Pantry
A kitchenette for a late night snack

PG2 Hostel Block

The Naming of the Student Hostels
written by Prof Harish P. M. to the students in March 2017

We discussed recently that we would try to come up with our own hostel names instead of using existing words. We have come up with a few names below, given the following design objectives:

1. New words, should not mean anything

2. Simple to remember, neither too long nor too short

3. Should not have a strong cultural affinity to any one culture (e.g. the names should not be a typical French word, or a typical Russian or Arabic word, etc.)

4. At the same time, the sounds and pronunciation of the word should be comfortable to Indians (after the names start to get established, they should slowly start to feel Indian and not very exotic)

5. Should be able to write them in devanagari script easily (without it looking awkward)

6. A google search on them should not reveal any already established items (many of them still show several hits and even some existing names, but once we establish, it would be easy for us to dominate the google search page)

7. Starting letters form an alphabetical series to aid in wayfinding. This will be important as there will be 20+ hostel buildings eventually within the same parcel. At the same time, I have looked carefully and it appears very unlikely that we will exceed 26 (number of letters in alphabet) in this parcel.

8. It sounds ok even if a donor name is later appended to it (prefixed or suffixed). With these objectives, the proposed names are:

AIBAAN   - ऐबान

BEAUKI   - ब्युकी

CHIMAIR - चिमेयर

DUVEN   - दुवेन

EMIET - इमएिट

FIRPEAL - फिरपील

I also tried to see if these were names that could not be easily turned into something that can be made fun of, but this can never be perfectly met, and moreover, some bantering is fun and ok.

9. We still have to think about naming the mess blocks. It might have to be a separate series that is distinctly different (maybe very short words, or long words, or something else distinctly different about them).

Director Prof Sudhir Jain addressing Bada Khana attendees

Students on sleeping mats

First night in the hostel

Students in the Class of 2015 were just finishing in May of that year, having spent all their four years at the temporary campus of IITGN -- at Vishwakarma Government Engineering College in Chandkheda. The Institute was preparing to move to the new campus in July of 2015, and to hold the Convocation for this batch at the new campus. So these students would be coming to the new campus in July for their first official, and in many cases final, event. However, before that,

Aibaan Hostel

on May 2nd , one of the hostels was inaugurated and a '*Bada Khana*' was arranged in celebration of the new campus, still in various stages of completion. The Bada Khana (meaning big meal) was meant for all members of the IITGN community, including construction workers, construction contractors and the project management team. So the students asked if they could spend the night after the Bada Khana at the new campus. IITGN agreed, organising a night in the hostel, Aibaan, that was the most complete at that point. There was no furniture so the Institute organised rolled-up bedding for the students and they camped out for one night in the new hostel. The Director, together with Professors Harish P. M., Jaison Manjaly and Atul Bhargav also camped out, staying in one of the apartments in Housing Block 30.

Dining Building- Entry View

3.13. Dining Building: Passive Cooling in the mess

The dining building occupies a pivotal position in the Hostel Complex. It is placed at the centre of the hostel parcel. During mealtimes this area is a hub of activity. An open platform functions as a spill-over space that has been developed as a shaded outdoor dining area. A central facility for all students with two independent mess facilities, the building is equipped with modern kitchens. This two-storey building caters to 1200 students. It has been designed specifically to cater to the harsh climate of the region. A Passive Downdraft Evaporative Cooling strategy has been adopted with an effort to minimize energy consumption.

Area : 3803 sq m
No. of Occupants : 300 people per floor
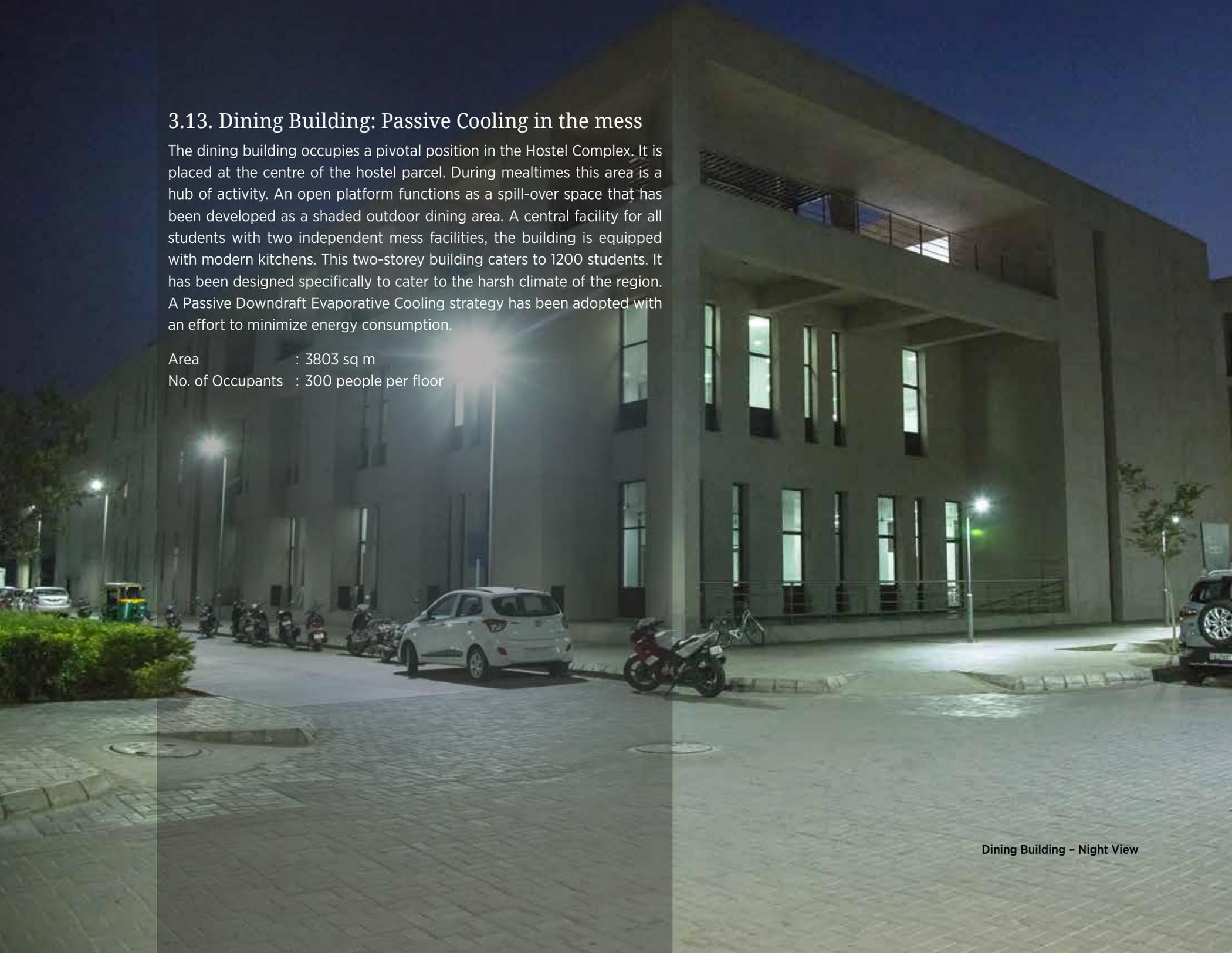
Dining Building – Night View

Landscaping in the Hostel area

3.13.1. Parametric Analysis

To understand the type of passive strategy to be used in the Dining Building, the climatic data of the location of the building, i.e., Gandhinagar, Gujarat has been studied and analysed for a complete year, i.e., 8760 hours.

Climatic conditions during the occupancy hours were analyzed in the software programme Ecotect.

Based on the results of the analysis, the building was divided in two different zones on the basis of occupancy and usage: Dining Area and Kitchen/ Food Prep Area. The dining area has three major occupancy schedules during the day- Breakfast, Lunch and Dinner. Each mealtime presents different challenges in terms of controlling the temperature, as illustrated in the figures on this page.

Gandhinagar is a BSh koppen classification: Hot semi-arid

3 Main Seasons

Summer	Monsoon	Winter
Mar-Jun	Jun-Sept	Nov-Feb

3 PERFORMANCE STRATEGIES

| EVAPORATIVE COOLING | STACK EFFECT/WIND ASSISTED NATURAL VENTILATION W/ MECH | NATURAL VENTILATION |

CLIMATE: BREAKFAST   CLIMATE: LUNCH   CLIMATE: DINNER
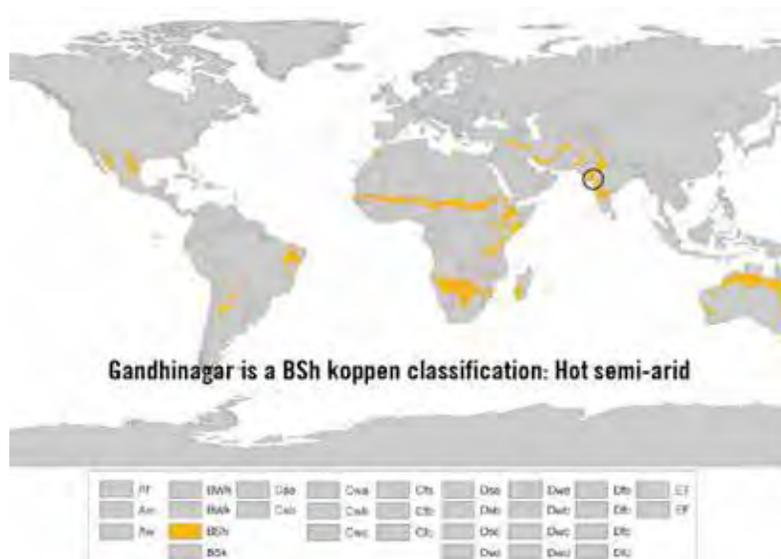
3.13.2. Implementation of Passive Downdraft Evaporative Cooling (PDEC)

Based on the results of the parametric analysis, the architects and IITGN decided it would be necessary to augment natural ventilation during the hottest months of the year. They chose the system known as Passive Downdraft Evaporative Cooling designed by M/S dbHMS Consultants Pvt. Ltd., Noida. In this system water enters a shaft from several nozzles on the roof and sprays a light mist in the shafts. Due to this mist, the air cools down and the heavier cooler air moves down the shaft, where it then enters the mess hall through specific louvers. To determine the PDEC tower design, the architects studied these parameters:

- Tower cross-sectional area
- Tower Height
- Number of Towers Required
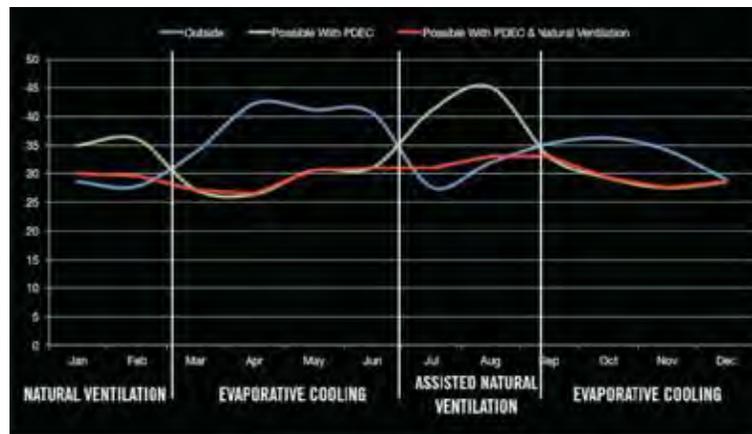
Possible Passive Cooling Strategies

| Observations	Natural Ventilation			Evaporative Cooling				Stack Effect/Wind Assisted Natural Ventilation w/mech			Natural Ventilation	
Months	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
TEMP	Low	Low-Mod	Mod-High	High	High	Mod-High	Mod-High	Mod-High	Mod-High	Mod	Low-Mod	Low
RH	High-Mod	Low-Mod	Low	Low	Low-Mod	High	High	High	High-Mod	Mod	High-Mod	High-Mod

Performance of Passive Strategy

3.13.3. Design Optimisation

The results of the analysis of the options for the PDEC tower are shown in the table and the figures below. It was determined that a single tower provided the most cooling in comparison to the other options. The single tower has a more predictable flow pattern by being centrally located whereas the smaller towers would block the flow to other towers at certain wind conditions.

OPTION 1 : FIVE TOWERS

Tower Number Study
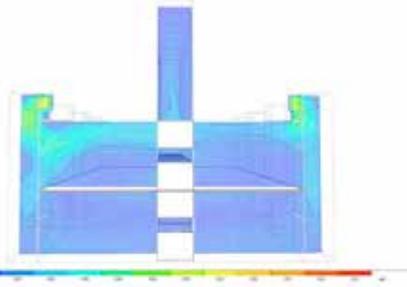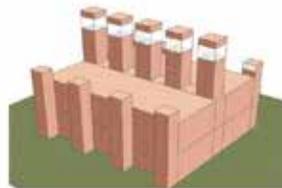
Velocity

OPTION 2 : THREE TOWERS
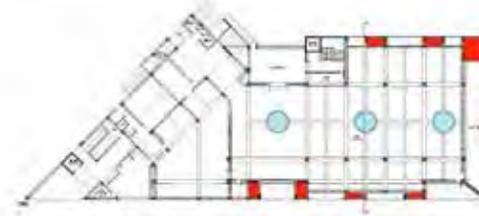
Tower Number Study
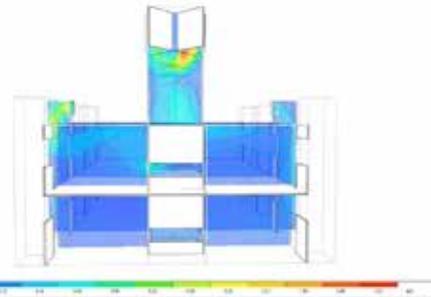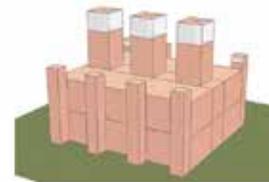
Velocity

OPTION 3 : SINGLE TOWERS
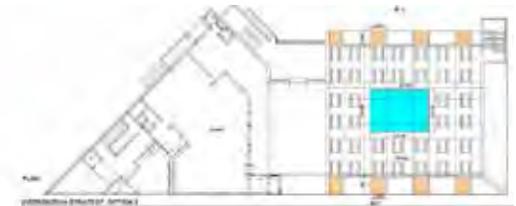
Tower Number Study
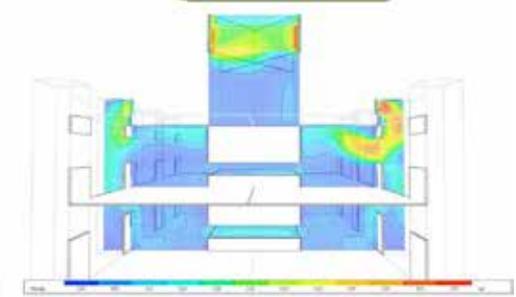
Velocity

	OPTION - 1			OPTION - 2			OPTION - 3		
TOWER AREA (SF)	484 SF (11' x 11')			196 SF (7' x 7')			324 SF (9' x 9')		
TOWER HEIGHT (M)	9	12	15	9	12	15	9	12	15
NUMBER OF TOWERS	4	4	4	4	4	4	4	4	4
COOLING OUTPUT (BTU/SF)	112	128	136	32	38	42	52	63	78.75
REQ OUTPUT (BTU/SF)	62	62	62	62	62	62	62	62	62
AIRFLOW PREDICTED (CFM/SF)	5.5	6.3	7	2.25	2.5	2.9	3.7	4.3	4.3
VELOCITY (M/S)	0.75	0.86	0.96	0.76	0.84	0.98	0.75	0.88	0.88
INLET % OF TOTAL AREA	7.44	7.44	7.44	3	3	3	4.5	4.5	4.5

3.13.4. Building Layout

Ground floor

First floor

Terrace

Dining Block – Conceptual Section

ELEVATION A

ELEVATION B

Inside the shaft of the passive downdraft evaporative cooling system. Cooler air escapes through the open louvers into the dining hall

4 *Confined Masonry Construction Typology*

In designing the new campus, the Masterplan envisaged the use of confined masonry for the construction typology for both the student hostels and the staff and faculty housing. This was the first application of engineered confined masonry construction in India for a large-scale project involving public buildings.

Confined masonry buildings are expected to have better earthquake performance than unreinforced masonry wall construction and reinforced concrete (RC) frames with infills. Evidence from numerous earthquakes in other countries indicates that good seismic performance can be achieved with confined masonry even without a high level of engineering, provided the quality of construction is maintained.

Confined masonry is a building technology that uses the same basic materials found in unreinforced masonry construction and RC frame construction with masonry infills, but with a different construction sequence and system. In confined masonry construction, the masonry walls carry the gravity and seismic loads and RC confining elements are used to confine the walls. These confining elements are critical to its better earthquake performance. They are effective in enhancing the stability, integrity and ductility of the masonry walls. This is in contrast to RC frame buildings with infills where the concrete frames carry the gravity and seismic load and are more complex to design and build.

Confined masonry uses locally available materials and known construction technologies and is particularly appropriate for up to four-storey buildings. The hostel buildings were ideal candidates for the adoption of this technology in terms of building height and layout and a significant amount of walls relative to floor area (wall density). Confined masonry construction has also proven to be more economical compared to RC frame construction for the selected buildings. Confined masonry is also being used for the next phase of hostel construction which is underway as of 2018.

A frame structure was adopted in certain critical areas (staircases) and for the dining block. Clay bricks were used for the foundation and fly ash bricks, manufactured on site, were used for the walls above the plinth level. This technology, construction details, and the challenges associated with its use for the campus housing buildings are discussed in more detail in a separate publication in this series, Confined Masonry for Residential Construction.

Hostel buildings under construction

5

Landscape Design

5.1. Landscape Strategy

The concept of streets as the activity center was formulated while designing the hostels. Following are the key principles adopted for the landscape works in and around the hostel buildings.

Hierarchy of streets: All the bicycle parking is provided on the secondary streets while all the common amenities, i.e., cafes, shops, student office, laundry, plaza etc. are provided on the main street.

Accessibility: All the entrance foyers and courtyards have steps and ramps for ease of access. Multiple access points have been provided to each building, encouraging students to access the buildings from any point.

Courtyards: Each building has its own courtyard and play courts. All the common rooms open up in courtyards with projected plinths that act as informal hangout spots for the students.

Privacy: Planters along the rooms create a visual and sound barrier for the ground floor rooms.

Segregation of services: Since the main street is the major activity center, all the service lines have been installed on the secondary streets and on the periphery of the buildings.

Native plant species: All the plants and shrubs proposed are locally available species.

Solar shading: The façades of the buildings along the street facing south will be shaded with large foliage trees.

Mango Tree – Removed


Mango Tree – Retained within the Courtyard

Neem Tree – Retained by Creating Niche in Building

**Cluster Plan : Response To The Existing Trees**

To encourage interaction:

a) Gathering areas (seats & benches) placed along main pedestrian access

b) Common rooms extending in courtyards

c) Shaded play courts with seating
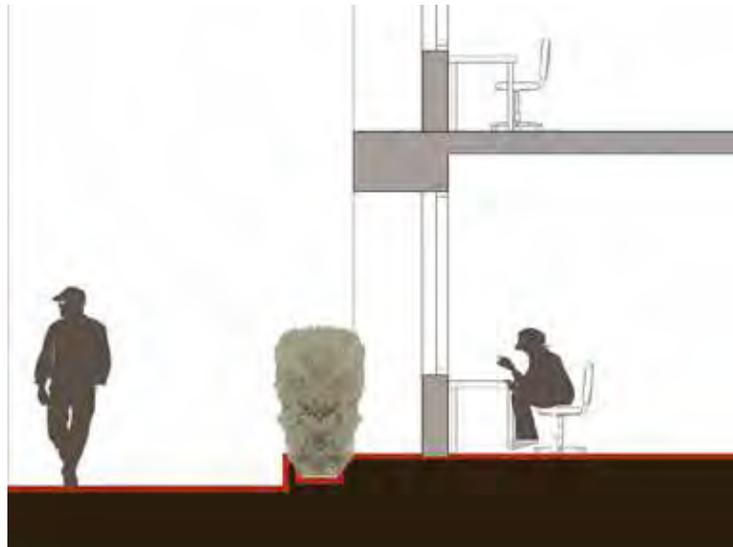
Privacy to Ground Floor Rooms

Shaded Seats
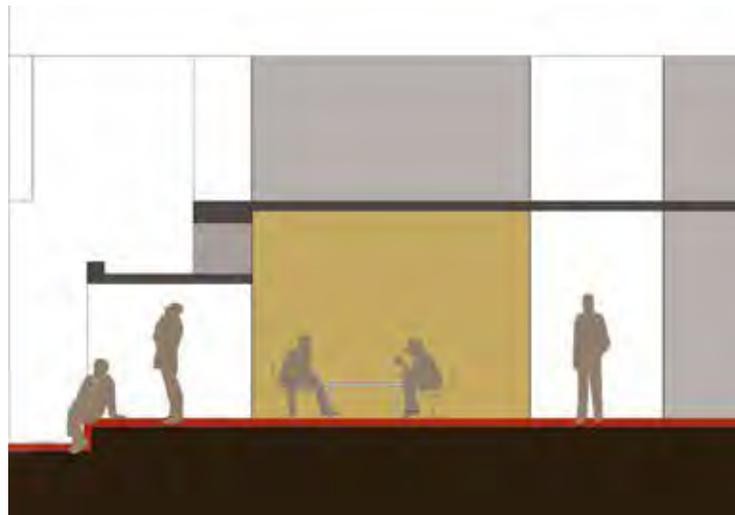
Common rooms extending in courtyards

View down main street, backside of Panchayat Circle

The central plaza is a hub with common interactive social spaces, cafes, an informal library, and other common amenities

Urban Elements : Street, Chowks, Gateways and Courtyards

5.2. Cluster Plan: Landscape Layout

5.3. Street Sections

Section 1-1

Section 2-2

Section 3-3

KEY PLAN

5.4. Proposed Plantation Plan

LARGE TREES

Scientific Name: Neolamarkia cadamba
Common name: Cadamba — No. of trees: 21
Location: Main street – south facing and courtyard

Characteristics:
- Large size tree—deciduous
- Leaves— large in opposite pairs on a single stem with shiny texture.
- Flowers—deep yellow in cluster seen from august
- Fruit— yellow round head seen from January to February.

Scientific name: Sterculia foetida
Common name: Wild Almond — No. of trees:17
Location: Central plaza and courtyard

Characteristics:
- Large size tree–, deciduous
- Leaves— 5–9 leaflets tapering on both ends
- Fruit— boat shaped fruit seen from February to march
- Flowers— bell shaped seen from March

Scientific name: Bombex ceiba — No. of trees: 8
Location: Entrance

Characteristics:
- Large tree— deciduous
- Leaves— palmately compound with 5–7 leaflets on one stalk.
- Flowers—large deep red in colour seen from february to march
- Fruit— capsular shape seen from may

SMALL TREE TREES

Scientific name: Plumeria obtusa
Common name: Champa white — No. of trees: 10
Location: Cluster courtyard

Characteristics:
- Small tree – evergreen
- Leaves – long with notch
- Flowers – cluster flowers white in color seen from April to may
- Fruit – shiny pods from may

Scientific name: Cordia Sebestena
Common name: Cordia — No. of trees: 15
Location: Main street – north facing

Characteristics:
- Small size tree – deciduous
- Leaves – opposite leaflets on one steam with rough texture on both sides
- Flowers – cluster orange in colour
- Fruit – long with seed embedded

MEDIUM TREES

Scientific name: Alstonia Scholaris
Common name: Saptaparni — No. of trees: 29
Location: Secondary street–west facing

Characteristics:
- Tree – Medium sized tree,evergreen
- Leaves – four to eight leaves along a single stem at same height.
- Flowers – small fragrant in clusters seen from October to December.
- Fruit – long and slender seen from March to April

Scientific name: Spathodia
Common name: African tulip tree — No. of trees: 27
Location: All courtyard

Characteristics:
- Medium size tree–, deciduous
- Leaves– 4–9 pairs of leaflets on single stem
- Flowers–large cup shaped orange in colour
- Fruit– pod shape

Scientific name: Mimusops elengi
Common name: Bonsai — No. of trees: 21
Location: West facing – courtyard and secondary street

Characteristics:
- Medium size tree–,evergreen
- Leaves– long leaves with glossy texture on top and wavy edges.
- Flowers–white fragrant flowers seen from May to June
- Fruit– berry green in colour seen from February to may

Scientific name: Peltophorum Pterocarpum
Common name: Copper pod — No. of trees: 15
Location: Main Entrance – secondary road, south facing

Characteristics:
- Medium sized tree – Palm,deciduous
- Leaves – 10–30 pairs of leaflets on a single notch.
- Flowers – Bright yellow fragrant, with crinkly texture

Scientific name: Erythrina variegata
Common name: Indian coral tree — No. of trees: 9
Location: Secondary street – east facing
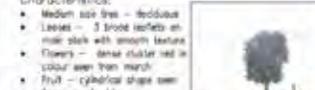
Characteristics:
- Medium size tree – deciduous
- Leaves – 3 broad leaflets on mid-stalk with smooth texture
- Flowers – dense cluster red in colour seen from march
- Fruit – cylindrical shape seen from may to july

Scientific Name: Caryota urens
Common Name: Jaggery Palm
Location: Entrance — No. of trees: 5
Characteristics:
- Medium size tree – Palm,evergreen
- Leaves – about 6m long leaflet with shiny green texture with ragged ends

6

Photos of the Completed Hostel Complex

7 Credits

Owner	**Indian Institute of Technology Gandhinagar**
Advisor Works	Mr Nagaraja B. N. (up to 30-04-2013)
	Mr L. P. Srivastava (from 06-05-2013)
Owner's Architect	Ar Shobhit Tayal, Design and Planning Counsel Pvt. Ltd., Ahmedabad
Owner's Engineer	Mr A. K. Kothari, Superintending Engineer (up to 28-01-2013)
	Mr G. C. Chaudhary, Superintending Engineer (from 04-02-2014)
Confined Masonry Experts	Prof Durgesh Rai, IIT Kanpur
	Prof Svetlana Brzev, British Columbia Institute of Technology, Vancouver
Structural Peer Review	Prof Indrajit Ghosh, Civil Engineering
	Prof Dhiman Basu, Civil Engineering
Faculty Team	Prof Sudhir K. Jain, Director
	Prof Ashwini Kumar, Civil Engineering
	Prof Harish P. M., Mechanical Engineering
	Prof Jaison Manjaly, Humanities and Social Sciences
	Prof Atul Bhargav, Mechanical Engineering
Principal Architect	**M/S HCP Design, Planning and Management Pvt. Ltd., Ahmedabad**
Structural Consultant	M/s N K Shah Consulting Engineers, Ahmedabad
MEP Consultant	M/s Jhaveri Associates, Ahmedabad
Kitchen Consultant	M/s Kitchen Solutions, Mumbai
Passive Cooling Consultant	M/s dbHMS Consultants Pvt. Ltd., Noida

Project Management   **Central Public Works Department (CPWD), Government of India**

Project Manager   Mr L. K. Bhargava, Superintending Engineer (up to 29-01-2016)

Mr Kapil Deo Narayan, Superintending Engineer (from 29-01-2016)

Building & Works Committee   **Indian Institute of Technology Gandhinagar**

Chairman   Prof Sudhir K. Jain, Director, IITGN (2009 - present)

Members   Prof Neelkanth Chhaya, Former Dean, Faculty of Architecture,
CEPT University, Ahmedabad (2009 - present)

Shri Kiran S. Wagh, Chief Advisor (Civil Infrastructure),
IIT Bombay (2009 - present)

Shri R. Subramanian, Former Additional Director-General,
CPWD, New Delhi (2009 - 2012)

Chief Engineer (Capital), Roads & Buildings Department,
Government of Gujarat, Ahmedabad (2009 - 2012)

Director (TS-I), Ministry of Human Resource Development
Government of India, New Delhi (2009 - 2011)

Shri A. K. Jain, Former Special Director General, CPWD
New Delhi (2012 - present)

Shri L. P. Srivastava, Former Additional Director General,
CPWD & Advisor (Works), IITGN (2012 - present)

Prof Ashwini Kumar, Professor-in-Charge,
Planning & Resources, IITGN (2012 - 2014)

Prof Harish P. M., Dean (Campus Development),
IITGN (2014 – 2018)

Prof Gaurav Srivastava, Dean (Campus Development),
IITGN (2018 - present)

Dr Prabhat Kumar, Former CMD, Bharatiya Nabhikiya Vidyut
Nigam Ltd, Kalpakkam, (2012 - 2016)

Shri M. B. Bhalala, Former Chief Engineer,
Road & Building Department, Government of Gujarat (2009 - present)

Secretary   Shri B. S. Punalkar, Registrar, IIT Bombay (2009 - 2013)

Shri P. K. Chopra, Registrar, IITGN (2013 -present)

Project Progress Monitoring Committee **Indian Institute of Technology Gandhinagar**

Members   Shri L. P. Srivastava, Advisor (Works), IITGN

Shri A. K. Jain, Former Special Director General, CPWD, New Delhi

Shri Kiran S. Wagh, Chief Advisor (Civil Infrastructure), IIT Bombay

Shri Prabhat Kumar, Former CMD, Bharatiya Nabhikiya
Vidyut Nigam Ltd, Kalpakkam (up to January 2016)

Shri Balraj Chadha, Chief Engineer, CPWD, Gandhinagar (up to May 2016)

Shri A. K. Agarwal, Chief Engineer, CPWD, Gandhinagar (July 2016 - present)

Shri Laksh Bhargava, Project Manager, CPWD (up to January 2016)

Shri Kapil Deo Narayan, Project Manager, CPWD (up to January 2019)

This publication is one in a series describing the development of IIT Gandhinagar's campus on the bank of the Sabarmati River in Gandhinagar. The campus development provided numerous opportunities for innovation and the series is meant to document these.

The focus of this publication is on the architectural design of the Hostel Complex in Phase I of campus development, building from goals and objectives set forth in the Masterplan. The architects selected for this challenge were HCP Design Planning and Management Pvt. Ltd. This publication describes their design approach, developed collaboratively with active participation from students and faculty. Similar to the academic philosophy for the new campus that places an emphasis on fostering meaningful cross-disciplinary interactions, the hostels were designed to be non-conforming, thought-provoking spaces.

Copies can be obtained by writing to the librarian@iitgn.ac.in