

Royal University of Bhutan

Space Norms 2020



Department of Planning and Resources
Office of the Vice Chancellor
Royal University of Bhutan
Thimphu: Bhutan

Preface

The Royal University of Bhutan (RUB) is expected to play a critical role in the socio-economic development of the nation. Therefore, it is vital for the University to be engaged meaningfully with the community, industries and the Government. The University must also be able to attract international students in the globalized environment. To ensure these contributions, the University should attain the highest level and standards supported by necessary infrastructure and facilities. The infrastructure-base development practices such as in Singapore and China show how significant it is to invest in higher education. To fulfil these objectives, the University is planning for a significant improvement in the quality of its teaching-learning, research and services. The RUB will develop state-of-the-art infrastructure and facilities to ensure conducive environment for quality teaching-learning, research and services.

To build quality infrastructure and facilities, the University needs to develop a framework with some general parameters and standards that will help assess the state of facilities and identify gaps for future developments. These Space Norms, which are expected to fulfil the standards were developed through a comprehensive study of existing national and international best practices. A group of expert-engineers from the Department of Disaster Management and staff from the

Department of Planning and Resources compiled the first draft after a seven-day workshop. Reports of Space Auditing study carried out in 2018-19, the Bhutan Building Code 2018, Rules for Establishment of Colleges in Bhutan 2017 and the common practices in the colleges provided good source of information for the document. With the completion of the draft, the provisions of the Norms (*Annexure 1*) were simulated in the colleges to make sure the norms would serve as the framework to assess the current utilization of infrastructure and facilities, identify need for development of new infrastructure, and, improve conditions of its infrastructure and facilities. The norms will be used to provide standards for development of minimum facilities to support the core services of the colleges such as academic, administrative, residential and recreational spaces.

Student number, academic programmes and activities of the colleges would form the basis to determine the size and type of facilities required. The norms shall be treated as the general guide to provide the first approximation of the requirements while the specific and detailed requirements shall be determined at a later stage.

These Space Norms comply with the prevailing rules in terms of designs, safety measures, architecture, provision for differently abled people and raising green buildings in the campuses of the colleges. The

provisions of these Norms shall be reviewed from time to time to meet the changing needs of the University.

Table of Contents

General Provision	6
Academic Spaces	9
Student Service Spaces	20
Administrative Spaces	24
Residential Spaces	28
Recreational Facilities	35
Campus Aesthetics	37
Disaster resilience, safety and inclusiveness provisions	40
Implementation Plan	43
Abbreviations	46
Annexure 1: Testing of Norms based on new facilities at CNR	47
Annexure 2: Analysis of classroom requirement in the Colleges	53
References	55

Part 1
General Provision

1.1. Landscaping

- 1.1.1. There shall be proper zoning of all major facilities such as academic zone, staff residential zone, student residential zone, recreational zone and so on.
- 1.1.2. Academic and recreational zones shall maintain adequate distance from the residential zones. These distances shall be determined by the colleges.
- 1.1.3. All facilities shall need colour blending to ensure uniformity.
- 1.1.4. The Masterplan shall be reviewed / prepared based on the assessment report of each college.
- 1.1.5. The ratio of space to built-up area shall be maintained for each college.

1.2. Building design

- 1.2.1. In order to optimize space utilization, the golden ratio shall be explored and applied for any new buildings.
- 1.2.2. Energy efficiency aspects shall be promoted by appropriately aligning structures to optimize sunlight.
- 1.2.3. Local climate and related factors shall be taken into consideration in the design of the buildings.
- 1.2.4. Appropriate facilities, based on climatic conditions such as heaters, air-conditioners and humidifiers shall be included while planning any new buildings.

1.3. Specification

- 1.3.1. Space requirement norms are based on carpet area.
- 1.3.2. The space of the toilets in the rooms shall be considered within the same carpet area, unless otherwise specified separately.

Part 2
Academic Spaces

2.1 Introduction

2.1.1 Academic Spaces include those spaces specifically meant for teaching- learning, such as classrooms, lecture halls, auditoriums, and laboratories for practical classes/studies.

2.1.2 Space utilization rate, particularly classrooms, shall be based on the frequency, occupancy and the utilization rates.

2.1.3 Frequency rate is calculated in percentage (hours used in a week / hours available in a week*100).

2.1.4 Occupancy rate is calculated in percentage {total number of students in a week / (capacity of the room*hour used)*100}

2.1.5 Utilization rate is calculated in percentage (occupancy rate * frequency rate * 100).

2.1.6 Each block of classrooms shall have restrooms planned to accommodate 50% females and 50% males.

2.2 Regular Classroom (capacity up to 60)

2.2.1 Ideally, a regular classroom is expected to accommodate 40 students.

2.2.2 Each regular classroom size shall be 80 sq. m at the rate of 2 sq. m per student.³

2.2.3 Generally, for 1000 students, there should be about 18 classrooms with 80% utilization rate as practiced in well-established universities (*working details at Annexure 2*).

2.3 Large Classroom / Conference and Seminar rooms (capacity of more than 60):

2.3.1 Ideally, a large classroom is expected to accommodate more than 60 students.

2.3.2 Each large classroom size shall at least be 120 sq. m at the rate of 2 sq. m per student.³

2.3.3 The largest classroom, which could be used as a conference / seminar hall shall have a reception area of 40 sq. m.

2.3.4 Generally, for every 1000 students, there should at least be 3 large classrooms.³ As per the *Rules and Regulations for Establishment of College 2012* (revised by DAHE 2017), there should at least be one lecture theatre / large classroom for every 300 students. (*Working detail at Annexure 2*).

2.4 Laboratories

2.4.1 Computer labs sizes shall be a minimum of 2 sq. m per student.⁵

- 2.4.2 Each computer lab shall ideally accommodate about 40 students in a room, requiring a room size of 80 sq. m.
- 2.4.3 The average student to computer ratio for general computer laboratory shall be 10:1.^{2&4}
- 2.4.4 Office space size for each lab technician shall be 12 sq. m including spaces for equipment and gadgets. The number of lab technicians required shall be determined by the staffing norm.
- 2.4.5 The average student to computer ratio shall be 1:1 for students taking up IT programmes³ and 1:3 for engineering programmes. However, laptops may be provided to students in dedicated IT colleges to optimize space utilization.
- 2.4.6 The above provision for computer lab shall apply to general computer labs. However, sizes of specialized computer labs requiring different practical sessions such as hardware, networking, robotics, etc., shall be determined based on specific needs.
- 2.4.7 Development of other specific laboratory spaces shall consider the provision for the following:
- 2.4.7.1 Space for specific equipment.

2.4.7.2 Communications / server rooms

2.4.7.3 Equipment storage spaces

2.4.7.4 Operational spaces,
e.g. darkrooms

2.4.7.5 Storage of hazardous and
flammable substances

2.4.7.6 Office for lab technicians of 12
sq. m.

2.4.8 The size and design of the labs shall be
based on specific needs of each
laboratory.

2.5 Rest rooms for all academic spaces

2.5.1 1 water closet for every 25 students.³

2.5.2 1 urinal for every 20 male students.³

2.5.3 1 washbasin for every 40 students.³

2.6 Library²

2.6.1 Bookracks cum reading floor space of
450 sq. m.

2.6.2 4 discussion rooms of 15 sq. m each.

2.6.3 1 book circulation room of 33 sq. m.

2.6.4 1 cataloguing & reference room of 102
sq. m.

- 2.6.5 1 server room of 20 sq. m.
- 2.6.6 Store room of 20 sq. m.
- 2.6.7 Foyer with reading space of 150-200 sq. m.
- 2.6.8 Photocopy and printing room of 12 sq. m.
- 2.6.9 Office space for librarian of 12 sq. m.
- 2.6.10 Restrooms: for Females – 2 toilets with 2 water closets and 3 washbasins on each floor, and Males - 2 toilets with 2 water closets, 4 urinals and 3 washbasins on each floor.

2.7 Lecture Theatre

- 2.7.1 Lecture theatre shall be located in close proximity from the student common space and classrooms.
- 2.7.2 Ideally, a lecture theatre is expected to accommodate 75-150 students.²
- 2.7.3 Each lecture theatre size shall be 75-150 sq. m at the rate of 1 sq. m per student.^{2&3(CLCS)}
- 2.7.4 Lecture theatre shall be generally rectangular with preferred proportion of 1:1.7 to 1:2.2 for line of sight.²

2.7.5 Restrooms: for Females – 3 toilets and 2 washbasins; Males - 3 toilets with 4 urinals and 2 washbasins.

2.8 Auditorium / Convention hall / Multipurpose hall

2.8.1 There shall at least be one auditorium / Convention hall / MPH with following spaces:¹

2.8.1.1 Assembly hall

2.8.1.2 Stage

2.8.1.3 2 backstage dressing rooms

2.8.1.4 Store

2.8.1.5 Projection / Control room

2.8.1.6 Office space

2.8.1.7 Restrooms: for Females – 5 toilets and 3 washbasins; Males - 5 toilets with 8 urinals and 3 washbasins.

2.8.2 The auditorium should accommodate the total population of the college.⁴

2.8.3 Ideally, the size of the assembly hall, including aisles (excluding other spaces such as stage), shall be 0.7 sq. m per student.²

- 2.8.4 The width of the chairs shall be between 45.72 - 60.96 cm (18-24 inches).²
- 2.8.5 The row spacing or “back to back” of seats shall be 76.2 cm (30 inches).²
- 2.8.6 If the floor layout is tier-based, the minimum height of riser shall be 11.43 cm to 12.7 cm to ensure visibility.²
- 2.8.7 Stage and other spaces shall be developed in proportion to the size of the assembly hall.

2.9 Academic Support Service Space

- 2.9.1 Language and study skills development spaces shall be created where appropriate.
- 2.9.2 Other academic support service spaces shall be identified and created based on specific needs.

2.10 Business Incubation Centre / Innovation Centre shall have the following spaces:

- 2.10.1 Common room for students of 100 sq. m with wifi connectivity.
- 2.10.2 1 meeting room of 50 sq. m.

- 2.10.3 A hall with 5-10 cubicles / rooms for students of 4 sq. m each, possibly with aluminum partition.
- 2.10.4 2 office spaces for mentors and staff of 12 sq. m each.
- 2.10.5 Fab Lab based on specific needs.
- 2.11 Research student cubicles / rooms
 - 2.11.1 A hall with cubicles shall be provided for students pursuing Masters by research. Cubicles shall be planned with 4 sq. m per student.
 - 2.11.2 A separate room / cubicles for PhD students shall be provided. Each room size of 12 sq. m shall accommodate at least 2 PhD students.
 - 2.11.3 All research students pursuing Honours, Masters and PhD shall be provided with cubicles / rooms.⁴
- 2.12 Circulation space for academic buildings shall feature:
 - 2.12.1 Corridor with minimum of 2 m in width.¹
 - 2.12.2 Staircase riser preferably 150 mm and not exceeding 180 mm.^{1&2&CST}

2.12.3 Staircase treads with minimum of 280 mm^{1&2} and preferably 300 mm.

2.12.4 Staircase width with minimum of 1.5 m.^{CST}

Part 3
Student Service Spaces

3.1 General Requirements

3.1.1 Each college shall develop a specific Student Service Centre, which shall act as a hub for students to gather for various support services.

3.1.2 The Student Service Centre shall be located in close proximity to both the residential and academic zones.

3.2 The Student Service Centre shall house a minimum of these following spaces:⁵

3.2.1 Office of the Dean of Student Affairs with 32 sq. m, including attached toilet.

3.2.2 Offices for Student Service Officers. Each room size of 20 sq. m shall accommodate two officers. The number of student service officers shall be determined by the staffing norms.

3.2.3 The offices for student leaders shall be provided with:

3.2.3.1 A student councillor / student president's office room of 12 sq. m.

3.2.3.2 A hall with cubicles for other student leaders of 90 sq. m, including a toilet for male and a toilet for female staff.

- 3.2.4 Cafeteria with a store, kitchen, and a toilet with total size of 290 sq. m.
 - 3.2.5 Counselling rooms of 120 sq. m.
 - 3.2.6 Mindfulness space of 85 sq. m.
 - 3.2.7 Conference hall with toilets of 120 sq. m.
 - 3.2.8 Music room of 65 sq. m.
 - 3.2.9 Stationery shop with 50 sq. m.
 - 3.2.10 Salon / barber shop with 40 sq. m.
(subject to requirements)
 - 3.2.11 Reprographic centre with 40 sq. m.
 - 3.2.12 Infirmary with sickbay of 80 sq. m.
 - 3.2.13 Common space (spacious corridor) with attached toilets of 120 sq. m.
 - 3.2.14 Common staff toilets close to office spaces, 1 each for females and males.
- 3.3 The colleges have the flexibility to determine the design of the student service centre(s). It could either be clustered in one location or distributed, based on the suitability at each college campus. However, in totality, the above spaces shall be made available for student services.

- 3.4 There shall be one Human Development Centre / Prayer Hall. The respective colleges shall determine the size and design of the hall.
- 3.5 There shall be a separate space for student lounge at the academic buildings to allow students to engage meaningfully while they wait for their classes.
- 3.6 There shall be a separate multipurpose hall / gymnasium.⁴ It will be used as a multipurpose hall and may accommodate indoor games and sports. The gymnasium shall have a minimum of the following spaces:
- 3.6.1 Multipurpose room that will at least accommodate two standard badminton courts.
- 3.6.2 Gym / fitness centre of 120 sq. m.
- 3.6.3 Locker room, shower room and toilets for males and females separately of 45 sq. m each. There shall at least be 4 water closets, 4 shower rooms, 3 urinals and 4 wash basins for males, and 6 water closets, 4 shower rooms and 4 wash basins for females.
- 3.6.4 A store.

Part 4
Administrative Spaces

4.1 General Requirements

4.1.1 Administrative spaces shall include all office spaces for administration and managerial purposes.

4.1.2 Administrative spaces shall be built in close proximity to academic spaces or within the same zone.

4.1.3 While administrative sections are provided with total space area, the college may determine the room layout that best serves its needs.

4.2 Offices for academics shall be provided as per the following details:

4.2.1 Office room for professor with 25 sq. m.

4.2.2 Office room for each academic of 14 sq. m.

4.2.3 Faculty lounge with an area of 100 sq. m.

4.2.4 Pantry close to faculty lounge of 9 sq. m.

4.3 Office space for the President shall be provided as per the following details:

4.3.1 One office room with attached toilet of 50 sq. m.

4.3.2 Adjoining room of 12 sq. m as PA's Office with a space as visitor's lounge.

- 4.3.3 Pantry close to PA's room of 9 sq. m.
- 4.4 Office spaces for other administrative, technical and managerial staff shall be provided with the following details:
- 4.4.1 Office space for the Deans with attached toilet of 32 sq. m.
 - 4.4.2 Office space for Finance section of 32 sq. m to house both the finance officer and the accounts assistant.
 - 4.4.3 Office space for Administrative section of 32 sq. m to house both the administration officer and the administration assistant.
 - 4.4.4 Space for storeroom, along with an office for the store keeper of 80 sq. m.
 - 4.4.5 Reception (PABX) room with office space of 12 sq. m.
 - 4.4.6 Total office space of 32 sq. m for estate manager and technical support staff.
 - 4.4.7 An office space of 50 sq. m for 2 ICT officers and 2 ICT technical associates along with a server room.
 - 4.4.8 A total office space of 70 sq. m for examination and student records section. It shall house the student records officer, assistants and serve as a record room.

- 4.4.9 All other officers and equivalent technical staff requiring office space shall be allocated with 14 sq. m per staff.
- 4.4.10 All other support staff requiring office space shall be allocated with 12 sq. m per staff.
- 4.5 Meeting hall with 20 seating capacity of 60 sq. m (similar to a boardroom), including toilets at the administrative block.
- 4.6 Lounge with pantry in the same room for each administrative office block, irrespective of the category of staff with an area of 18 sq. m.
- 4.7 A central store with adequate capacity to house miscellaneous properties such as *Chadri* items and construction materials shall be built in each college.
- 4.8 Circulation for administrative spaces shall be similar to academic spaces given under Clause 2.12.
- 4.9 There shall be a common toilet on each floor for both males and females.

Part 5
Residential Spaces

5.1 General Requirements

5.1.1 The University shall provide accommodation for a proportion of students enrolled on full time programmes.

5.1.2 Student residential zone shall be separate from the staff residential zone. Ideally, the student residential zone shall be located closer to the academic zone(s), student service centre and the recreational zones.

5.1.3 There shall be a staff residential zone with residential spaces for academics, administrative, and technical staff.

5.1.4 Dedicated residential spaces shall be made available to staff as reflected under specification clause 5.5.1.

5.2 Undergraduate / Diploma Student Hostel

5.2.1 Each room (for each student) shall be furnished with:⁴

5.2.1.1 A bed

5.2.1.2 A study table

5.2.1.3 A chair

5.2.1.4 A table-top book rack with single shelf

5.2.1.5 A wardrobe.

5.2.2 The space allocated per student shall be:

5.2.2.1 Single 10 sq. m

5.2.2.2 Double 16 sq. m

5.2.3 Similarly, rooms with single occupancy shall be limited to a very few in number and bunker beds shall be discouraged for any new construction.

5.2.4 Each floor shall be provided with toilets and bathrooms with the following details:

5.2.4.1 One toilet for every four students

5.2.4.2 One bathroom for every four students

5.2.4.3 A separate space adjoining the bathrooms with four washbasins.

5.2.5 Circulation space shall be similar to details mentioned under academic spaces.

5.2.6 There shall be a common space for kitchen, dining and store for self-catering

hostel on each floor. The space size shall be 2.6 sq. m per student.⁵

5.2.7 For full boarding hostels, a common space for kitchen, dining, store, washing area and servicing counter shall be provided based on 1.9 sq. m per student.⁵ The total capacity of the space shall be determined by the college based on management practices. For instance, if the college plans to use a shift system, the space could be smaller.

5.2.8 There shall at least be one common room for each hostel block. The common room shall serve as a TV room and lobby for student gathering and social events.

5.3 Postgraduate Student hostel

5.3.1 Postgraduate students may be provided with a single occupancy room.

5.3.2 One bedroom apartment may be developed for postgraduate students with the following space allocation:

5.3.2.1 1 bedroom of 14 sq. m.

5.3.2.2 1 living room of 9 sq. m.

5.3.2.3 Toilet and bathroom common to the whole floor of the building as per the norms given in 5.2.5.

5.4 International Student hostel

5.4.1 International students may be provided with a single occupancy or double rooms in a separate block. They may be allowed to stay in other hostels too, depending on their needs.

5.4.2 International students may be provided with a separate hostel block. The allocation of space of the room shall be 10 sq. m for single and 16 sq. m for double occupancy.

5.4.3 A common toilet and bathroom as per the norms given in 5.4.5.

5.4.4 There shall be uniform circulation space as discussed in 2.12.

5.5 Staff Residences

5.5.1 A college may provide on-campus accommodation to essential employees, including the President, Deans, Student Service Officers, some Administration and technical staff, some academics, maintenance staff, driver and security guard.

5.5.2 Dedicate adequate units of residential facilities to accommodate a minimum of 50% of the college staff.

5.5.3 Space allocation for different categories of employees, include the following:

5.5.3.1 President with 220 sq. m

5.5.3.2 Academic / Administrative & Technical staff with 120 sq. m. (3BHK) or 90 sq. m. (2BHK) as determined by the college.

5.5.3.3 Single occupancy (bachelors quarter) with 65 sq. m.

5.5.4 Presidents shall be provided with a garage with a capacity for two cars.

5.6 College Guesthouse:

5.6.1 Colleges are expected to receive an increasing number of short-term based academics and experts every year. A guesthouse in each college shall be built to accommodate adjunct faculty, visiting lecturers, and experts.

5.6.2 The guesthouse will also house international visiting academics and scholars.

5.6.3 The college guesthouse shall have a minimum of 8 rooms. The construction of a guesthouse shall be determined based on availability of space.

Part 6
Recreational Facilities

6.1 Football Ground

6.1.1 A minimum of one football ground for each college based on the international standard size of 105m x68m.

6.1.2 There shall be a gallery at one side of the ground at least.

6.1.3 There shall be toilets and changing rooms for both the male and female students.

6.2 Basketball courts

6.2.1 Each college shall have at least two international sized basketball courts of 28m x 15m.4

6.2.2 At least, one of the basketball courts shall have a gallery at one side.

6.3 The college shall provide additional mandatory facilities as given below:

6.3.1 Volleyball court

6.3.2 Futsal

6.3.3 *Khuru* Range

6.4 The colleges may also try to provide other games and sports facilities such as:

6.4.1 Archery Range

- 6.4.2 Athletics track
- 6.4.3 Swimming pool
- 6.4.4 One lawn tennis court.⁴
- 6.4.5 Astro Turf and floodlights at the football ground.
- 6.5 There shall at least be one open mini theatre at or close to the student service centre.
- 6.6 Parks:
 - 6.6.1 Total open park space of a minimum of 2.5 acres.
 - 6.6.2 Parks shall have adequate benches, canopy / gazebo, tree shades, footpath, and well maintained lawns.
- 6.7 Cafeterias may be built near games and sports complex, in academic zone(s), at the parks, etc. based on the needs.

Part 7
Campus Aesthetics

- 7.1 Parking spaces shall be developed near:
 - 7.1.1 Residential buildings
 - 7.1.2 Office buildings
 - 7.1.3 Public spaces, such as sports complex / football ground
 - 7.1.4 Auditorium / multipurpose halls
 - 7.1.5 Prayer hall
 - 7.1.6 Recreational Parks
- 7.2 Garages shall be built based on the number of office cars / busses / trucks, etc.
- 7.3 Green and protected areas shall be identified and developed.
- 7.4 A network of footpaths shall be built connecting all the buildings.
- 7.5 An internal road network of 5 m width with footpath at the sides of 1.5 m width shall be developed connecting all major zones.
- 7.6 There shall be a provision for well-connected storm water drainage system on campus.
- 7.7 There shall be well-developed sewerage and water treatment plant on campus.
- 7.8 Laundry service space shall be provided.

- 7.9 Rainwater and solar power harnessing shall be developed where appropriate.
- 7.10 Waste management infrastructure, including waste collection, segregation, and recycling plants shall be developed in each college.
- 7.11 Other unspecified open spaces (e.g. evacuation centre for disaster, open air gymnasium, etc.) may be developed based on needs and affordability.

Part 8

Disaster resilience, safety and inclusiveness provisions

8.1 General Requirements

8.1.1 While the structural designs shall ensure safety aspects to a large degree, provision are kept for disaster risk reduction aspects in the layout.

8.1.2 Disaster resilient features reflected in this norm is the minimum required for any new building.

8.2 Fire / earthquake safety:

8.2.1 All new buildings shall have provisions for emergency exit(s) and an evacuation area.

8.2.2 There shall be a dedicated space with a store for emergency operation centre in every college (it should be the most durable and easily accessible structure).

8.2.3 All new buildings and strategic locations shall have a provision for fire hydrants.

8.2.4 The masterplan of each college shall have fire hydrant plan with water reservoir and pipe network.

8.2.5 All buildings shall have provision for fire extinguishers on each floor.

8.3 Areas for any physical construction shall be determined based on geophysical stability studies.

- 8.4 Major catchment areas (prone to flooding) shall be identified and protected by avoiding any construction works, especially buildings.
- 8.5 Street lighting shall be provided in all strategic areas to ensure safety.
- 8.6 CCTV(s) shall be provided in certain strategic locations for campus security.
- 8.7 All new public spaces such as the auditoria, sports complex, academic and residential spaces shall be designed to cater to the physically challenged members of the college.

Part 9
Implementation Plan

9.1 General Provisions

9.1.1 The Norms drafted herewith shall be implemented once approved by the relevant authorities.

9.1.2 All the new spaces developed by the University shall be guided by the Norms.

9.1.3 Colleges shall use the Norms as the basis for development of new spaces. The Department of Planning and Resources at the Office of the Vice Chancellor shall provide the required technical support.

9.1.4 The Norms shall be used as a basis to set priority for infrastructure development for each of the Five Year plans.

9.2 Way forward

9.2.1 The Department of Planning and Resources shall, in collaboration with the colleges, carry out assessment of existing spaces and identify new spaces to be developed based on the Norms. The Space Auditing Report shall be used as the basis to assess the current situation, and Strategic Plan targets shall be used to identify the future needs.

- 9.2.2 The DPR and the Colleges shall set priority to prepare **plan of action** for development of new facilities prior to each FYP period.
- 9.2.3 The DPR and the Colleges shall prepare masterplans, including detailed designs, drawings and estimates for all colleges, based on the needs assessment reports carried out prior to the FYP period.
- 9.2.4 Based on the masterplan, the DPR and the Colleges will develop Detailed Project Report with write-ups in each preceding FYP to be implemented in the following FYP.
- 9.2.5 The DPR shall compile the Detailed Project Reports (DPRs) and consolidate it as part of FYP for submission to the Gross National Happiness Commission (GNHC).

Abbreviations

Adm	Administrative
CLCS	College of Language and Culture Studies
CNR	College of Natural Resources
CST	College of Science and Technology
DAHE	Department of Adult and Higher Education
DPRs	Detailed Project Reports
FYP	Five Year Plan
GNHC	Gross National Happiness Commission
HoD	Head of Department
ICT	Information Communication and Technology
IT	Information Technology
m	Metre
MPH	Multipurpose Hall
OVC	Office of the Vice Chancellor
PA	Personal Assistant
RUB	Royal University of Bhutan
Sq. m	Square Meter
TV	Television

Annexure 1: Testing of Norms based on new facilities at CNR

1. Academic Blocks

- 1.1. The corridor was measured from column to column. It was 2.2 m in width. The site engineer reported that the corridor is appropriate for a floor accommodating 160 students at a time.
- 1.2. Staircase riser was ranging from 150 to 300 mm. The team physically climbed to assess the most comfortable riser height. It was felt that the riser of 180mm was most comfortable.
- 1.3. Staircase pitch/angle was ranging from 31 to 33 degrees. The team felt that 31 degrees angle was the best.
- 1.4. Staircase treads were measuring 300mm, which appeared to be comfortable on climbing.
- 1.5. A regular classroom that was expected to accommodate 40 students was assessed. The total area of the classroom was 78.89 sq. m. There was good circulation space. The per student area of 2 sq. m was witnessed to be very ideal. The College has been using a table size of (1.2m x 0.45m) which appears to optimize the space utilization for the classroom.

- 1.6. A smaller classroom measuring 6.82m x 9.57m was studied. The classroom could comfortably accommodate 32 students, which works out to about 2 sq. m per student.
- 1.7. There were toilets on each floor of classroom blocks accommodating 160 students. The toilets had three water closets, 2 wash basins and 3 urinals for males. However, it was felt that the female toilets should accommodate an additional water closet in place of urinals for males. With this, the toilet facilities will be as per the norm.
- 1.8. The total area for toilets was 6.451m x 3.04m, and appears to be spacious for 80 capacity each.

2. Offices

- 2.1. An office space measuring 6.081m x 3.025m accommodated two academics. It was felt that the room was bit narrow and long with approximate ratio of 1:2. Spaces could be saved if the layout is designed using lower ratio.
- 2.2. A staff office measuring 3.08m x 3.02m was accommodating two staff. The team felt that the office appeared too congested with one cupboard, two sets of tables and chairs and file racks.
- 2.3. There was yet another staff office

accommodating two staff within an area of 15.34 sq. m. The area appeared congested with office furniture and equipment.

- 2.4. Another office for two staff at IT Section had a dimension of 3.13m x 6.04m (18.9 sq. m). The team felt that the size 18 sq. m would be ideal to accommodate two staff.
- 2.5. An office space for one person measuring 5.86m x 2.32m was seen to be a bit spacious. A metre reduction could still comfortably accommodate one staff. The team felt that 12 sq. m could be an ideal office space for one staff requiring a cupboard, file racks and space to receive guests.

3. Conference Hall

- 3.1. A conference hall with an area of 14.29m x 10.56m (150.9 sq. m) was assessed. The hall was built to accommodate 80 people. The team felt that the 1:2 ratio would be most ideal to give more room for internal circulation and for different internal arrangements.
- 3.2. There was an adjoining office space of 14.31 sq. m. The team felt that it was too spacious for a single occupant.
- 3.3. The corridor with 3.6m x 10.27m dimensions was assessed and looked adequate for circulation, reception and tea breaks.

4. A GIS computer lab was provided with a hall size similar to the conference hall. The site engineer reported that it could comfortably accommodate 80 computers. It currently has 40 computers. Therefore, the per student space for computer lab could be 2 sq. m.
5. Student Hostel Block
 - 5.1. The team assessed the spaces of a female hostel. The rooms measuring 18.77 sq. m appeared too spacious for two occupants as was planned earlier. The rooms currently accommodate 4 students, which however appears too cramped.
 - 5.2. A common kitchen was provided to four rooms with the dimension of 7.85m x 5.05m. Currently a small space at one end is partitioned as a separate bedroom for the females. The team felt that the original room plan was comfortable to cater to eight students, with combined space for kitchen and dining.
 - 5.3. The toilet provisions for 8 students include 4 toilets, 3 bathrooms and 2 washbasins. The team felt that the ratio of 2 students to one toilet would be more than what is actually required. The overall area of toilets and bathrooms was measuring 19.49 sq. m. However, it was noted that the toilets are currently shared among 16 students adjusted in rooms initially created for 8 students.

5.4. The hostel block has no common room and as such does not create space for students' social life.

6. MPH

6.1. The College has a newly built MPH with the assembly hall of 423.998 sq. m. It accommodates two badminton courts.

6.2. It has four backstage rooms and a balcony.

6.3. It has a pantry of 9.17 sq. m.

6.4. A toilet for male with 4 water closets, 2 urinals and 2 wash basins.

6.5. A toilet for female students with 4 water closets and 2 wash basins.

7. Staff quarter

7.1. The student service officer's quarter was assessed to take the dimensions of a 3 BHK quarter. The staff shared that currently the space is comfortable to her and two other occupants.

7.2. The staff quarter has three bedrooms measuring 11.8, 14.24, and 14.22 sq. m.

7.3. There were two toilets (one common and one for master bedroom) measuring 4.64 and 4.48

sq. m. The toilets also included the bathroom space.

- 7.4. Sitting room measuring 22 sq. m.
- 7.5. Kitchen measuring 11.6 sq. m.
- 7.6. Overall areas for the staff quarter measuring 82.98.

Annexure 2: Analysis of classroom requirement in the Colleges

Colleges	Standard Capacity	No of classrooms	Total students present	Average Utilization rate	Actual Rooms Req (80% utilization rate)	Class room req. for 1000 stds	Remark
CLCS	Normal	20	1230	74.53	18.63	15.15	Under Utilized
	Large	1	1230	5	0.06	0.05	Under Utilized
CNR	Normal	10	670	64.3	8.04	12.00	Under Utilized
	Large	2	670	57	1.43	2.13	Under Utilized
CST	Normal	24	902	44.5	13.35	14.80	Under Utilized
	Large	2	902	59	1.48	1.64	Under Utilized
GCBS	Normal	25	1345	83.52	26.10	19.41	Over Utilized
	Large				0.00		
JNEC	Normal	18	806	49.72	11.19	13.88	Under Utilized
	Large	1	806	70	0.88	1.09	Under Utilized
PCE	Normal	33	1022	67.24	27.74	27.14	Under Utilized
	Large				0.00		
SCE	Normal	22	972	63.82	17.55	18.06	Under Utilized
	Large				0.00		

Colleges	Standard Capacity	No of classrooms	Total students present	Average Utilization rate	Actual Rooms Req (80% utilization rate)	Class room req. for 1000 stds	Remark
SC	Normal	26	1670	104	33.80	20.24	Over Utilized
	Large	2	1670	57.5	1.44	0.86	Under Utilized
Total	Normal	178	8617	68.95	19.55	17.58	Average of all
	Large	8	7947	49.7	1.6	3	

Note: GCBS, PCE and SC have very high utilization rate as the existing classrooms are accommodating students way beyond their capacity. For instance, classrooms with 30 capacity are accommodating 36 students.

References

- ¹Ministry of Works and Human Settlement. (2018). Building code of Bhutan 2018. Thimphu: Ministry of Works and Human Settlement.
- ³Royal University of Bhutan. (2018). Space auditing – Royal University of Bhutan: consolidated report. Thimphu: Royal University of Bhutan.
- ⁴Department of Adult and Higher Education. (2017). Rules and regulations for establishment of colleges in Bhutan 2012 (revised 2017). Thimphu: Department of Adult and Higher Education.
- ²Subramanian, N. (2017). Design of reinforced concrete structures. New Delhi: Oxford University Press.
- ²Macquarie University. Macquarie design guidelines. Retrieved March 4, 2020 from http://property.mq.edu.au/space_types/teaching_spaces/lecture_room
- ²Theatre Solutions. Auditorium seating layout and dimensions. Retrieved March 5, 2020 from <http://www.theatresolutions.net/auditorium-seating-layout/>
- ²University of Michigan. Computer classroom design. Retrieved March 5, 2020 from <http://www.crlt.umich.edu/learningspaceguidelines/computerclassroom>;
- ²University of Maryland. <https://provost.umbc.edu/files/2019/02/UMBC-Instructional-Space-Utilization-Analysis-Report-20190109.pdf>