

## Sustainable Design Engineering of Student Dormitories in Iraqi Universities

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### Abstract

University study and the promotion of scientific advancement are among the most significant goals pursued by students completing their secondary education. However, students often encounter challenges when admitted to universities located in cities different from their hometowns. In such cases, the availability of suitable university dormitories becomes crucial. These dormitories must provide essential services, security, privacy, psychological comfort, and the independence necessary for students to adapt to living away from their families during the study period. This research examines the current state of dormitory buildings in several Iraqi universities, reviews international standards for student housing, and explores how services can be improved to meet students' needs.

**Keywords:** *Engineering Design Standards, University Dormitories, Housing Standards, Services, Security, Student Dormitories Buildings*

### Introduction

The Architectural design aims to Harmonize with the human needs, creating environments that promote social and psychological well-being. The study focuses on the design and functionality of university dormitories in Iraq. These dormitories often face criticisms regarding their independence in providing essential service and addressing students' needs to privacy, security, and comfort. The research evaluates the existing conditions of dormitories and suggests ways to improve their design and operational standards. For example, The University of Baghdad's dormitory facilities have faced significant challenges due to overcrowding, yet recent renovations have introduced more modernized spaces to meet student needs. Similarly, the dormitories at University of Basra highlight the disparity in service quality between older and newer building, emphasizing the need for Consistent upgrades across all campuses.

**Research Importance:** This study addresses a pressing issue affecting thousands of students residing in university dormitories across Iraq. The quality of these facilities significantly impacts students' academic performance and overall well-being.

**Research Problem:** Many University dormitories in Iraq failed to meet the required standard for a student housing. Issues such as inadequate security, lack of a privacy, Poor quality service, and unclear architectural design requirements hinder the functionality and efficiency of their facilities .

**Research Purpose:** To identify a specific architectural and engineering requirements that enhance the quality of dormitory buildings, ensuring They provide comfort, privacy, and adequate services for students .

**Hypothesis:** Improving the design and services of university dormitories in Iraq can create a more comfortable and supportive environment for students, addressing their need and enhancing their academic experiences.

### Basic Design Elements of Dormitory Buildings

The design of university dormitories should address various aspects, including functional, social, and cultural needs. Key elements include [1]:

**Bedroom:** Bedroom must provide privacy and comfort, with adequate space for movement and essential furniture .(Bed, wardrobe, desk) [2]. There are many standards for bedrooms like [3, 24]:

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- 1.1.1 Area: 9-19 m<sup>2</sup>.
- 1.1.2 Natural lighting with Windows Occupying at least 1/8 of the room's area.
- 1.1.3 Proper furniture arrangement to avoid clutter.

**Table 1: International Bedroom standards and Current Iraqi Standard**

	Feature	International Standard	Current Iraqi Standard
1	Room Area	9-19 m <sup>2</sup>	Often below standard
2	Natural Lighting	Minimum 1/8 of room area	Frequently inadequate
3	Furniture Setup	Organized	Overcrowded
4	Ventilation	Centralized systems	Mostly dependent on individual fans

In the Netherlands, the "Student Hotel" concept integrates flexible room layouts ergonomic furniture, and shared social spaces to optimize student living experience. These dormitories are also featuring energy- efficient lighting and ventilation systems (Table 1).

**Service Rooms:** They must have the following constructions [4]:

**Kitchens:** Should allow for individual or group food preparation, with proper ventilation, and durable, non-flammable materials.

**Bathrooms:** Must Prioritize Safety, privacy, and accessibility, with appropriate materials to resist moisture and fire.

**Storage Room:** for cleaning supplies, Seasonal furnishing and maintenance equipment.

**Laundry Area:** Equipped for washing, drying, and ironing clothes, either centrally or individually.

**Recreational and Social Spaces:** These spaces must have the following constructions [5]:

- Gymnasiums.
- internet rooms.
- multipurpose halls for lectures or special event .
- living rooms designed for relaxation and social interaction.

Example, the University of Melbourne's student housing incorporates dedicated recreational zones, including game rooms and rooftop gardens, to promote mental health and community bonding (Figure 1) .



**(Figure 1: Australia Melbourne student village the university of Melbourne campus)**

<https://campuslivingvillages.com/australia/melbourne/student-village-the-university-of-melbourne-campus/shared/>

**Circulation Spaces:** These spaces must have the following constructions [6]:

Corridors and the staircases designed to facilitate safe and efficient movement

Emergency escape routes to ensure safety during critical situations .

**Supervision Rooms:** These spaces must have the following constructions [7]:

Designated spaces for supervisor, ensuring effective monitoring and management of dormitory operations .

### **Engineering Design Requirements**

**Privacy:** Among the most important data that must be taken into account when designing an internal housing section, as well as when starting to furnish it. And allocate the basic places in it, We must take into account the principle of privacy, which is divided into[8]:-

- Internal privacy: Separation between communal and private spaces within the dormitory.
- External privacy: Isolation from external disturbances using architectural solutions such as insulating materials.

Example: The dormitory design at Stanford University prioritizes internal privacy by incorporating soundproof walls and private study spaces within shared living areas. This approach ensures that students can focus on their academic work without external interruptions [9].

Why Dorm Rooms Easily Transmit Noise: College dorm rooms are notoriously echoey, amplifying every little creak and voice. It often feels like you can hear even the faintest whisper spoken next door. (Figure 2).

There are several key reasons these shared living spaces easily transmit noise [10]:-

- Hollow Walls Offer No Insulation
- Echoing and Amplification
- Gaps Allow Noise Transfer Between Rooms
- Hard Flooring Reflects Sound
- Invest in Quality Noise Canceling Headphones
- Use Large Area Rugs for Hard Floors
- Strategically Arrange Furniture
- Seal Doors and Windows with Weatherstripping
- Seal Noisy Door Gaps
- Eliminate Vibrating Windows
- Install Heavy Soundproof Curtain



<https://blog.burtonacoustix.com/soundproof/soundproof-dorm-room>

**Independence:** Providing individual spaces within shared rooms (e.g., separate beds, desks, and wardrobes). There may be more than one individual (a common room), so there will be furniture designated for each individual (bed - wardrobe or a separate part of it - desk with a chair - a private drawer) and in the private room all types of privacy (intimacy) are achieved (Figure 3). If there are

several occupants of the room, as well as (reservation and isolation) if the room is for one person [11, 22, 23].

Example: The University of Tokyo's dormitories offer semi-private rooms with individual desks and wardrobes, ensuring each student has their own functional space while sharing a common room with roommates [12].



(Figure 3: Example of Housing Floor Plans)

<https://www.pinterest.com/pin/four-bed--66498531975245315/>

**Safety:** Ensuring protection from external threats and creating a healthy, noise-free environment [13]. The internal housing provides protection from factors or the outside world and satisfies the need for safety by protecting from any abnormal external conditions and providing a healthy environment that is relatively free of noise and the heat [14].

Example: The student dormitories at (ETH) Zurich employ advanced security systems, including biometric access controls and 24/7 surveillance, to provide a safe environment for residents [15].

**Flexibility:** Allowing for future expansions and modifications without compromising functionality [16]. There is the possibility of future expansion in case the need arises, such as an increase in the number of residents, or the design flexibility is also represented in the possibility of changing the type and function of a part or a number of parts or uses for rooms when needed [17].

Example: Modular dormitory designs, such as those in Singapore's Nanyang Technological University, allow for easy expansion and reconfiguration to accommodate changing student demographics.

**Human Factors:** Considering factors such as study duration, crowding, and psychological needs in dormitory design [18].

Example: The University of British Columbia integrates mental health support areas within dormitory complexes, including relaxation lounges and accessible counseling services, to support students' well-being.

### Current State of University Dormitories in Iraq

**Architectural design that is consistent with the needs of University Dormitories:** a group of issues can be identified that can be addressed to reach the design form that is in harmony with the needs of the residents of the internal sections. Which can be formulated as follows [19]: -

- There are a large number of universities, colleges and institutes spread across the cities of Iraq.
- The central distribution of students by the Ministry of Higher Education in Iraq creates dissatisfaction among individuals due to the distance between the city in which the student lives and the city in which the university in which he will study is located.
- There are internal departments in most cities.
- General dissatisfaction by parents and students with the internal housing for students, especially female students' housing in the internal departments.
- Regarding the four technical universities in Iraq, the number of internal departments in them is (61) internal departments in the academic year (2022-2023) spread in the north, center and south of Iraq, of which (14) departments are rented from the (private) sector.

- The Ministry of Higher Education in Iraq rents (290) sites for student housing in Iraqi cities.
- There are abundant and detailed references for construction technology, but we only have a little information related to housing conditions, and this was specifically the goal of (Ernst Neufert) [20] when he gave architects basic information to enable them in this matter.

**Evaluation of Dormitory Buildings (Figure 5-6):** An evaluation of dormitory buildings in several Iraqi cities revealed the following issues [21]:

- **Location:** Many dormitories are far from educational institutions, requiring transportation.
- **Overcrowding:** Rooms often house more students than their intended capacity.
- **Service Quality:** Limited ventilation, cooling, and heating systems. Lack of modern amenities such as internet access.
- **Security:** Minimal security measures, often limited to basic fencing.
- **Recreational Facilities:** Inadequate spaces for sports and social activities.



(Figure 5-6: Example of dormitories in Baghdad)

## Analysis and Recommendations

### Analysis of the Questionnaire:

The researcher took a number of questionnaire samples to study and analyze the current reality of the buildings of the internal departments. The samples were male and female for students of institutes and colleges, i. Among the questions about the subject of the research, the reality of the services, their quality, and the degree of their satisfaction with them, as well as whether there is something that can be added to the internal department and develop its level. (300) questionnaires were distributed to several internal departments in (Baghdad, Najaf, Hilla and Kufa) and 250 of them were complete and valid information. I took the percentage of the answers to the questionnaire, and the answers were (Yes) and (No). The questions, answers, and percentages were as follows:

Q1 / Do you prefer a private room or a room shared with others?

- (91%) of the respondents preferred shared rooms, and they attributed the reasons to not wanting to be alone for a long time, in addition to the preference for companionship and the desire for new friendships.

Q2/Is the boarding school close to your place of study (it is possible to walk there)?

- The answers were (87%) of the students needed a means of transportation to move back and forth to the boarding school.

Q3/ What is the color of the finishing material for each of the following determinants in your room in the interior section?

- The answer was similar in terms of the colors of the ceiling and walls in a light brown color and the color of the iron doors and windows in a gray color

Q4/ What furniture is available to you in the room (Table 1)?

**(Table 1: The answers of the furniture is available to you in the room)**

Put a sign near the furniture	bed	sideboard	nightstand	wardrobe	other furniture
	89%	20%	76%	84%	0%

Q5: Is the temperature and ventilation of the room comfortable for you?

- The answers were (37%) of the students they said (Yes).

Q6 / Are there audio and visual equipment in the room?

- The answers were (63%) of the students they said (No).

Q7/ Do you prefer having paintings in the room?

- The answers were (70%) of the students they said (Yes).

Q8/ Are there green plants in the room or in the interior?

- The answers were (85%) of the students they said (No).

Q9/If the previous answer is (yes), is it natural or artificial?

- The answers were (0%) of the students they said natural (No).

Q10/ Are the types of social spaces available in the department commensurate with your needs?

- The answers were (28%) of the students they said (Yes).

Q11/ Are there other spaces that you would like to be available in the interior section? (Reception room - sports room - room for watching TV) Mention other spaces, if any.

- A number of suggestions were mentioned, such as sports rooms, television, and ....

Q12/ Are the services currently available in the department compatible with your needs?

- The answers were (28%) of the students they said (Yes).

Q13/ Are there other services that you would like to provide in the internal department?

- The answers were (58%) of the students they said (Yes).

Q14/ Are the corridors well lit during the day without the need for artificial lighting?

- The answers were (32%) of the students they said (Yes).

Q15/ Are the rooms supervised directly by the officials?

- The answers were (42%) of the students they said (Yes).

Q16/ What type and nature of gates are there around the inner section?

- The answers were of the students they said Ordinary iron doors and (PRC).

Q17/ Does the degree of security in the interior suit you?

- The answers were (25%) of the students they said (No).

Q18/ How long do you spend in the internal section?

- The answers were of the students they said, the period ranged from 2 months to 5 months.

Q19/ Are there other additions, if available, that would make you feel more comfortable?

- The answers were of the students they said, a number of suggestions were mentioned, such as nearby shops, parks, and internet services.

Q20/ Is there recycling in the internal section of the trash?

- The answers were (95%) of the students they said (No).



**Survey Results (Table 3):**

A survey of 250 students from dormitories in Baghdad, Najaf, and Hilla highlighted the following:

- (91%) preferred shared rooms for social interaction.
- (87%) required transportation due to the distance between dormitories and institutions.
- Only (37%) found the temperature and ventilation satisfactory.
- (63%) lacked access to audio-visual equipment.

**(Table 3 :Survey Question)**

	Survey Question	Positive Response(%)	negative Response(%)
1	Preference for shared rooms	91%	9%
2	Need for transportation	87%	13%
3	Satisfactory temperature and ventilation	37%	63%
4	Access to audio-visual equipment	63%	37%

**Recommendations:**

1. Develop strategic plans to address dormitory deficiencies, prioritizing students' needs.
2. Establish clear standards for dormitory design, focusing on privacy, safety, and flexibility.
3. Improve facilities by integrating modern services such as internet access and recreational spaces.
4. Train staff to enhance the management and operation of dormitory buildings.
5. Allocate budgets for maintenance and future expansions.

**Conclusion:**

Improving university dormitories in Iraq is essential for creating an environment conducive to academic success. Addressing issues such as overcrowding, poor service quality, and inadequate security will significantly enhance students' experiences. Strategic planning, coupled with adherence to international standards, can transform these facilities into supportive spaces that foster both academic and personal growth. Therefore, we must work to achieve the following action points:

1. The increases in the number of students are not commensurate with the capacity of the internal departments in Iraq. Therefore, it must be Studying the housing needs of the students of the internal department and the numbers expected to occupy these complexes in the future, with a study of any obstacles that may hinder the establishment of this service and finding appropriate solutions for it.
2. Poor services and lack of security are among the most important factors that push students to change their place of study from distant provinces to their own, but with a lower academic level.
3. Developing the strategic plan for the internal department, ie a general plan, and conducting time programming for it according to the priorities of students' needs and according to the available human and material capabilities in the form of annual plans (the internal operational plan of the department).
4. Setting specifications for the buildings, equipment and devices that must be available in the internal department, and determining the needs of the internal section of the necessary manpower and making plans to train new employees.

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