AN INVESTIGATION ON THE PLANIMETRIC DESIGN EFFICIENCY OF GUESTROOM FLOORS IN FOUR-STAR HOTELS

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AN INVESTIGATION ON THE PLANIMETRIC DESIGN EFFICIENCY OF GUESTROOM FLOORS IN FOUR-STAR HOTELS

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ABSTRACT

A INVESTIGATION ON THE PLANIMETRIC DESIGN EFFICIENCY OF GUESTROOM FLOORS IN 4-STAR HOTELS

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A large number of hostelries have been established in Turkey in line with the necessities of our age. From the period of Seljuk and Ottoman, we encounter many variations of these facilities which have come up to our time starting from the caravansaries. Today, even though these facilities differ architecturally, conceptually they work in the same way. The common feature in almost every one is to keep the maintenance, establishment and repair costs at the minimum level. In addition to this, hotel facilities should be given importance to functionality and efficient flow in space. As a condition to this foresight, the design and organization of the floors where guestrooms are located in hotels are significant in both evaluating the fuctionality of these units and in examining the facilities architecturally. While designing a facility from the bottom up and creating it, the designer's knowledge on the planimetric configuration of the hotels built previously may lead the designer to different perspectives. Thus, it is so essential that how efficient these currently used facilities are shared among the guests, employers and the circulation areas should be investigated and the rational relations among these should be analyzed. In this study, the planimetric configuration of the floors where standard rooms of four-star hotels established on a single parcel in Cankaya district of the city of Ankara in Turkey is examined.

In the study, 9 hotels carrying the features mentioned above were randomly selected from a sample space of 25 facilities. The architectural drawings of these structures were obtained from the relevant institutions and organizations. Data regarding area calculations and measurements made were made the investigator from these drawings.

Based on these measurements, 3 different statistical tests were used in order to determine differentiations and similarities among the ratios depicted in chapter 3. These tests were stated as; regression analysis, *t*-tests and analysis of variance. Results showed that significant differences are obtained when the net usable areas are examined and classified according to the number of beds they have and no significant differences were obtained when the analysis made according to the other factors.

Key Words: Hotel units, the design of hotel floors, planimetric configuration, statistical analysis.

ÖZ

ANKARA İLİ DAHİLİNDE TEK PARSEL ÜZERİNE KURULU 4 YILDIZLI OTELLERİN STANDARD ODA KATLARININ PLANİMETRİK TASARIM ETKERLİĞİ ÜZERİNE BİR ARAŞTIRMA

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Literature bakıldığında, yakın geçmişimizde inşaa edilmiş farklı tiplerde otellerle karşılaşmaktayız. Bu yapılar her ne kadar mimarî olarak birbirinden farklılık gösterse de işlevsel olarak aynı şekilde çalışmaktadırlar. Bu tür yapılarda sağlanması beklenen ortak başarı; inşaat sürecinden başlayıp işletim süreci içinde yapının yapım, bakım ve onarım maliyetlerini en alt seviyede tutmak ve hacimsel olarak fonksiyonelliğe, akıcılığa önem vermesinden geçer. Bu bilgi doğrultusunda, otellerde misafir odaların bulunduğu katların tasarımı ve organizasyonu, katlarda bulunan birimlerin kullanılabilirliğinin ölçülmesinde ve yapının mimarisinin bir bütün olarak incelenmesinde önem taşımaktadır. Tasarımcı, bir yapıyı oluşturmadan önce geçmişte inşaa edilmiş otellerin planimetrik oluşumunu incelemiş olması, onu farklı bakış açılarına yönlendirebilir. Bu yüzden, hali hazırda kullanılan otellerin, konaklamaya gelen müşterilerine ve personeline ayrılmış olan alanların ne kadar verimli kullanıldığı ve nasıl pay edildiği araştırılıp, aralarındaki oransal ilişkiler analiz edilip tasarımcıya ulaştırılmalıdır.

Bu çalışmada, Türkiye'nin Ankara ili Çankaya ilçesi dahilinde tek parsel üzerine oturmuş 4 yıldızlı otellerin, misafir odalarının bulunduğu katların planimetrik tasarım etkerliği incelenmiştir. Yukarıdaki özellikleri içeren 25 otelden 9'u rastgele seçilmiştir. %36'lık bir kısmı oluşturan bu yapıların mimari projelerine ilgili kurum ve kuruluşlardan ulaşılmış ve üzerlerinden yapılan ölçümlerle oda katlarının alan hesaplarına dair metrajları çıkarılmıştır. Bu metrajlardan esas alınarak hesaplanan oranlar, geçerliliği Kabul edilmiş etmenlere göre sınıflandırılmış ve saptanan farklılıkların kaynağının belirlenmesi için 3 farklı istatistik çalışmadan faydalanılmıştır. Bunlar ikili *t*-sınaması (*t*-testi), dağılım grafikleri ve varyans analizleri yapılmıştır. Ikili t-sınaması ile iki değişken arasında olabilecek ilişkiler incelenmiş; dağılım grafikleri ile iki değişken arasındaki doğrusal bir ilişki olup olmadığının bulunması ve bu doğrusal ilişkinin bir doğrusal denklemle nasıl ifade edildiği incelenmiş; ve varyans analizleri ile de bir değişkenin başka bir değişkenin üzerindeki etkisi incelenmiştir. Bu analizlerden elde edilen sonuçlara bakıldığında yatak başına düşen yapısal alan sınıflandırılarak yapılan incelemelerde oranların farklılık gösterdiği, diğer etmenlere göre yapılan analizlerde ise oranların farklılık göstermediği anlaşılmıştır.

Anahtar Kelimeler: Oteller ; oda katlarının tasarımı; planimetrik oluşumu; istatistik analizler.

To My Parents

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CHAPTER 1

INTRODUCTION

In this chapter are first presented, under respective sub-headings, the argument for and objectives of the study being reported herein. Again under a dedicated sub-heading, it continues with a brief overview of the general procedure followed in its conduct and ends with a succinct description of what is covered in each of remaining chapters, under the sub-heading titled “Disposition”.

1.1. ARGUMENT

From past to present, a large number of hostelries has been established in Turkey in line with the necessities of our age. Starting with the construction of the caravansaries, many different forms of these facilities have come up to our time. Today, various types of hotels are found in Turkey on account of diverse planimetric configuration. The location of the site and restricted zone areas causes diverse configuration of hotel floors. As defined by RUTES (1985) hotel floors can be cited as single-loaded corridors, double-loaded corridors, offset, triangular form, rectangular form, atrium plan *etc.* The aim of all these different designs is to provide accessibility and functionality to the rooms and other spaces. The primary concern of architects as well as interior designers is to provide an appropriate design for hotel planning for guests, staff and administration. However, design efficiency, the main concern of hotel management is to enhance its income for their owners. Because of this reason, accommodation of guest privacy and comfort needs (ergonomics), lowest maintenance costs, providing the best services in terms of client needs and obtaining the lowest construction costs are of their interest.

The dominant factor in creating a hotel design is the spatial efficiency of the guestrooms and en-suite bathrooms. The basis of the importance given to hotel rooms is established on the fact that they are used several times by various guests. Sometimes one to three guests accommodate a room per day. Additionally, staff also visits the hotel rooms at least two times per day. Hotel rooms, therefore, have one of the highest wearing co-efficients, *i.e* abrasion of materials in long run, when compared to other hotel units. Simply because one guests enters and leaves the hotel room approximately four times per day.

In addition, guests, management and staff also routinely use hotel floors. The primary concern is to generate efficient design solutions in terms of high population in hotels. This is why; the overall area must be analyzed before designing the guestroom floor plans. The construction period should start only after completing the design solutions, *i.e* analyzing the wearing co-efficient, circulation density and functionality of the spaces. If at all to be made, planimetric efficiency of hotels must concentrate on the configuration of guestroom floors simply because they generate the major part of overall area.

Studies show that there are many factors that influence the level of efficiency, *i.e* functionality of the guestroom floors, if the subject is taken as a whole. Among these may be cited, usable space for diverse units; type and size of facilities; dimensions of the guestrooms; length, width, and height of circulation spaces; and so on. Working efficiency of employees is affected by these areas, especially on guestroom floors which give service 24 hours a day. Furthermore, employees may also become fatigue due to long walking distances in the circulation paths, which then negatively influences their working performance.

The efficiency of design may also be affected by dimensions of guestroom areas, including en-suite bathrooms, dressing rooms, *etc.,* their location in floor plans and even the placement and the number of beds in the room. To exemplify the condition, the number of beds can differ due to the position, type and dimensions of the hotel rooms. The decision should be taken by calculating the area between wall-face to wall-face. It is observed that the number of beds in each room is not placed in respect to the area and volume due to the desire for higher profits. However, functionality can be reduced by the addition of excessive amount of furniture into the room. Also, all of the hotels that were studied had similar sized en-suite bathrooms. In order to enhance the space and volume of the room, they are all small in scale and impractical.

Circulation areas and serving areas with their location, dimensions and their organizations are other spaces that affect the design efficiency in guest-room floor units, apart from guestroom areas. For example, if the width of the circulation space increases, the rate of change and how these changes affect the size, number and location of the neighboring areas such as guestrooms, elevator shafts, serving rooms will gain importance. Besides, secondary spaces such as mechanical rooms and serving rooms may vary in dimensions according to the number of clients and/or the number of guestrooms.

Overall dimension and planimetric configuration, named shortly 'aspect ratio' are other subjects involving the factors that affect the floor plan design efficiency. To summarize briefly, note that aspect ratio is the ratio of its longer dimension to its shorter dimension. This proportion gives the constructional and operational efficiency of the floors and helps calculating heating-cooling amounts of the volume if concerned.

Definition was made concerning the principal aim of this study under the foregoing considerations as a multifaceted analysis of guestroom floors in hotels according to their planimetric design efficiency. The hotels that are analyzed in this study are all located in Ankara, Turkey. Although there are a limited number of hotels that are chosen and evaluated, it is certain that this study will be useful for future researchers.

1.2. OBJECTIVES

The conceptual framework of the study broadly rested on the determination if any remarkable relation could be found between different parameters. In this context, its primary focus was on planimetric design efficiency of guestroom floors in 4-star hotels. Following from the argument, objectives were therefore confined to those involving the analysis of guestroom floors in the hotels. While in some aspects the aim of the study is overlapped with those postulated earlier by KAZANASMAZ (2005), the author focused on planimetric design efficiency of inpatient departments in healthcare facilities in question. Seven fundamental objectives were thus established; namely;

(a) to determine net usable floor areas and gross floor area in hotels on guestroom floors;

(b) to determine the ratio of net usable floor areas to gross floor area in order to determine design efficiency in terms of construction, management, and maintenance and to measure the flexibility and functionality of the space.

(c) to define the planimetric design efficiency of guestroom floor plans and areas of primary spaces per bed by using the ratio of net usable areas to gross floor area.

(d) to define the planimetric design efficiency of guestroom floor plans and areas of secondary spaces per bed by using the ratio of net usable areas to gross floor area.

(e) to define the planimetric design efficiency of guestroom floor plans and areas of circulation spaces per bed by using the ratio of net usable areas to gross floor area.

(f) to identify the guestroom areas as primary spaces depending on their dimensions, locations, and impact on the dimensions and arrangement of circulation paths in floors.

(g) to identify the service areas as secondary spaces depending on their impact on both plan shape of the floor and operational efficiency of the hotel management.

1.3. PROCEDURE

A general survey was first conducted to establish familiarity with the subject domain, which included an evaluation of hotel guestroom floors based on their spatial chracteristic, composition and organization. Next was defined the sample space of four-star hotels that sit on a single lot, located in various parts of Çankaya, Ankara. It was defined for the quantitative aspects of the study to analyse planimetric design efficiency of their guestroom floors. After these were identified with all their pertinent attributes came a comprehensive phase where an extensive search was made in the literature to obtain specific information on planimetric configuration of different hotels and also on universal design for touristic facilities. This was followed by the third phase, in order to select related hotels from among a sample space of hotels a roughly 36% random sample was constructed. This chapter also covers the material based on the study as well as the methodology used in assessing the data. In the fourth phase, examination of the production drawings of those hotels falling in the sample was made; dimensions of spaces on guestroom floors were noted for calculating areas of spaces and obtaining ratios of net usable floor areas to gross areas as analogue indicators for analysis of design efficiency. In this, classification of various spaces was made into 3 main categories as primary, secondary and circulation spaces. In the last phase comprised on the analysis of variance (ANOVA) conducted to determine whether there were significant differences among hotels grouped based on the area of primary spaces per bed, area of secondary spaces per bed, area of circulation spaces per bed, constructional area per bed, and net usable floor area to gross floor area in terms of indicator ratios. Students' *t*-tests were conducted and scatter plots were constructed to understand if there was a direct relationship among primary spaces, secondary spaces and circulation spaces.

1.4. DISPOSITION

There are five chapters to this report. This first, containing the argument, the objectives and the procedure of the investigation, along with this disposition which summarizes what follows in the remaining chapters, gives a broad view of its most salient aspects.

The second consists of a literature review on general characteristics of hotel planning, design and design efficiency of guestroom floor planning is presented. The third chapter provides a thorough description of study material and methods used in both data collection and in its analysis. Here, factors of design efficiency of guestroom floor plans are evaluated through analyses of variance (ANOVA). The fourth then sets out the specific result of the study, together with a discussion of these in terms of its objectives and relevant aspects iterated in the literature are given. The fifth concludes the study by summarizing its findings and offering pertinent recommendations.

CHAPTER 2

LITERATURE SURVEY

A total of 36 sources were examined for this study with regard to planimetric configuration of different hotels. During the survey, the researcher observed that each article and/or journal represented the subject, *i.e* hotel architecture, in the same way but from a different perspective. For this reason, 36 sources were collected and then explained by the researcher. On the other hand, within the sources, there are also different articles revieling various details about hotels in general.

In this chapter, hotels in general, hotel archictecture, *i.e* form and design, and guestroom floor plans were studied according to their context. It consists of four sections and the characteristics of the hotels in this study are as follows: (1) Hotel planning, configuration and design, (2) Design efficiency of hotel guestroom floors, (3) Configuration of the guestroom design and (4) Methodology.

2.1. REPORTS ON HOTEL PLANNING, CONFIGURATION AND DESIGN

SIGUAW and ENZ (1999,44) expound on the term "hotel" as a few words. According to SIGUAW and ENZ (1994, 44) the main objective of hotels is to make their guests feel as if they were at home by giving the hotel a residential feel and designing the hotel in a way that it meets the needs of a specific market as expressed by some researchers. As an aside LAWSON (1995, 1) criticizes that several factors as marketing, economics, location, enterprise, planning and design development affect the successful development of hotels.

STIPANUK (1992, 357) in summing up the development of the hotel industry, states that, there were only roadside inns and taverns before 1800s, while hotels rapidly evolved during 19^{th} and 20^{th} centuries. The same author continues to say that hotels had been uncommon until the Tremont House in Boston and the Astor House in New York were built and describes how technological developments such as central heating, indoor plumbing, gas, electric and elevators in the late 1800s affected design of hotels.

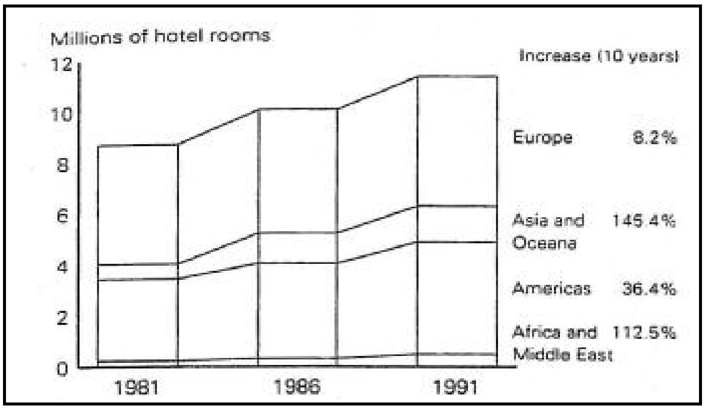


Figure 2.1. Increase in the number of guest rooms in hotels, by geographical location. (LAWSON,1995,3).

STIPANUK (1992, 357) also indicated that hotel industry faced a tremendous growth in 20th century particularly after World War II. The author continues with mention of tremendous development of hotel industry in the last fifty years; in 1950's roadside motor inns were developed; later in 60s, convention hotels and suburban hotels emerged; airport hotels developed in the 1970's; lastly in 1980's all-suite hotels and resorts were introduced.

Both STIPANUK (1992, 357) and BAUD-BOVY (1998, 23) suggest that hotels, catering for different market requirements and operating under different conditions of scale, ownership and management, range within several types. Therefore, definitions of hotels are rarely precise and they are subject to continuous change.

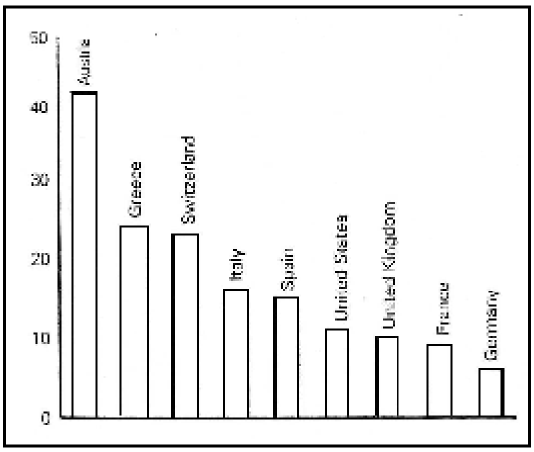


Figure 2.2. Distribution of hotel rooms by country population in 1991. (LAWSON,1995,3).

To quote from another source, HUFFADINE (1993, 125) emphasized that quality standards and the detail of the interior design is one of the basic features affecting the success of a hotel in business. Therefore, the goal and objectives of the project should be obtained, expenditure controlled, and fit-out implemented in a satisfactory way, the project team and the manager should clearly comprehend the special requirements of the functional areas of a hotel.

		Economy *	Some comfort **	Average comfort ***	High comfort ****	Deluxe *****
Two-bed room (net) including bathroom	m²	[illegible]	[illegible]	25.2	30.0 (+2*)	[illegible]
	sq ft	[illegible]	[illegible]	[illegible]	[illegible]	387
Room circulation and service2	m²	4.5	[illegible]	7.8	14.0	[illegible]
	sq ft	48	[illegible]	84	151	[illegible]
Residential area (total)	m²	22.0	27.0	[illegible]	44.0	[illegible]
	sq ft	[illegible]	291	[illegible]	474	[illegible]
Public and support areas (total)3	m²	5.5	[illegible]	13.0	18.0	[illegible]
	sq ft	59	86	139	[illegible]	[illegible]
Residential area	% of total	80	77	72	71	[illegible]
Total per unit	m²	27.5	[illegible]	[illegible]	52.0	[illegible]
	sq ft	296	377	494	[illegible]	[illegible]
Total per bed	m²	13.8	17.5	22.5	[illegible]	37.5
	sq ft	148	[illegible]	242	[illegible]	[illegible]

Notes
(1) [illegible]
(2) Corridors, stairs, elevators, [illegible]
(3) [illegible]

Figure 2.3. Gross areas for two-bed hotel units, given by category and grade. (BAUD-BOVY, 1998, 23).

As an aside, HUFFADINE (1993, 126) also points out that the interdependent function of the construction process is conducted by the team programmers, which then are programmed into the schedule in order of performance. What is so in this regard, the author continues, as these activities progress, with a desire to substitute options, the schedule and programme are again analyzed to find out areas of risk and uncertainty. Continuing, the author comments that in hotel and resort development, a large part of the work package breakdown is related with interior design and fit-out.

As explained by HUFFADINE (1993, 126), planning and design for the modern variations on hotel and resort themes should include the comforts necessary to support different functions. For instance, a luxurious and mixed-use hotel requires different space configurations, a functional allocation and technical equipment. These differences are often minor; however, they are significant. The author further notes that guestrooms, public areas, guest transport, storage and service areas are the major interior spaces requiring elaborative design definitions.

HUFFADINE (1998, 127) also gives information regarding the space allocation for various facilities in the hotels. The design and dimensions of space allotted to various functions , the quality and diversity of facilities available to the guest, the quality of finishing materials, and the standard of restaurants and kitchens affect the budget category, standard, or rating; *e.g.,* three-, four-, five-star, or luxury.

In addition to this, the same author further stipulated that several space and other criteria are used to establish functional relationships between areas and departments. These are quoted in many references and although there are common minimum acceptable standards for an international hotel.

Table 1.1 WTO minimum hotel standards *(continued)*

	1 star	*2 star*	*3 star*	*4 star*	*5 star*
Public telephones	Telephone available through reception	Telephone booth in the lobby		Soundproof booth in lobby with national and international connections	
			Telephone available near all public rooms		
Bedrooms					
Size	Adequate for free movement, comfort and safety. Minimum area in square metres (excluding bathroom and lobby):				
Single	6	8	10	12	13
Double	10	10	12	14	16
Triple	12	12	14	16	19
Suites				Some suites available or connecting rooms to make temporary suites	Independent suites of various types and connecting rooms
Single bed minimum size	1900 mm x 800mm			2000 mm x 800mm	
Linen/towels	Bed linen changed with each new occupant. Towels changed with each new occupant and daily →				
	Bed linen changed twice a week		Bed linen changed daily		
Room cleaning	Daily →			Additional room cleaning on request up to 12.00 pm	24 hour additional room cleaning
Storage	Closet or wardrobe with hangers plus shelves or chest of drawers. Increasing in sophistication →				
Seating	Minimum of one chair per person		Minimum of one armchair per person		
Tables	One bedside table per guest →				
		Table in room	Writing/dressing table	Writing/dressing table with drawers	
Lighting	Natural light through windows during the day. Artificial light at night adequate for reading. Ceiling light with switches at entrance and bedside. One bedside lamp per person →				
			Reading lamp at armchair/writing table		
Floor covering	Suitably tiled or covered floors with bedside rugs or carpets where appropriate			Wall to wall carpets or high quality flooring and floor coverings	

Figure 2.4. Valid hotel room standards across the world. (LAWSON, 1995).

World Tourism Organization (WTO,2001) breaks down the minimum hotel standards in global spread. On a more tangible stand in this vein are the several specifications for room standards given by WTO (2001), which is reproduced in Figure 2.4., below.

2.1.1. Reports on hotel Categories

LAWSON (1995, 20) dwells on the identification and sizes of hotels which were described by their locations, standards of quality, operation as a chain or extent of specialization. It is also emphasized by the author that the stock of hotel accommodation in most developed countries is characterized by a high proportion of small family-run hotels, inns, and guest houses. Generally recently built hotels are within the mid- to large size range to justify commercial investment and group operation. The author continues to specify the optimum number of room for efficient staffing is usually approximately 200 while larger units can provide savings in property and advantages in marketing. According to LAWSON, in prime locations, the high cost of site acquisition will usually enforce the minimum size and grade to ensure a viable cost/room ratio.

According to BAUD-BOVY (1998, 23), the optimum sizes for hotels increase gradually and the threshold of size is determined by operating requirements. For example, guest-houses and pensions need 10-20 rooms while resort hotels require 300-500 rooms. The same author goes on to note that more than 500 beds in resorts face difficulties and uncertainties of marketing and finance in a rapidly changing world and social patterns.

2.1.2. Reports on portfolios in hotel design

LAWSON (1995, 38) stresses that hotel design is determined by three parameters as location and site considerations, market and operator requirements, cost and time. The same author goes further to state that the hotel development is identified with five major types as mid-range, high-grade, budget hotels, resort hotels and suite hotels. Mid-range hotels include commercial hotels in suburban areas, near airports while high-grade properties offer city centre hotels, with adaptive re-use and mixed development. On the other hand, resort hotels include vacation villages and adaptive re-use of country houses and finally suite hotels constitute condominiums and serviced apartment.

Suburban hotels, resorts, convention hotels, suite hotels, super luxury hotels and casino hotel are out of this study, so no details are given regarding to these hotels. Downtown hotels, adaptive re-usable hotels and mixed-used hotels are briefly explained under this heading.

(a) The Downtown Hotel

As indicated by RUTES (1985, 37), being adopted from European inns, the early downtown hotels were built on Broadway in New York City and it was developed in the beginning of 1790s. Compared to inns, they were larger and had more comfortable rooms and a space that could be used for social and business meetings as LAWSON (1995, 48) mentioned.

HUFFADINE (1993, 126) points out that downtown hotels have often been used for both political and business purposes, and today there are more business opportunities in the industry thanks to the provision of special conference and convention facilities, audiovisual entertainment, gyms and saunas.

As LAWSON (1995, 48) indicates, the most prestigious city locations in Europe have the limited sites which are also subject to stringent town planning controls. Therefore, downtown hotel development emerges from conversion of other buildings and refurbishment and complementary enlargement of existing hotels to make use of the advantages of their siting and character at most.

Downtown hotels, which usually had a four-storey structure with 173 rooms, social and business meeting areas, lobby as well as door locks and indoor bathrooms in guestrooms became popular in the end of 17^{th} century mostly in U.S cities such as

Boston, Philedelphia, and Baltimore. At the end of World War I, an effective hotel construction started in 1920s. Moreover, after the World War II, there was a sudden expansion in travel and tourism sector. This is the reason of the increasing number of downtown hotels (RUTES 1985, 38).

RUTES (1985, 40-41) also points out that the ideal size of hotels is defined by some threshold factors as an additional restaurant, an extra elevator, a computerized front desk system, an extra mechanical supply system, more complicated structural and foundation systems with regard to their extra building height. The same author (1985, 41) also explains that the hotels with a number of rooms between 100 and 200 are more advantegous than most chain hotels since an available room can always be found although no advertisement is made. Meanwhile, as profit margins can be higher in hotels with number of rooms between 200 and 500, they should have strong financial power and advertisement as well.

Since the number of customer per room and accommodation time are close to each other in downtown hotels as it is in suburban hotels and airport hotels, net room measures of guestrooms vary by 10%. The approximate room measures in downtown hotels are 3.8 m x 5.5 m. Besides, that the room width is more than the standard measures only helps the dimensions of bed and wardrobe to enlarge. However, it is a more effective choice that the room is longer than the standard measures as it helps locating an additional armchair and hidebed (RUTES 1985, 47).

According to RUTES (1985, 47), enlarging the guestroom is a more costly system than legthening it as the floor thickness and the open space between column and beam increase in out façade. Therefore, designers focus on legthening the room instead of enlarging it.

(b) Updating the Existing Hotel (Adaptive Re-Use)

RUTES (1985, 110) states that constructing a new hotel is more costly than upgrading an existing hotel. While keeping the structure fresh and vigorous, upgrading a hotel leads to a more profitable result for the investor since a newly constructed hotel should be renewed semi-annually. Therefore, upgrading an existing building and presenting it to the market afterwards results in more fruitful outcomes. The shape and character are mostly predefined where hotels are provided by extension or conversion of existing buildings. In this vein, while that by LAWSON (1995, 61) indicates that it is not easy to change the sizes of rooms and proportions of space and this results in disproportionately high ratio of public areas and circulation spaces. To illustrate, wide window spacing, high ceilings, or single-loaded corridors may restrict the number of rooms achieved without major cost and structural implications.

LAWSON (1995, 62) also mentions that guestrooms are generally to standard 3.65m x 8.5 m dimensions in re-adaptive type hotels while some 5% of them are suite; however, the high percentage of single occupancy in business hotels may justify rooms of 3.6m x 8.0 m.

(c) Mixed-Use Developments

Mixed-use complexes are generally used as hotel, office building, rental residence and shopping centers. The first example of such buildings is the Place Vendom built in the period of Louis XIV. This classical structure is an example of a mixed-use building with its shopping centers, office areas, apartments and hotels. Two hundred years after this building, in 1920s, todays mixed-use complexes emerged by the construction of Grand Central Terminal in New York (RUTES 1985, 133-135; LAWSON 1995, 48).

As defined by RUTES (1985, 136), the rapid rise of shopping centers in 1960s caused the hotels to reserve a place for shopping and highly profitable shopping centers started to be located in many hotels in 1970s.

According to RUTES (1985, 136), the advantages of mixed-use developments can be listed as below: the combined central energy plant that serves the whole complex, the combined security guard on enclosed mall, and combined health clubs that serve for guests as well as the community members.

2.2. REPORTS ON DESIGN EFFICIENCY OF GUESTROOM FLOORS

One of the issues that should be mentioned in design efficiency is space planning. As it is indicated by HUFFADINE (1998, 129) space planning must fulfill the demands of various spatial needs, circulation, and the staff servicing in hotels. The same author mentions that while developing a design, it should be considered that the efficient use of space and the provision of high-quality interior environmental control are essential.

According to LAWSON (1995, 222) the biggest concern of the investors while constructing a hotel is to keep the circulation areas and support units in minimum amounts so that maximum importance is given for the areas in guestroom floors. The author (1995, 222) also stresses that guestrooms constitute between 65% and 85% of the total constructed area of a hotel. The largest source in hotel revenue is the income from rooms, which is the largest part of the gross profit.

While in another study based on design efficiency of guestroom volumes, RUTES (1985, 161) states that the most efficient guestroom floor plan is the one providing the shortest walking distance for the guests as well as the staff. As the same author continues, a few programme requirements exist for the guestroom floors designated for the number of guests and service elevators, guestrooms and exit stairways adapting to the required building code.

RUTES (1985, 161) also states that before starting a design of a hotel, an architect and an interior architect should analyse the guestroom floors and decide how the layouts of guestroom floors will be. These layouts can be designed as long corridor, double- or single-loaded corridor, compact vertical towers, or flamboyant atrium. For instance motor inns guestroom floors are often planned with a double-loaded corridor and might be shaped into L, T, □ or other patterns.

What is the most suitable order for the guestrooms? RUTES (1985, 161) suggests that the selection of a hotel plan type can be considered with site, environment, and space requirements; hereby, the architect should consider that any configuration will shape the financial depletion of the project. According to the same author, the most economical design may not always provide the best design solution. Therefore, shorter walking distance, high efficiency on guestrooms and more attractive spatial elements may influence the guest's attitude towards the value of the hotel experience. STIPANUK (1992, 362), on the other hand, points out that all hotels are subjected to numerous construction regulations, such as zoning codes, health standards or sign ordinances. Therefore, it is necessary that the development team establish preliminary construction standards for the hotel in addition to estimating and refining space requirement and defining the operational aspects of the proposed hotel.

2.2.1. Reports on planning efficiency to maximize guestroom area

RUTES (1985, 161), HUFFADINE (1998, 127) and STIPANUK (1992, 367) notes, efficient room floors can be formed by reducing the circulation areas and service areas in rational way. In this vein, designers, architects and engineers work in coordination in establishing this efficiency and enhance the rate of floors on which guestrooms are located to the other floors in total.

Both RUTES (1985, 161) and HUFFADINE (1998, 127) also presents information regarding the analyses of scores of different tower plans. The outcome of this analysis demonstrates that some planning configurations of tower plans result in more eligible solutions than other types. These aspects notwithstanding, the author notes that the selected configuration is compatible reflects positively on the gross area of guestroom floors by 20% and total area by 15%; e.g., the difference among double-loaded corridors, single-loaded corridors and atriums shifts the net area of guestroom between 43 m^2 and 53 m^2 forming a - 10 m^2 discrepancy. In Figure 2.5. and 2.6., below, show hotel guestroom floor analysis from different authors.

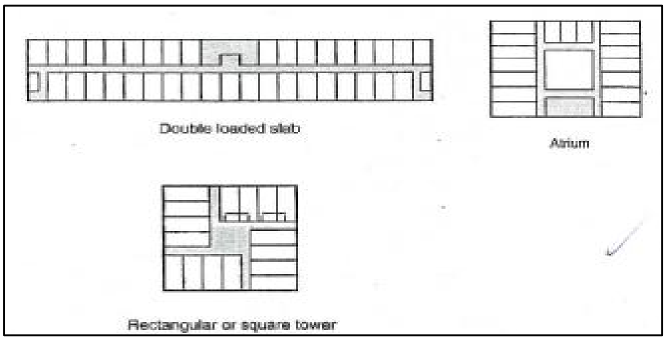
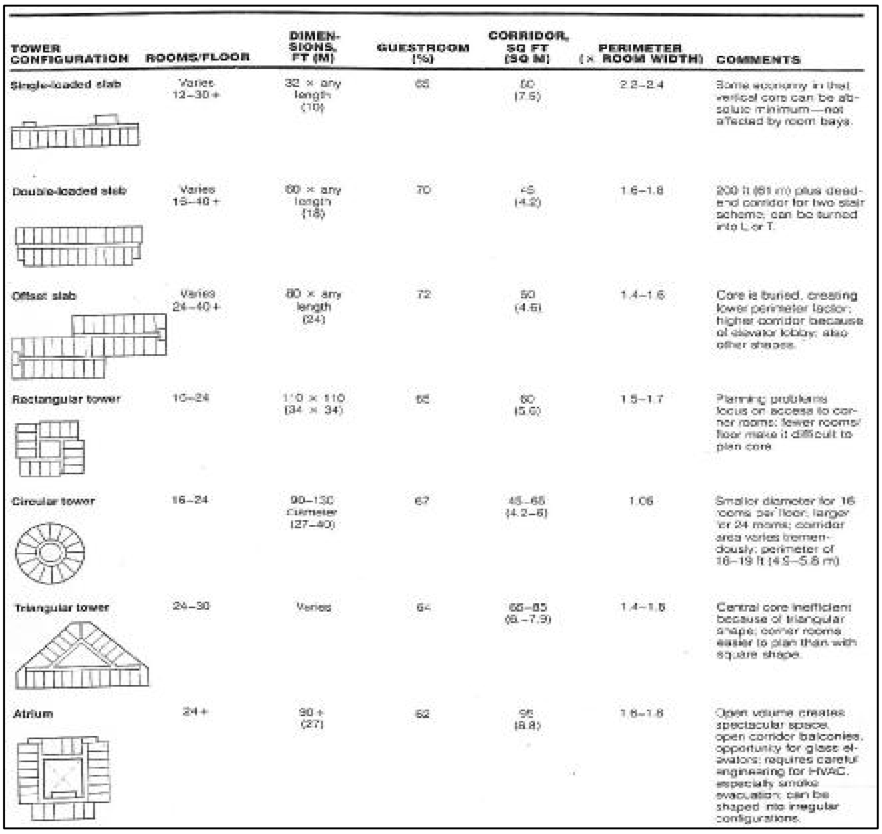


Figure 2.5. Example of guestroom floor analysis.
(HUFFADINE, 1998, 128).



TOWER CONFIGURATION	ROOMS/FLOOR	DIMENSIONS, FT (M)	GUESTROOM (%)	CORRIDOR, SQ FT (SQ M)	PERIMETER (× ROOM WIDTH)	COMMENTS
Single-loaded slab	Varies 12–30+	32 × any length (10)	65	80 (7.5)	2.2–2.4	Some economy in that vertical core can be absolute minimum—not affected by room bays.
Double-loaded slab	Varies 16–40+	60 × any length (18)	70	45 (4.2)	1.6–1.8	200 ft (61 m) plus dead-end corridor for two stair scheme; can be turned into L or T.
Offset slab	Varies 24–40+	80 × any length (24)	72	50 (4.6)	1.4–1.6	Core is buried, creating lower perimeter factor; higher corridor because of elevator lobby; also other shapes.
Rectangular tower	16–24	110 × 110 (34 × 34)	65	60 (5.6)	1.5–1.7	Planning problems focus on access to corner rooms; fewer rooms/floor make it difficult to plan core.
Circular tower	16–24	90–130 diameter (27–40)	67	45–65 (4.2–6)	1.05	Smaller diameter for 16 rooms per floor, larger for 24 rooms; corridor area varies tremendously; perimeter of 16–19 ft (4.9–5.8 m)
Triangular tower	24–30	Varies	64	65–85 (6.–7.9)	1.4–1.6	Central core inefficient because of triangular shape; corner rooms easier to plan than with square shape.
Atrium	24+	90+ (27)	62	95 (8.8)	1.6–1.8	Open volume creates spectacular space, open corridor balconies, opportunity for glass elevators; requires careful engineering for HVAC, especially smoke evacuation; can be shaped into irregular configurations.

Figure 2.6. Hotel guestroom floor analysis. (RUTES, 1985, 162).

STIPANUK (1992, 367) dwells on the fact that the planning necessities for guestrooms floors should be determined by the number of guestrooms or suites, guest and service elevators should be suited availably, exit stairways must meet the building code, sufficient amount of linen storage and vending areas should be supplied. According to the type of arrangement, as it is mentioned by the same author, these elements can easily affect the total floor area by 10 %. This means a well-made planning creates a considerable influence on the efficiency of guestroom areas. Compare to this, PICKARD (2005, 147) points out that gross residential areas add circulation and floor service spaces to the net room areas. The author continues gross factors can vary from less than 5% for chalet and lodge type buildings with external entrances, through 20-30 % for double-loaded central corridors accessible by lifts and stairs, up to 35-45 % for single-loaded side corridors and tower buildings.

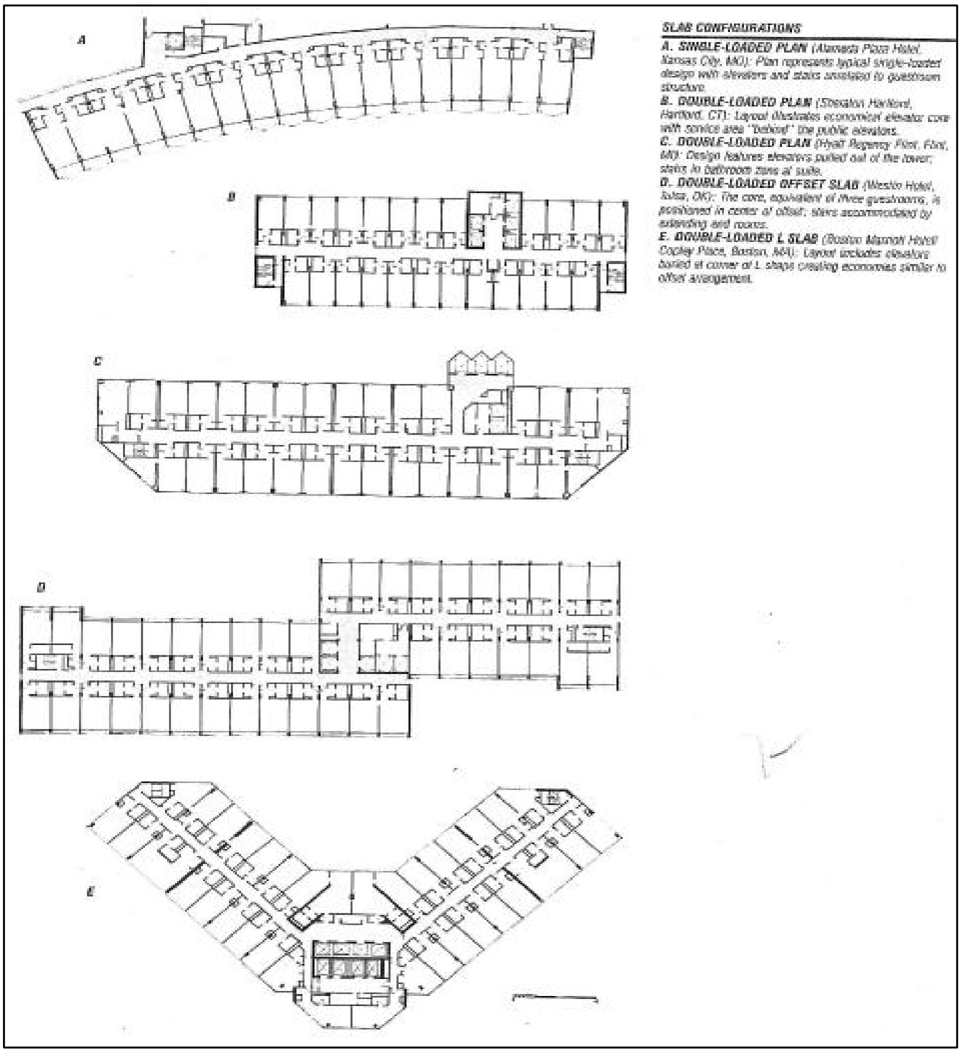


Figure 2.7. Different floor configurations for hotels. (RUTES, 1985, 163).

As emphasized by RUTES (1985, 161), by calculating the percentage of the total floor area that is designated for the guestrooms, the most efficient typical hotel floors can be found out. These show variations between 60% and 75%. In order to detect this efficiency, it is necessary to examine the plan layouts at first e.g. atrium, double-loaded plan *etc.* An increase in this percentage helps the architect or the designer locate larger rooms and more rooms on a floor. However, STIPANUK (1992, 360) emphasizes, the ratio of guestroom space to public space is the most apparent difference among properties. This ranges from over 90 % guestroom space in budget properties to less than 65 % guestroom space in large convention and resort hotels.

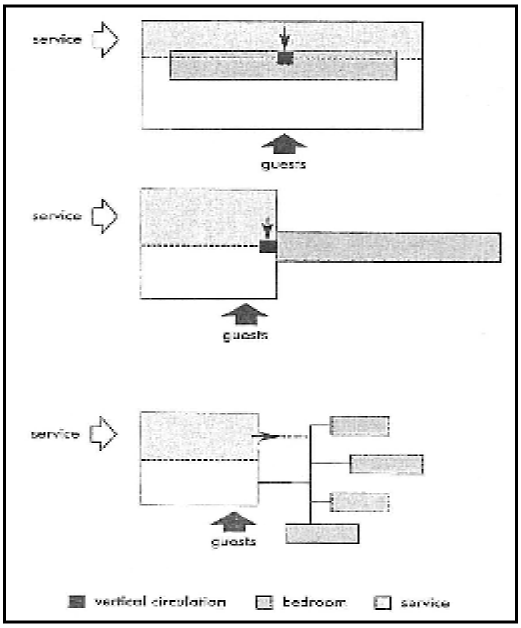


Figure 2.8. Three basic arrangement for relation of guestroom block to public room areas. (PICKARD 2005, 143).

2.2.2 Reports on plan configurations for guestroom floors

According to RUTES (1985, 161) and HUFFADINE (1998, 129), before forming the plan configuration, the architect has to consider five different issues namely; corridor loading, shape of the plan, core location, core layout and stair location. While corridor loading gives an idea to the architect on forming service and circulation areas, the shape of the plan is formed by analyzing what kind of an area the building is constructed on. The architect shapes the location of service and customer elevators, the place where service areas will be located by applying to the core location and core layout. Besides, stair location is established by trying to answer questions such as where the fire, customer and/or service stairs should be located and how many meters they should occupy.

It is also stated by HUFFADINE (1998, 129) and RUTES (1985, 161) that the percentages of floor area that are allocated for fruitful functions should be maximized if possible, and circulation and non-revenue producing space should be kept at a functional minimum level. According to the same authors, these needs should be balanced by the designer.

RUTES (1985, 161) suggests that, compared to other types, double loaded schemes are more efficient and that single loaded corridors need 4 to 6 percent more floor area for the same number of rooms. The author believed that experienced hotel architects make the length of the building narrower by making the plans tighter. This system creates the opportunity for the formation of a more functional plan by helping the areas (service area, lifts, corridors *etc.*) other than guestroom reduce. "Offset plan" can be presented as the best example since in this plan system, service and guest areas are solved together and a more economical result is reached.

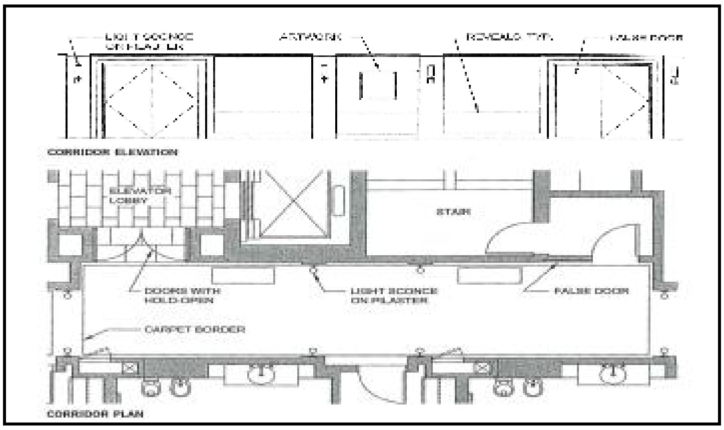


Figure 2.9. Drawing of an offset hotel guestroom entry. (MCGOWAN & KRUSE, 2004, 381).

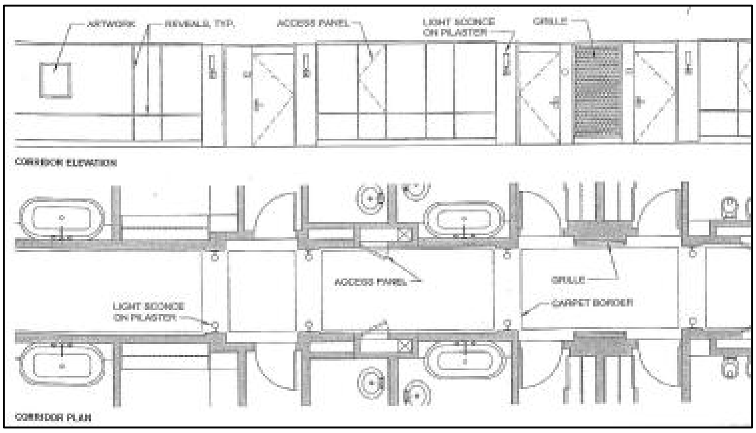


Figure 2.10. Drawing of an aligned hotel guestroom entries.
(MCGOWAN & KRUSE, 2004, 381).

RUTES (1985, 164) also gives brief information with regards to the core design. This is the most important items of a guestroom floor, by means of which several items such as service areas, lobby transition areas, shafts and fire stairs can be solved. Obviously, there is an improvement in the efficieny of the plan when the core displaces the fewest number of guestrooms. Besides, another factor restricting the number of rooms in guestroom floors is the building core laws.As emphasized by RUTES, in some building codes the number of hotel rooms and approach distances are indicated clearly; e.g., some specifications dictate that in some regions the stairs cannot be farther than 61 meters.

On the other hand, REZKINOFF (1986, 547) and PICKARD (2005, 147) state that the travel distance requirements depend on the kinds of occupancies and the fire protection level that is provided. They emphasize that travel distances may be doubled, that is, from 30.48 m to 45.72 m by adding automatic sprinklers.

Besides atrium scenic lifts, the best location for guest lifts is the main lobby within control of the front desk. Guest and service lifts, normally in the ratio 2:1 and 3:2 are mostly located back to back for financial concerns (PICKARD 2005, 147).

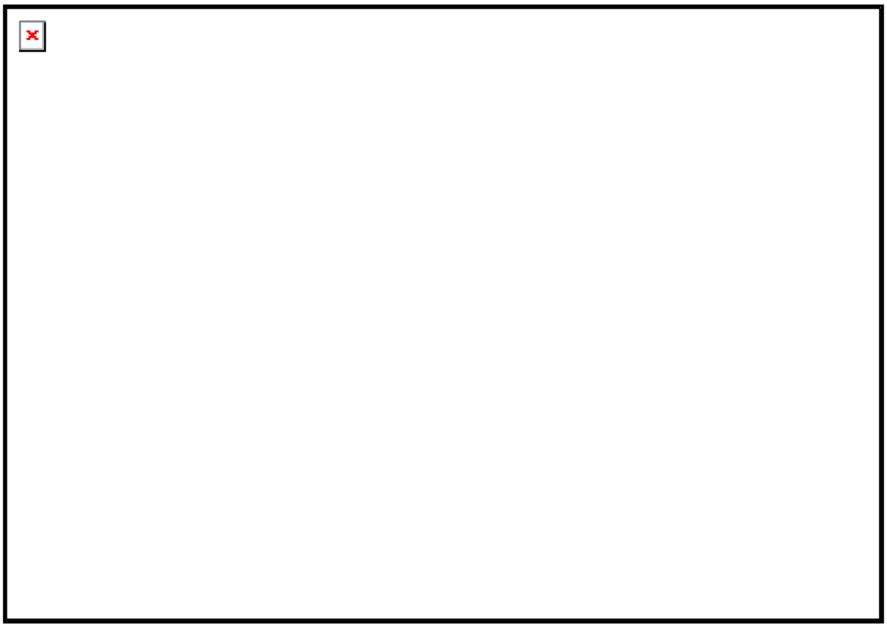


Figure 2.11. Maximum travel and exit distances for hotel guestroom floors. (REZNIKOFF, 1986, 547).

RUTES (1985, 164-166) explains the other major classes of guestroom floor plans as the vertically oriented tower plans and the atrium plans. Tower plans are divided into five as ***pinwheel***, ***square***, ***circular***, ***cross-shaped*** and ***triangular***. As the author continues the general rule of these is that there is a core in the center. As well as service areas, stairs, shafts and lifts can also be located on this core. The shape of tower plan (triangular, circular, square *etc.*) radically changes the volume area as well as the shape of the guestrooms. Another plan is the atrium plan. The first of the atrium plan is in Hyatt Regency Hotel in Atlanta in 1967. Designed by John Portman, the hotel used the atrium space efficiently.Pursuant to RUTES, the correct atrium design is made up of the formation of single loaded corridors and they serve as a balcony opening from the rooms.

Similarly STIPANUK (1992, 368) defines the guestroom floor configurations as including the double-loaded slab, where rooms are laid out on both sides of a central corridor; the tower, where rooms are grouped around a central vertical core; and the atrium featuring guestrooms of a single-loaded corridor encircling a multi-storey lobby space. Generally, the double-loaded slab is the most efficient one, with about 70% of the gross floor area for guestrooms; the amount of salable space decreases from 60% to 65 % in tower and atrium plans. However, PICKARD (2005, 142) states that normally the residential areas of a hotel constitutes at least 65-70% of the total built space in hotel, and the number of bedrooms is vital regarding hotel operation.

As McGOWAN and KRUSE (2004, 381) indicate, the guestroom corridor is a bridge for the transition from public space to the private space. Long double-loaded corridors are common for hotel guestroom floors. The corridor, conversely, is often constrained by minimum width and height. Due to McGOWAN and KRUSE, the minimum corridor width is usually 2.45 m for a double-loaded corridor.

Another issue is the functionability in service area. LAWSON (1995, 238-239) and McGOWAN and KRUSE (2004, 381) state that for parked and waiting trolleys, the service lobby width should be 2.1 m to 3.0 m space. On the other hand, the area of service room for 30 rooms should be 3.0 x 4.2 m. Besides, linen rooms should be located next to service elevator and/or at end of corridor next to service stairs.

2.3. REPORTS ON GUESTROOM DESIGN

In a hotel, the design and furnishing of the guestroom and/or suite rooms can be perceived as an interior space arrangement instead of an architectural problem. The interior architect works in coordination with the architect and arranges the guestrooms as well as the public spaces. The duty of the interior architect here is to seek an answer to the question how the most suitable, functional and ergonomic hotel room can be formed.

As RUTES (1985, 168) suggests, the guestroom and its bathroom is the most usable space than other spaces in the hotel. In order to change the guestroom into an available place for living, it is necessary to equip the room with sufficient materials. In accordance with the same author is that arranging such equipment and making the space arrangements in the room require group work. Ergo, manager, technical engineer, architect and interior architect work in coordination in order to create the most functional room.

HUFFADINE (1998, 132) indicates that in all of the differing types of four- and five-star hotels as well as all-suite hotels and the motels, the private bathroom is a normal adjunct to the guest room. As the author continues it is not very common to build a three-star hotel in the category without this facility if there is not any constraint or characteristic that has had a major effect on the design.

As mentioned by STIPANUK (1992, 370) and RUTES (1985, 168), Until the Tremont House in Boston was built in 1829 and Buffalo Statler Hotel (1908), no major hotel had private bathrooms. They also add that the rapid development of Holiday Inns and other motor inn chains in the 1950s and 1960s were the results of the understanding to provide a consistent product to traveling families, demanding two double beds that were standard in these chain guestrooms and also locked bedrooms were introduced for the first time.

RUTES (1985, 168) also states that there was a big expansion in hotel sector in 19th century thanks to the developments in technology. The inventions of new equipments such as gas, electricity, voice annuciator, telephone and lifts can be stated as the reasons of change in hotels. According to RUTES, the biggest innovation of that time was the Statler Hotel opened in 1908 in Buffalo. Bathrooms integrated in the guestrooms were firstly designed for this hotel. As mechanically economical and easy use was considered, bathrooms were located back to back between the rooms. By this way, mechanical systems of the two rooms were done with a single shaft.

There were some 11 312 000 rooms in hotels and similar establishments in 1991 all over the world with an increase of 30.4 % in the ten years from 1981, as LAWSON (1995, 3) mentions. The ratio of beds in hotel guestrooms averaged 1:93.Alongside, according to the same author, the number of guestrooms in comparison with the population of a country indicates the level of investment in international and domestic tourism and the indication of a potential for investment or the risk of hotel saturation in a country is the level tourism demand and hotel room densities.

At last, generally AKOĞLAN (1998, 40) and NEUFERT (1978, 452) outline that guestrooms of the hotels which constitutes of five different classes vary according to their classification. In one-star hotels there are single rooms larger than 8.00 m² and twin rooms of 12.00 m². In two-star hotels the single rooms are 12.00 m² and twin rooms are 16.00 m². On the other hand, three-star hotels have single rooms of 14.00 m², twin rooms of 18.00 m² and four-star hotels have 16.00 m² single rooms and 24.00 m² twin rooms. Finally, five-star hotels include 18.00 m² single and 26.00 m² twin rooms.

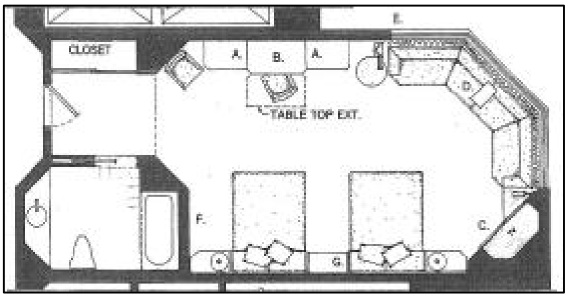


Figure 2.12. Typical hotel guestroom plan.
(BAUCOM, 1996, 214).

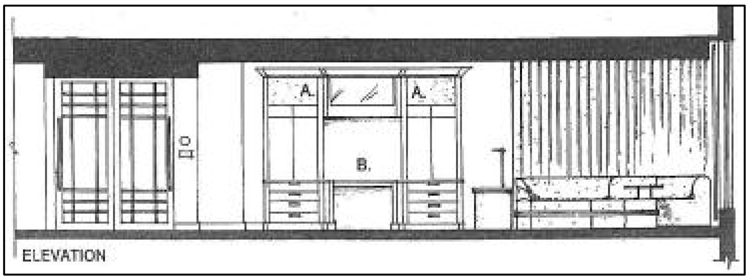


Figure 2.13. Typical hotel guestroom elevation.
(BAUCOM, 1996, 214).

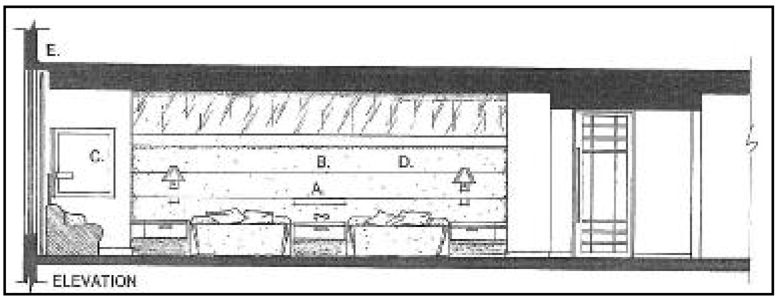


Figure 2.14. Typical hotel guestroom elevation.
(BAUCOM, 1996, 214).

2.3.1. Reports on design criteria of guestrooms

Both RUTES (1985, 168) and STIPANUK (1992, 370) state that designing the hotel room should be made at the schematic design stage. After the structural bays, items and elements that should be used in the room and general furnishings (mobile and stable furniture, measures *etc.*) are determined, the room design should begin. The interior architect forms the room that best serves the needs after considering all these stages elaborately.

In this paragraph LAWSON (1995, 222) mentions the significance of guestroom dimensioning. Reductions in the area of a room are multiplied by the number of rooms involved. A 12 % saving in room area constitutes more than the space of the building in total. Nevertheless, too small rooms are often visually crowded, inflexible and difficult to service, which results in an increase in wall and furniture damage.

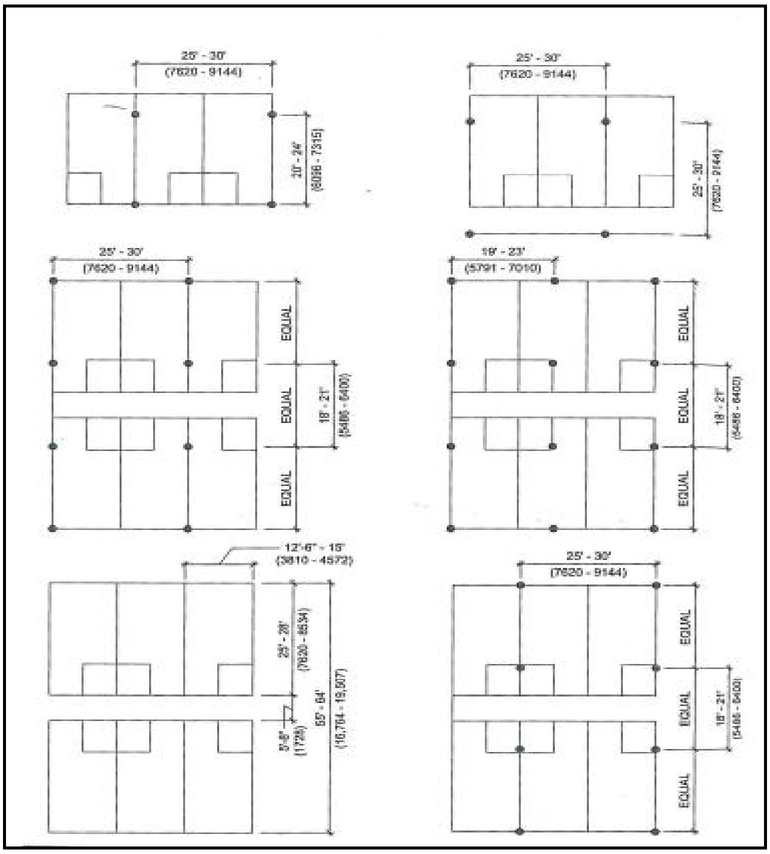


Figure 2.15. Typical structural bays for hotel guestrooms. (McGOWAN & KRUSE, 2004, 384).

LAWSON (1995, 222) sums up the standardization on room dimensions as follows: there is mainly repetition in room sizes with different furniture arrangement alternatives. Standardization is significant in terms of cost and time saving, uniform quality, efficient organization, and maintenance. Repetitive modules from floor to floor are vital in multi storey units for structural and mechanical design. Figure 2.16, below, indicates some standardized dimensions in hotel guestroom floors.

RUTES (1985, 169) states that five different stages should be completed so as to reach the desired outcome in a hotel room design. These are; defining the lodging guests, confirming the guestroom dimensions, confirming the number and type of suites, determining the type of guestroom beds, and establishing the interior budget.

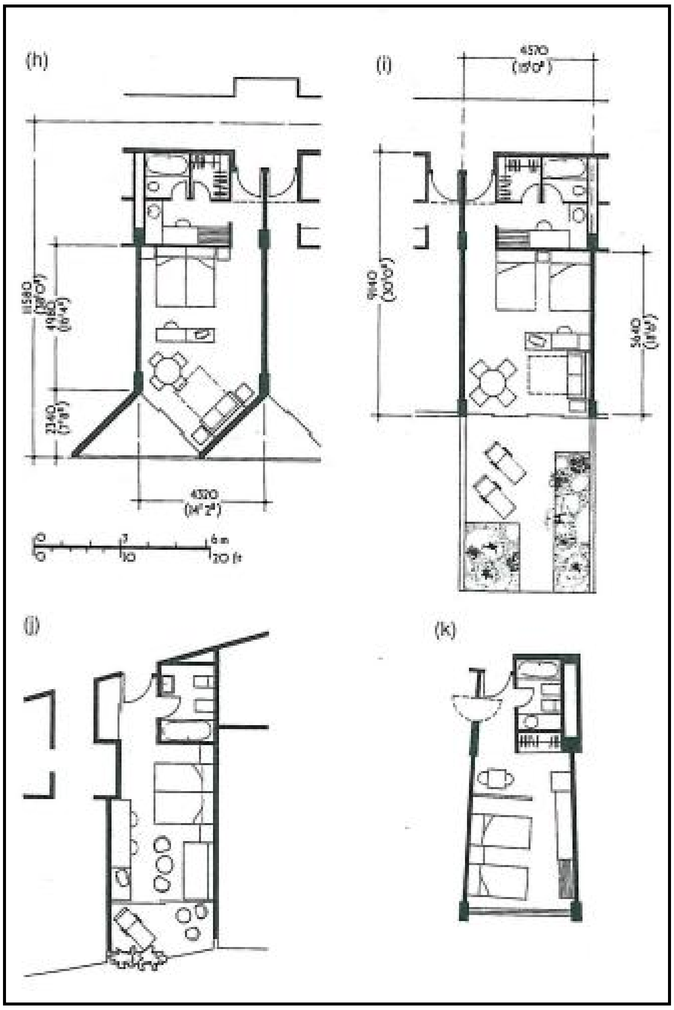


Figure 2.16. Typical hotel guestrooms.
(LAWSON, 1995, 228).

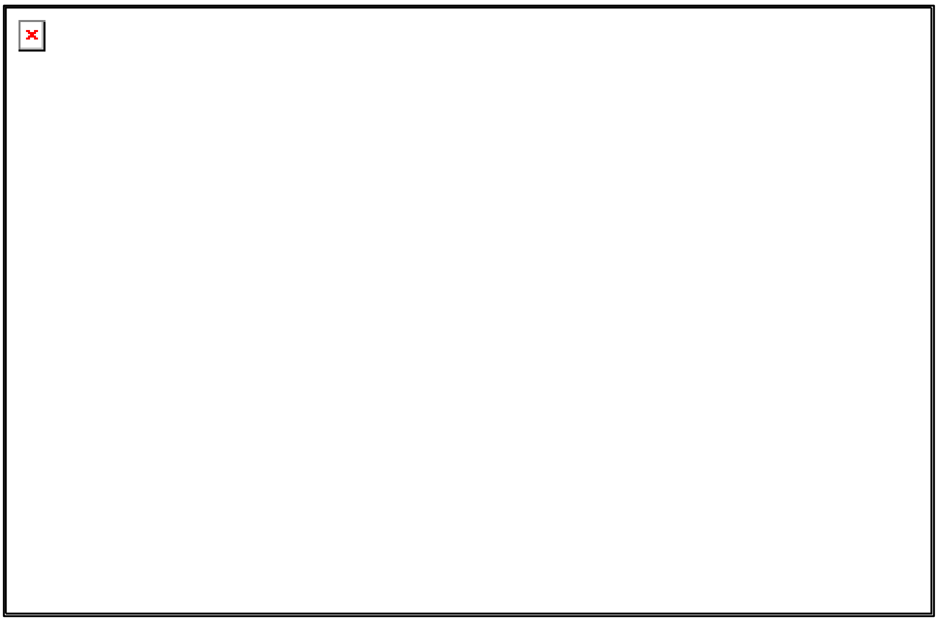


Figure 2.17. Different suite types for hotels.(LAWSON, 1995, 30).

RUTES (1985, 170-171), BAUCOM (1996, 211-212) and BAUD-BOVY (1998, 24) criticisize that the furnishings for a particular hotel are determined by marketing strategies. Generally, two double beds or an oversized bed- queen or king exists in standard hotel rooms. One of the items that help a hotel room to be preferred for 100% is the room mix. To provide this, it is necessary that the room should be designed as flexible as possible. A king sized bed, a sofa that can be used as a bed as well and similar furniture should exist in rooms. The furniture that should be located in the room can be determined by analyzing the function of the room. It is necessary to find out the space requirements of the room and when and how long activities such as resting, sleeping, working, dressing are done in the room. Generally, the bed module exists in the middle of the rooms while dressing area is located right next to the bathroom. They also points out that some elements used in guestrooms should be considered much. These are; the number and format of bed per room, luggage transfer and stowage, extent of hanging and drawer/shelf space, room facilities (television, telephone, service), drying facilities, family needs (additional/convertible rooms), self catering, and design.

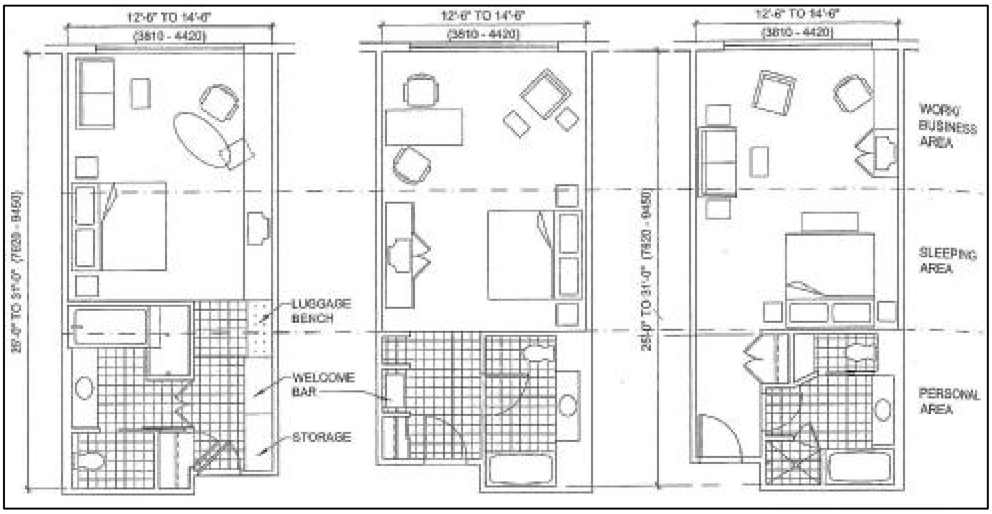


Figure 2.18. Configurations for typical hotel guestrooms. (McGOWAN and KRUSE, 2004, 378).

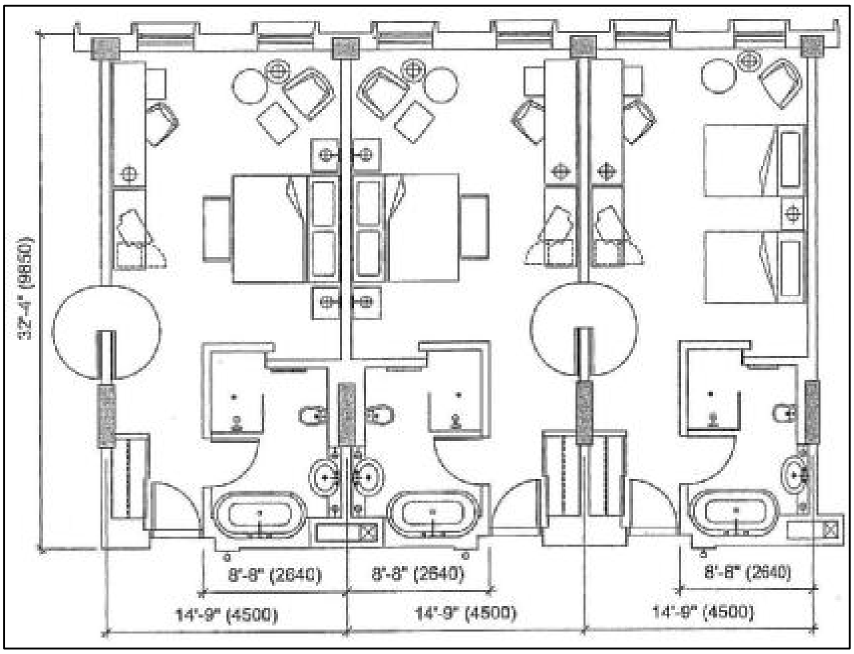


Figure 2.19. A plan of guestroom combinations. (McGOWAN and KRUSE, 2004, 378).

Overall in this paragraph, AKOĞLAN (1998, 39) states that in hotel businesses, rooms differ according to the furniture inside, utilization purposes and room sizes. The author divides guest rooms into seven separate categories as; suite room, single room, connection room, triplex, double room, twin room and studio room. In suite rooms, there exists a living room and a number of bedrooms connected to it. The living room part of the suite room is called parlor. Suite rooms may be detached from each other by a wall as well as a screen. Rooms with a single bed are called single rooms while rooms with independent twin beds are called twin rooms. Should there be one large bed in the twin room, it is called double room. Connection rooms are interconnecting rooms. They are two or more rooms with a transition opportunity within each other. All of these rooms are arranged as bedrooms. Connection rooms may sometimes be sold to separate customers providing the communicating door is kept closed. Rooms with a couch and which are arranged as sitting rooms are called studio rooms.

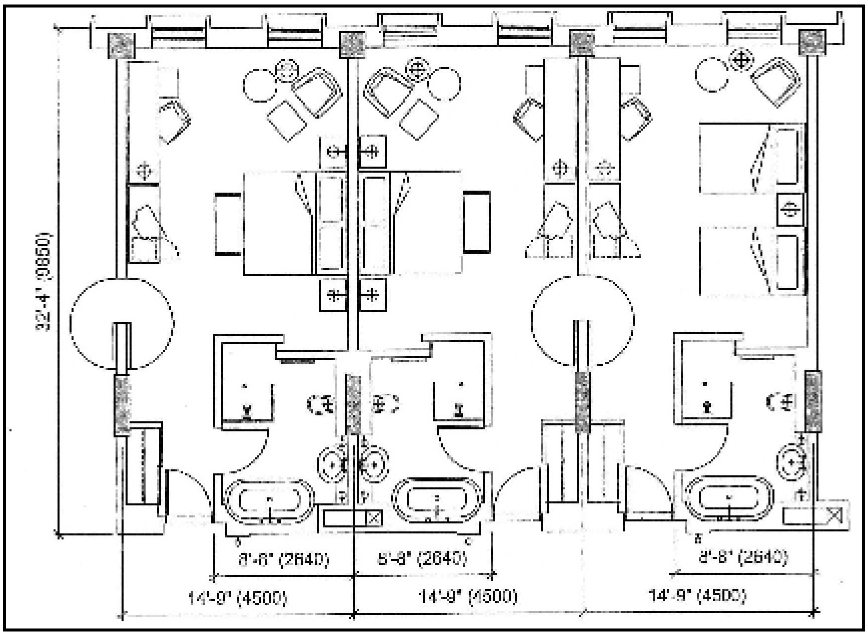


Figure 2.20. An example of standard suite rooms. (MCGOWAN and KRUSE, 2004, 378).

The functional zones of room units are also important issue for the design criteria of guestrooms. In accordance with LAWSON (1995, 225), the various unit zones are listed as lounge/work, beds, dressing, luggage and storage, bathroom, bedside, and circulation. All of these have sufficient activity space for convenient use and cleaning and are zoned areas for the various functions. It is necessary that zones overlap to serve more than one purpose for economy. Next to functional zones, the dimensioning of rooms can be examined by various authors under this heading.

First of all, NEUFERT (1978, 450) suggests that the sizes of the hotel rooms vary depending on the sufficient number of beds, sitting area and wet areas in the room. The net area of a standard room is approximately 21.80 m². The size of the room constitutes three different areas as wardrobe- 14.60 m² (3.65 x 4.00), corridor- 3.60 m², bath and shower- 3.60 m². This standard measures may differ according to the accessibility of the room. For instance, comfortable rooms are approximately 29.00 m² while suites are 42.00 m².

As PICKARD (2005, 145) & NEUFERT (1978, 450-451) indicate, the internal room dimensions are determined by the market necessities, standards of hotel, number and sizes of beds and furniture. Twin beds (1000 x 2000 mm) or one double (1500 x 2000 mm), queen size (1650 x 2000 mm), king size (2000 x 2000 mm) or double are preffered in higher grade hotels. As the authors continue, the net dimensioning of hotel rooms can not be determined by person = m² formula. Planning hotel guestrooms functionally is realized by determining sufficient number and sizes of usage areas, transition, and transport areas.

One of the most important issues to consider while designing a room is the room's net width. Pursuant to RUTES (1985, 171) net width can be found in proportionate with the overall structural shape of the building. In general, as explained by the author, the standard room width is determined as 3.7 m. Furniture such as a king sized bed, wardrobe, sofa can easily be placed in a room with such a width. In rooms designed narrower than this scale, mobility will be limited. Enlarging the room width upto 4.1 m or 4.4 m increases the manufacturing costs while helping change the style of the room.

SIGUAW & ENZ (1999, 46) also states that setting up the width of the room to 4.3 m, rather than the more typical 3.7 m, to provide greater comfort and value to the guest is the best practice in hotel architecture.

PICKARD (2005, 145) also emphasises that the room width of 3.6 m is efficient as it allows a wardrobe in the lobby and furniture along the party wall. The minimum width for a narrow frontage is 3.0 m. Increased room width allows more spacious impression and optional bed and bathroom layouts. Besides, according to PICKARD, room length is generally more flexible and may extend to a balcony or angled window.

Over and above, LAWSON (1995, 225) states maximum benefit should be obtained from the outside walls as a rule and the most critical dimension of the hotel rooms is the width. The number is reduced by an increase of width. Instead it increases the length of corridors and the ratio of perimeter wall length: volume enclosed.

Normally, standard rooms are based on a bed with a length of 2000 mm and with wall furniture widths of 600 mm, which leaves a 1000 mm circulation and activity space. This room width can be slightly decreased in order to economize- minimum 3.5 m or increased to give a more spacious impression to 3.75 m or 3.90 m (LAWSON 1995, 228).

As also emphasized by BAUD-BOVY (1998, 24) the room width affects frontages and travel distances. Normally, standard rooms are based on 3.65 m models, with a minimum of 3.5 m. In pavilion style hotels, there is opportunity for greater flexibility.

On the other hand, LAWSON (1995, 229) defines room lengths as generally more variable although dictated by structural or site limitations. The layout often provides for bathroom/sleeping/working/ day use areas to obtain maximum benefit from natural light. The number and spacing of fitments determine the bathroom dimensions. The author also gives information about the sleeping area extends about 2.40 m for a metric double or queen sized bed, 2.90 m for metric twin beds, and 3.70

m for double-double beds allowing for side access. On the other hand, the day use area is more flexible takes up about 1.70 m to be extended 2.3 m. and the minimum is about 1.0 m in economy units.

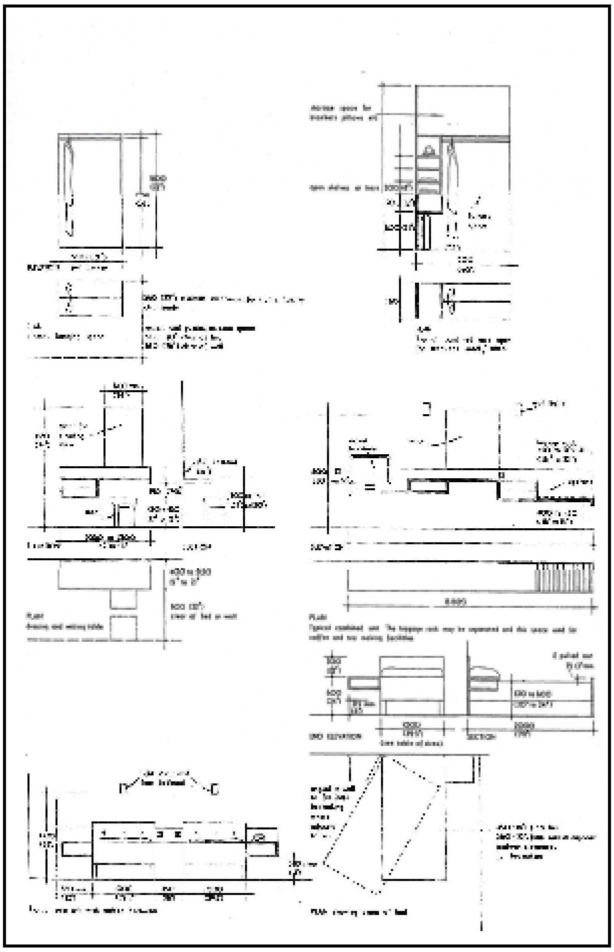


Figure 2.21. Space requirements for various items of hotel guestroom furniture. (LAWSON, 1995, 233).

LAWSON (1995, 229-230) also reports the typical standardized dimensions in guestrooms. The following are the typical ratios of twin beds: doubles 3:1 for mixed market and 1:1 for business users. Rooms are to the same modular dimensions in many circumstances; however, corridors may be offset to provide longer rooms on one side. Luxury and high-grade hotels offer rooms in many different sizes and arrangement. According to the same author, overall lengths are typically 8.4 m to 8.6

m. Area widths may rise up to 3.9 m to 4.1 m. In high-grade hotels 4 to 8% of rooms may be formed as suites, which are located at the corners, and top floor of buildings.

Hotel type	*Room without bathroom or lobby*		*Bathroom only (internal)*[a]		*Overall including lobby area*	
	(m)	(m^2)	(m)	(m^2)	(m)	(m^2)[c]
Budget	3.6×3.5 (11'9"×11'6"	14.70 136 sqft)	2.15×1.9 (7'x 6'3"	4.09[b] 44 sqft)	5.8×3.5 (19'×11'6"	20.3 66'6")
Mid-grade	4.9×3.6 (16'×12'	17.64 192 sqft)	2.35×2.0 (7'9"×6'6"	4.7 0 50sqft)	7.0×3.6 (23'×12'	25.2 276 sqft)
High-grade	6.0×3.9 (19'6"×12'9"	24.20 249 sqft)	2.65×2.2 (8'8"×7'3"	5.83 63 sqft)	8.7×3.9 (28'6"×12'9"	33.9 363 sqft)

Notes: [a]Metric dimensions include pipe ducts and are based on standard 1700 m (5'6") bathtub.
[b]May have compact shower room 2.8 m^2.
[c]Figures rounded.

Figure 2.22. Standard guestroom dimensions. (LAWSON, 1995, 229).

BAUD-BOVY (1998, 23) criticises the subject from another point of view that room sizes provided in hotels are mostly determined by grade, location, market emphasis, design and size. Besides hostel type accommodation, the author also adds hotels and resorts provide guestrooms en-suite with bathrooms or shower rooms. Between 16 and 20% of the total unit area of a guestroom is occupied by a typical bathroom and compact ergonomic design with layouts grouped around service ducts is often emphasized. The use of showers in lieu of baths, especially for single rooms can be a way of economizing.

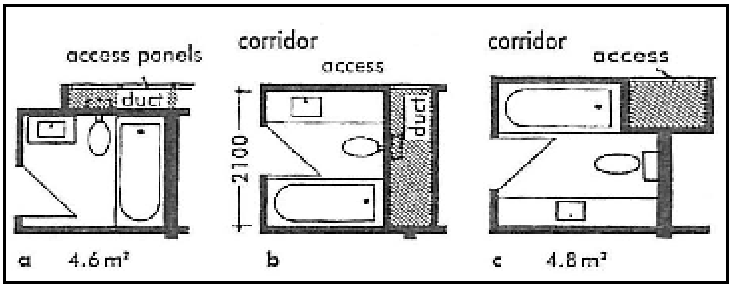


Figure 2.23. Bathroom vent shaft detailing of a typical guestroom. (PICKARD, 2005, 147).

In standard guestrooms, bathrooms are similarly arranged as back to back and they share common vertical vent shafts in order to confining noise. Their dimensions are mainly shown by the number of fixtures and the size of the bath. Bathtubs should be

1700x750 mm in size while whirlpools 1700x915 mm may be installed and separate shower cubicles. Water closets, bidets, and wash basins should be properly installed (LAWSON 1995, 231-232).

On the other hand, MCGOWAN and KRUSE (2004, 380) states that guest room bathrooms must include durable hardware and finishes, sufficient level of vanity lighting, sufficient counter area and sufficient number of fixtures. Regular guest room baths in the U.S. have three fixtures as toilet, sink and tub while the ones in Europe generally include four fixtures as toilet, bidet, sink and tub. Bath tubs are usually 1.50 m length and countertops should be a minimum of 1.20 m in length.

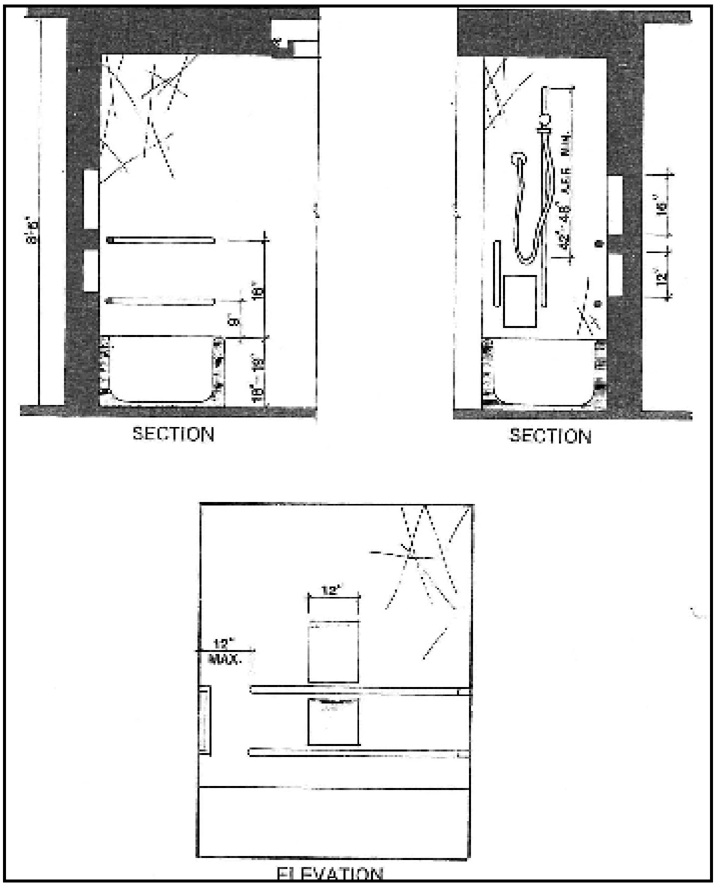


Figure 2.24. Bathroom section and elevations of typical guestrooms. (BAUCOM, 1996, 221).

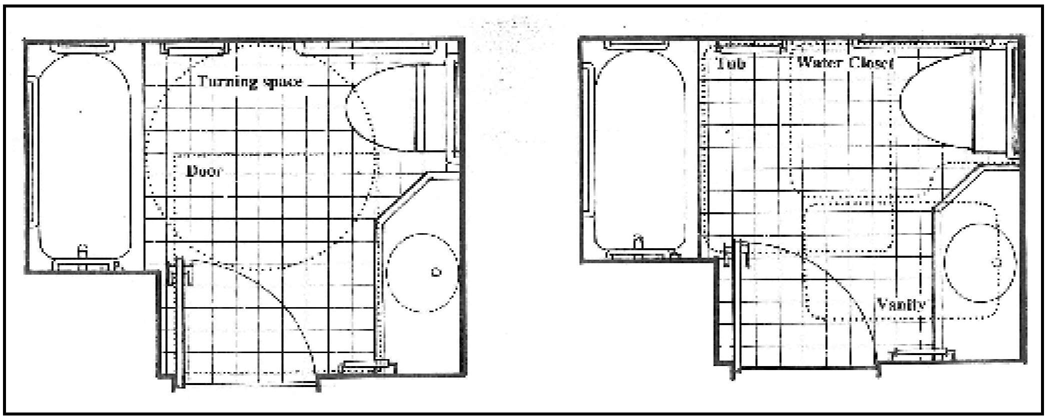


Figure 2.25. Bathroom plans with required clearances.(DECHIARA, 1991, 380).

2.3.2. Reports on accesible guestrooms

BAUCOM (1996, 212) creates a new dimension by commenting differently on arrangement of hotel rooms. Generally more time is spent in the hotel rooms than in any other area of the hotel, so it should feature the physical needs of the most diverse group of people to ensure a pleasant experience for almost every kind of person. BAUCOM conceive that design criteria should be developed to meet the physical needs of the average person at the age of sixty-five, the comfort level for all age groups is improved and the overall guest experience is enhanced.

On the other hand, DeCHIARA (1991, 374) suggests that hotel rooms are designed as places for relaxation and sleep at a reasonable cost, where visitors feel secure and comfortable. Hotel rooms make use of less floor area and offer less secondary and frill items. Nevertheless, room or suite layouts are available for the physically disabled.

DeCHIARA (1991, 77) stresses is that accessible guestrooms have design features and floor plans with suitable space for disabled guests. Space may be based on the design of certain furnishings. The width of the access aisle at the bed is arranged according to the design of bed side table. Access to dressers is arranged according to the width of the drawer and the maneuvering space to turn into desk is arranged according to the width of kneespace.

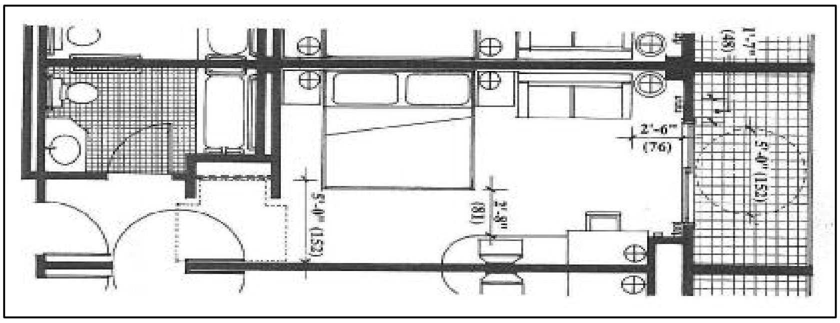


Figure 2.26. Accessible hotel guestroom plans with 3.66 m bay spacing. (DECHIARA, 1991, 377).

Both LAWSON (1995, 230-231) and PICKARD (2005, 148) analyses room dimensioning for disabled guests and they indicate that 1 or 2% of rooms must be equipped for the purpose of disabled use as a rule. Additionally, they argued that the disabled rooms are generally located on ground floors; and the minimum width of corridors must be 915 mm wide and while doors 815 mm should have a clear opening; the central turning space of 1.52 m must be allowed in bathrooms and this will increase the bathroom width to 2.75 m.; Bedrooms of standard 3.65 m width can be adapted with furniture arrangement and modification; 910 mm space should be left between beds and furniture; and 685 mm space is needed between beds and furniture for knee space.

As DAVIES (1994, 15-16) argues, many individuals have a restricted range of motion or a lack of strength in the upper extremities that limits activities. A research made in 1970 showed that over 12 million Americans had troubles in lifting or reaching with their arms, and 10 million people had difficulty in bending, kneeling, or sitting. In addition to these, vertical and horizontal reach can also be a problem for guests who are not "average" in stature. For example, short guests and children cannot reach high places as taller guests do. Davies (1994, 16) mentions that the average height of a woman over 65 years of age is 1.55 m, and her vertical reach is limited to 1.70 m - more than 23 cm lower than a younger male adult.

Two accessible rooms are required in structures with one to 25 rooms in the United States, for 25 to 50 units, three accessible rooms are obligatory. Four out of 100 rooms must be wheelchair accessible, four should be available for people with reduced hearing, and there should be a roll-in shower in one. As all hotel guestrooms are not required to be 100% accessible at present, some changes in the existing "typical" room floor plan are necessary for the rooms to become universally accessible. Square meter will have to be increased to fulfill the needs of the person with differences in vision, hearing, strength and flexibility (BAUCOM 1996, 212-213).

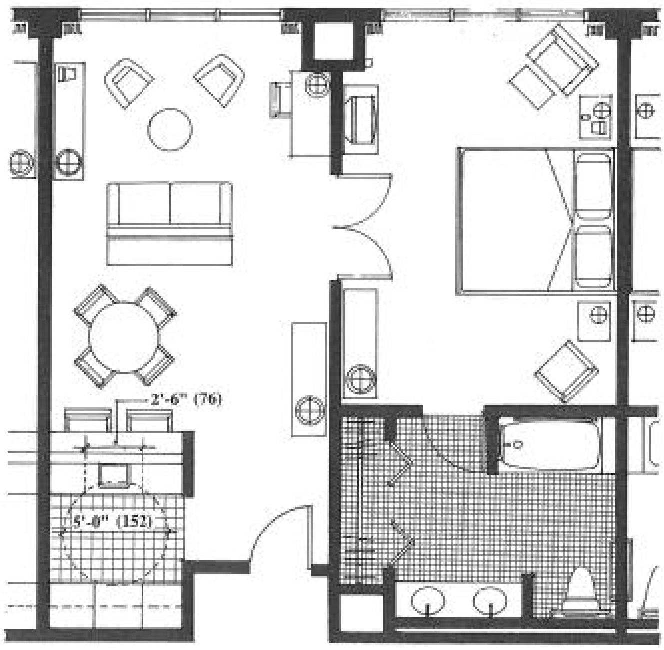


Figure 2.27. Accessible hotel suites with 4.27 m bay spacing. (DECHIARA, 1991, 377).

As stressed by DAVIES (1994, 16) anthropometrics gives a basis for design standards related to comfortable range of motion; therefore; design standards are commonly established to serve 90% of the user population. Standards are formed considering the worst-case.

DAVIES (1994, 17) indicates that some factors as weight and sex affect the range of joint movement whereas age can affect guests' ability to perform certain activities. According to the same author, research shows that elder people, considered as a group, are shorter in height and have a shorter reach. Average body size and stature have increased significantly since 1920.

Baucom (1996, 213) also mentions about the importance of furniture display in accessible rooms, the details of which can be summarized as below:

- Bedside tables should not be more than 20” (51 cm) deep in accessible rooms and ensure a 36” (app. 90 cm) of clear space on the access side of the bed for this maneuver.
- At least 36” (app. 90 cm) wide entrance doors are necessary.

Guestroom baths should be designed depending on accessible design criteria. As stated by Baucom (1996, 219) in fact bathrooms differ as follows:

- Vanity tops should allow 24” (app. 60 cm) of clear space on each side of the sink.
- Tubs and showers should have hand-held shower units which can be used both while standing and sitting. The hand-held shower requires a minimum 60” (app. 150 cm) hose which is mounted on a vertical 42” (app. 105 cm) slide bar.

DAVIES (1994, 78) mentions that extra space on the design of most guestrooms with a structural bay spacing 13’ (app. 3.95 m) or greater is minimal. Narrower bay clearances the additional area required in the bathroom often influence the layout and function of the sleeping area and the required depth of the unit. Moreover, Davies (1994, 78) gives some information regarding the entry doors to accessible guestrooms which should be 3’-0” (app. 90 cm) wide to provide a 32” (app. 80 cm) clear opening. The clear space on the corridor side is also available for the guests to approach the lockset ergonomically.

As DAVIES (1994, 88-92) emphasises, some bathrooms in guestrooms should have wheelchair maneuvering space, including clearances for door operation, a turning space, and the floorspace required for each bathroom fixture. Doors are the main functionality for the accessible baths and they should be designed to swing out because these rooms do not have sufficient maneuvering space for wheelchair users to perform a 180° turn.

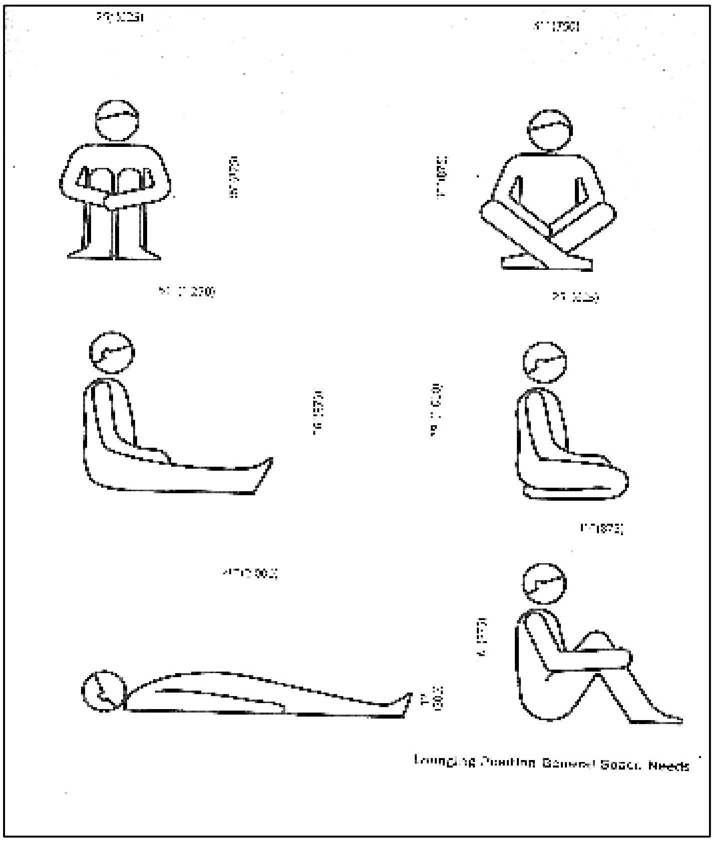


Figure 2.28. General Space needs for lounging.
(McMORROUGH, 2006, 87).

2.4. REPORTS ON METHODOLOGY

Under this section are collected the various calculation methods given in the literature for obtaining quantitive values on aspects pertinent to the subject domain. Being quite extensive, cited here are therefore those deemed most germane in enabling the investigation at hand. As such, they are presented below under the heading analyzing of selected data.

2.4.1 Analyzing the consisted data

The data are analyzed with three different types of statistical investigation, which are two sample Student's *t*-tests; Regression Analyses; and single-factor Analyses of Variance. The selected data analysis is briefly explained below.

(a) Student's t-tests

In this context, McCLAVE, BENSON and SINCICH (289, 2001) note that the distribution of *t*-statistic in repeated sampling was discovered by W.S. Gosset in 1908 , a chemist in the guiness brewery of Ireland. The main issue of Gosset's work is that the *t*-statistic has a sampling distribution very much like that of the *z*-statistic; *i.e* normal distribution. Like *z*-distribution, *t*-distribution is mound-shaped, symmetric with mean 0. DUZGUNES and ELIAS-OZKAN (83,2006) give some comments on *t*-distribution. According to them, the primary difference between them is that the *t*-statistic is more variable than *z*-statistic; simply because, *t* contains two random quantities ($\ddot{x}$ *and* s), whereas z contains only one ($\ddot{x}$). The formula for *t*-statistics is presented below.

$$t= (\ddot{x} - \mu)/(s/\sqrt{n}) \quad \text{...} \quad (2.1)$$

McCLAVE, BENSON and SINCICH (289, 2001) comment on the *t*-distribution is that the actual amount of variability in the sampling distribution of *t* depends on the sample size *n*. A convenient way of expressing this dependence is to say that the *t* statistic has (*n-1*) degrees of freedom (df). In other words, the smaller the number of degree of freedom associated with the *t*-statistic, the more variable will be its sampling distribution. DUZGUNES and ELIAS-OZKAN (83, 2006).

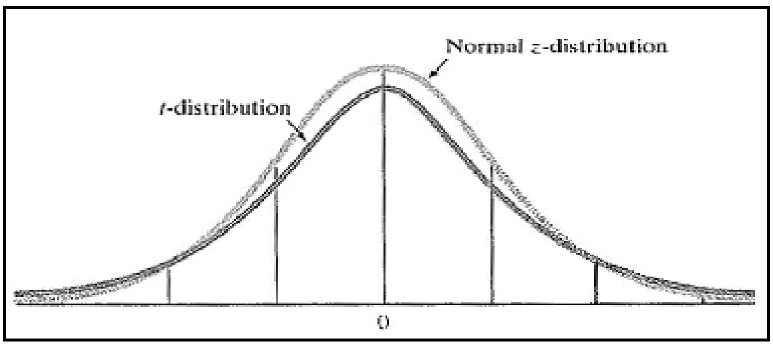


Figure 2.29. Standard normal (z) distribution and t-distribution with 4 (df). (McCLAVE 298, 2001).

In figure 2.29, above, shown both the sampling distribution of z and the sampling distribution of t-statistic with 4 df. The increased variability of the t-statistic means that the t value, $t_{\alpha,}$ that locates an area α in the upper tail of the t-distribution is larger than the corresponding value z_{α}. For any given value α, the t value t_{α} increases as the number of degrees of freedom (df) decreases McCLAVE, BENSON and SINCICH (289, 2001).

(b) Regression Analysis

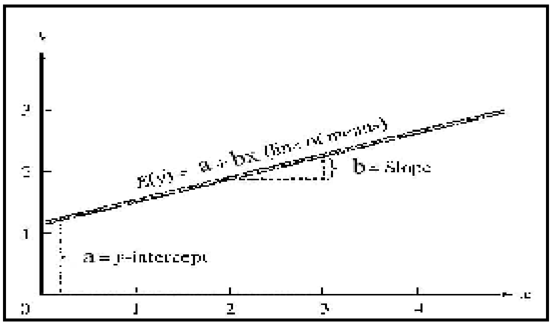


Figure 2.30. The straight line model. $\mu_{y/x}$ increases by the amount of b as x increases 1-unit. (McCLAVE 459,2001).

As DUZGUNES and ELIAS-OZKAN (115, 2006) interpreting the method of regression analysis, or regression modeling with a simple formula:

$\mu_{y/x}= a + bx$ = Deterministic component…………………..(2.2)

In these calculations it is assumed that y is a response variable (dependent) in some way related to predictor variable (independent), x. In the formula, above, a is the y-intercept of the line, *i.e.*, the point at which the line intercepts or cuts through the y-axis and b is the slope of the line, *i.e.*, the amount of increase or decrease in the deterministic component of y for every 1-unit increase in x. The line represented by 2.2 is called the least squares line, the regression line, or the least squares prediction equation. The methodology used to obtain this line is called the method of least squares. McCLAVE, BENSON & SINCICH (458, 2001); DUZGUNES and ELIAS-OZKAN (115,2006).

As McCLAVE, BENSON & SINCICH (462, 2001) argue that the quantities of *a* and *b* that make the sum of squared errors minimum are called the least square estimates of the population parameters a and b and their formula is represented below.

Slope: $b = rs_y/s_x$……………………………………….. (2.3)

y-intercept: $a = y - bx$…………………………………… (2.4)

As emphasized by DUZGUNES and ELIAS-OZKAN (116,2006), the *L* symbol is representing the line of best fit. It is required at least two points intercept on the line. The smaller the vertical distance from the given points, the higher the rate of dependendancy for one over the other.

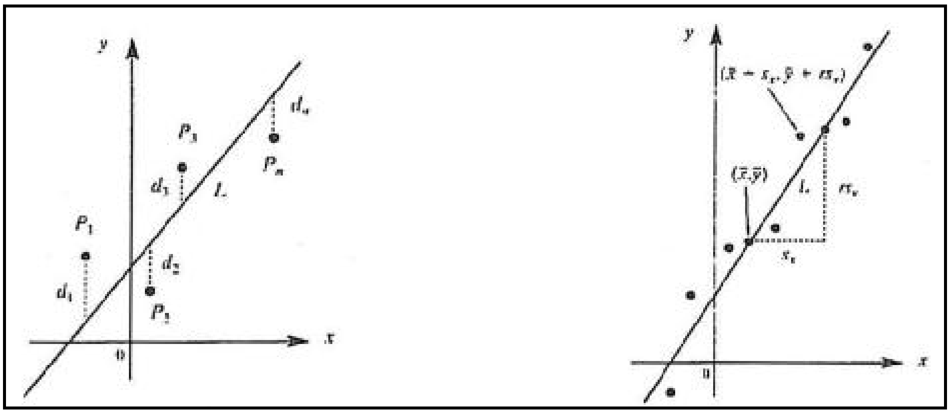


Figure 2.31. Least square line equations for scatterplot. (DÜZGÜNEŞ, ELIAS-ÖZKAN 117, 2006).

(c) Analysis of Variance (AnoVa)

Analysis of variance (AnoVa) is a collection of statistical models and their associated procedures, in which the observed variances partitioned into components due to different explanatory variables. In its simplest form, AnoVa gives a statistical test of whether the means of several groups are all equal, and therefore generalizes student's two-sample *t*-tests to more than two groups.

Source	df	SS	MS	F
Treatments	$p - 1$	SST	$MST = \frac{SST}{p-1}$	$\frac{MST}{MSE}$
Error	$n - p$	SSE	$MSE = \frac{SSE}{n-p}$	
Total	$n - 1$	SS(Total)		

Figure 2.32. General AnoVa summary table for a completely randomized design.(McCLAVE 828, 2001)

CHAPTER 3

MATERIAL AND METHOD

This chapter covers the material based on the study as well as the methodology used in assessing the data. In order to ensure clarity and accuracy, these two themes are introduced separately despite being overlapping. Material involves iterations that depict the data estimated and also several ratios which are derived from these as analogue indicators of design efficiency while methodology has a direct nature covering the processes that are utilized in data collection and while evaluating the conclusions.

3.1. MATERIAL

The population was defined as facilities nominally in the private enterprise. Findings of an initial survey took this determination as a base which showed the selected hotels that are nearly parceled on a same lot are statistically analyzed for their area functionality. The number of beds was also mentioned in order to arrive at a conclusion in the calculation of the areas for each hotel floors.

Detachment had to be made for the survey in general related to the community with the highest rate of hotels in Ankara. For this purpose, Çankaya community was used due to its high population and rate of its hotels. Selection of the hotels was made from various parts of Çankaya regardless to their owners or situation. Measure of each hotel will be made according to the area it covers- the height of the ceilings, the length and the width of the room floor *etc.* Hotels that are chosen have approximately the same number of rooms, but vary on both their volumes and areas. Along with, the circulation areas and other facilities that cover in each hotel vary from one unit to another. Discrepancy results of each unit were shown both in functionality and planimetric design. However, the categories of hotels are the same.

Study material consisted of architectural drawings; these were obtained from the municipality of Çankaya, Ministry of Tourism and Culture of Turkey and the management of selected hotels. These constituted a sample space of 25 facilities, from which an approximately 36% random sample of 9 units were chosen. The specific method used in this selection is described under 3.2.1. Although the planimetric design of each hotel shows diversity, the gross-floor area on guestroom floors covered by each is roughly the same. While studying the standard guest rooms on various hotel floors, calculation and examination were also made for the circulation area (elevators, halls, and stairways), the maintenance rooms and the facility rooms. Analyze was made for randomly selected 9 standard hotel floors of randomly selected 9 hotels. For example, in one unit the 2nd floor was chosen, while in another 4th floor was chosen; the reason for this was the fact that although the hotels are different, all of their standard floor plans are approximately the same. As the research proper was specifically evaluating the planimetric design efficiency of each guestroom floors. For this reason, only typical guestroom floors were used in order to assessing the results. Postulation was made related to the fact that all such floors were standardized for the aim of the study. While schematic representations of their floor layouts and then dimensions are given in the Appendix section within the same order, relevant descriptive aspects concerning individual sample elements to which a digit-units label for reference purposes was assigned to each of them as they were drawn are summarized under columns A to C in Table 3.1.

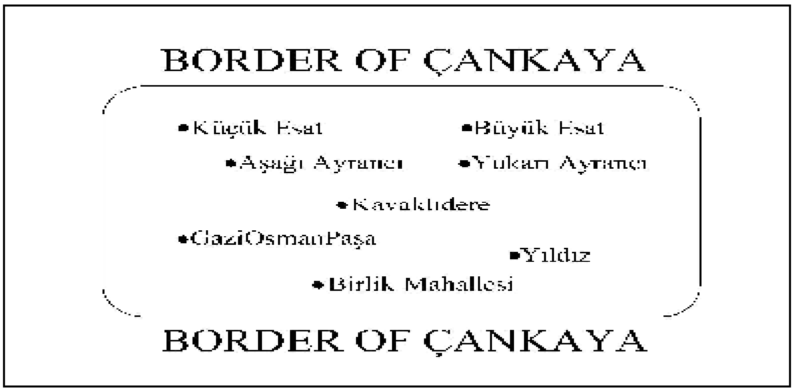


Figure 3.1. The schematic diagram of selected districts which are located within the limits of Çankaya.

Raw data as utilized in calculation of the different floor areas that were derived from concerned architectural drawings on the basis of dimensions given thereon deemed of relevance to the study. Room and space designations given thereon were also utilized, which helped establishing functional distinction among the various types occupying a given floor. Moreover, given dimensions were used to obtain various parameters of the entire floor plans. A brief description of calculated areas is given under section 3.1.1. and followed by classification of spaces that for the functional is given under 3.1.2. The ascending values of calculated areas are given in Table 3.1, under columns G to J.

A certain number of ratios that were obtained from calculated areas had to be made as analog indicators for observing the constructional design efficiency. A brief description of analogue indicators is provided in section 3.1.3 and their numerical values are given in Table 3.1 under columns L to T.

3.1.1. Calculated Areas

Calculated areas consisted of three parts: a) net usable floor area; b) gross-floor area; c) construction area. These areas are quoted by KAZANASMAZ (2005). The each of them is summarized below.

(a) Net-usable floor area:

The area of all interior spaces on typical room floor as calculated from the internal dimensions (wall face-to wall face) that is given on floor plans. While calculating net usable floor areas, door thresholds, balconies, terraces, ventilation and/or other duct ways or shafts, light wells, elevator shafts, and also structural elements such as columns were excluded.

(b) Gross floor area:

The overall built area of a typical guestroom floor, calculated from external dimensions given on floor plans. All unenclosed projections from wall faces, such as balconies, terraces, attached columns, overhangs and fins were excluded from the calculation of gross-floor area.

(c) Construction area:

The difference of the two areas cited above, inclusive of all internal elements that were left out from net usable floor area calculations. The value was obtained by subtracting the net-floor area from the gross-floor area, as ***c=b-a***.

3.1.2. Functional Classification of Spaces

Classification of hotel floors containing standard guest rooms were made accordingly. Along with guestrooms, on each floor, there are diverse facility areas and rooms which contain equipments for maintenance of that floor. There are also mechanical rooms, technical rooms, customer elevators, service elevators, halls and staircases in each hotel guestroom floor. According to DÜZGÜNEŞ (2003) and KAZANASMAZ (2005) these areas with diverse functionality were renamed into three categories. The first category was nominated as "primary spaces"; second category as "secondary spaces"; and the third as "circulation spaces". The compass of each is briefly characterized below.

(a) Primary Spaces

In this category were included all guest bedrooms (both single, double and twin bed-types) except for en-suite bathrooms were included in this category. As a rule, the areas which are accepted as 'populated' were counted in this category.

(b) Secondary Spaces

All other facilities excluding what were counted as circulation spaces were included in this category. Maintenance rooms, storage rooms for care supplies, and if any, mechanical and electrical rooms were also included. Besides, any other spaces for support services specific to the type of hotel were included.

(c) Circulation spaces:

This was inclusive of all lobbies, hallways, all stairs and ramps- together with one floor and one intermediate landing, elevator shafts, and also all access corridors. Except primary, secondary spaces, and also other duct ways and shafts were excluded while calculated the circulation spaces.

In Apendix section, spaces assigned to each of these categories are enumerated on the schematic floor layouts by their respective legends. Also, their relative proportions for sample elements are described in Figue 3.1. In the figure, each bar units (100%) shows the primary, secondary and circulation spaces with respect to their proportional balance.

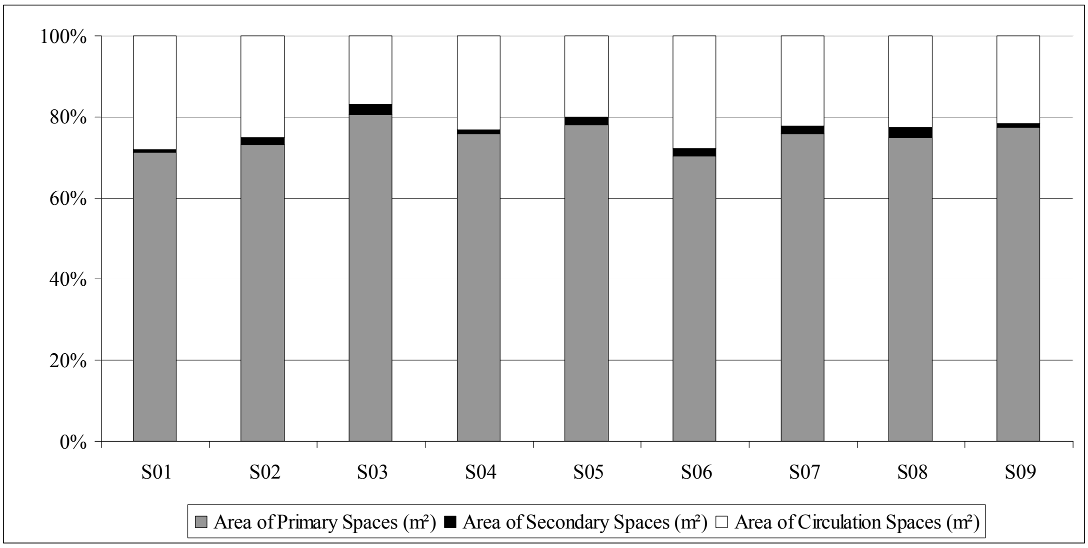


Figure 3.2. Distribution of primary, secondary and circulation spaces for each sample element, with deficiencies indicating areas taken up by constructional features.

3.1.3. Derived Ratios (Analogue Indicators)

In this study, derived ratios consist of nine parts. These were designated as: (a) net usable floor area per bed; (b) gross floor area per bed; (c) area of primary spaces per bed; (d) area of secondary spaces per bed; (e) area of circulation spaces per bed;

(f) constructional area per bed; (g) ratio of primary spaces to secondary spaces; (h) ratio of primary spaces to circulation spaces; (i) ratio of net usable area to gross floor area. Again, the description of each is briefly studied in accordance with the research taken on KAZANASMAZ (2005).

(a) Net usable area per bed (Ratio 01)

This was considered as a key factor of planning design. The larger this ratio, the stronger would be the perception of an overall spatial outlook that provides for guest comfort. By extension, it was also considered to be one for the day-to-day working conditions of staff, in terms of both general ambiance and accommodation provided for guests.

(b) Gross Floor area per bed (Ratio 02)

The question here was defining a general indicator for both overall design efficiency and economy where, in contrast to ratio (a), a low value would be interpreted as a high level of the former and low one for the latter concern.

(c) Area of primary spaces per bed (Ratio 03)

This was taken as a direct indicator of the priority values attached to the provision of adequate guest accommodation in the overall space allocation scheme, distinct from ratio (a), again on the assumption that the larger it is, the greater would be the adjunct priority.

(d) Area of secondary spaces per bed (Ratio 04)

In this case, the objective was to define an indicator for the extent mechanical and other ancillary support services being provided, in so far as allocated area could be considered as such. In this context, large values would be considered as positive and low values as a negative feature-of course, relative to ratio (c), values higher than this would be open to interpretation as an overburden in terms of both planimetric efficiency and operating cum-maintenance costs.

(e) Area of circulation spaces per bed (Ratio 05)

The outlook here was straightforward concerning the fact that the ratio would inherently reflect not only the anticipated traffic density in terms of both guest and staff movement, but also the priority given to obtaining an efficient design in terms of particular floor arrangement preferences so implemented while keeping to normative requirements in effect.

(f) Constructional area per bed (Ratio 06)

A latent indicator for the degree of moderation practiced in creating the building domain- the enclosure as well as appurtenances deemed essential for performing the functions ascribed to it was the subject of this; hence, an indirect one for the inherent material cost to them of being in such a domain. Very low values would be open to interpretation as over-economizing at the expense of minimal adequacy, while high ones would invite questions on the perspicacity of the designer(s) in achieving the basic integration that is necessary for any well-balanced product.

(g) Ratio of primary spaces to secondary spaces (Ratio 07)

Defining any inherent norm that was being observed in this respect was of interest here; *i.e.* regardless of if there happened to be some underlying prescribed value- broad though it may be-on which the allocation of these two kinds of space was based, irrespective of actual hotel type. This would be supported by a marked central tendency while a large dispersion would imply the opposite, that the ratio was dependent on the type of hotel.

(h) Ratio of primary spaces to circulation spaces (Ratio 08)

This was considered through a perspective similar to that of ratio 05, but in this case, purely on an area basis to more directly reflect any aspiration to space allocation efficiency on the part of the designer, again insofar as normative requirements allowed. Additionally, the objective was described immediately above for ratio (07).

(i) Ratio of net usable area to gross floor area (Ratio 09)

This ratio was taken as the basic indicator for the level of planimetric design efficiency achieved throughout the guestroom floor unit, as it was lacking any and all functional distinctions and thus reflected the essential architectonic outlook if not accomplishment of the design office in question. This ratio is also reffered as the *efficiency quotient.*

The comparison of the magnitudes of salient ratios is shown with bar charts for preliminary overview. As seen below, Figure 3.2 shows the comparison of the area of primary spaces per bed (ratio 3) and the area of primary spaces per bed versus gross area per bed (ratio 02) while Figure 3.3 shows the comparison of the area of secondary spaces per bed (ratio 04) and the area of primary spaces per bed versus gross area per bed (ratio 02). Lastly, Figure 3.4 demonstrates the comparison of the area of circulation spaces per bed (ratio 05) and (ratio 02).

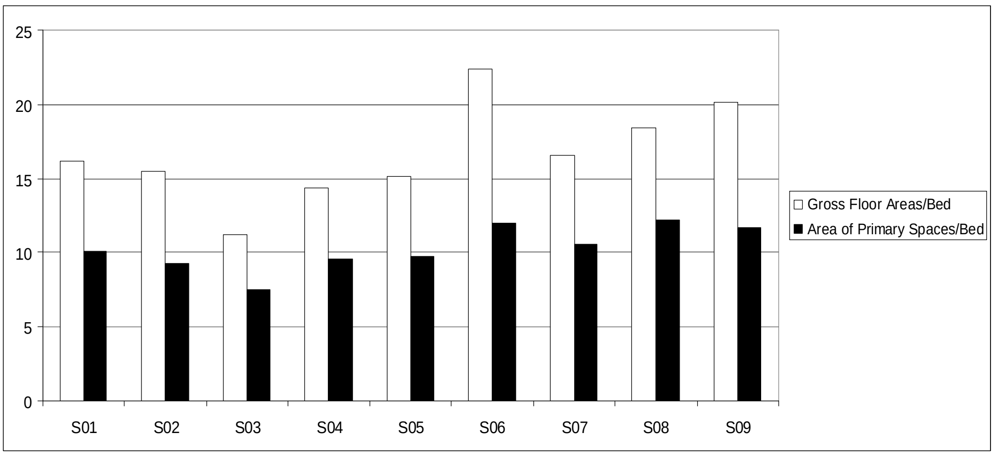


Figure 3.3. Area of primary spaces per bed versus gross area per bed in guestroom floors.

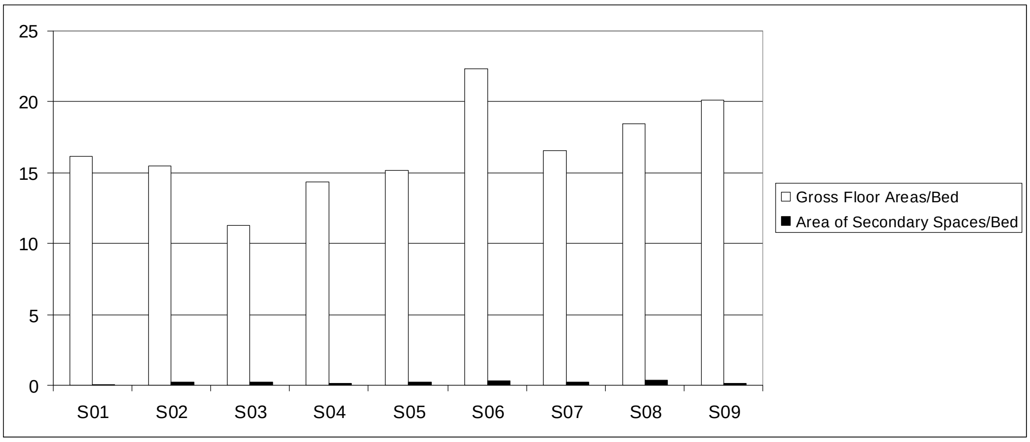


Figure 3.4. Area of secondary spaces per bed versus gross area per bed in guestroom floors.

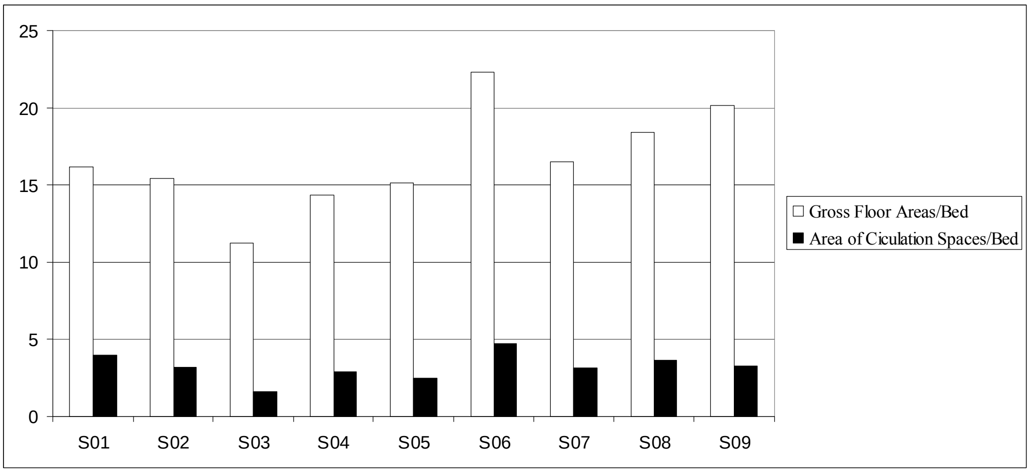


Figure 3.5. Area of circulation spaces per bed versus gross area per bed in guestroom floors.

3.2. METHOD

The procedure followed in compiling data obtained from the sources cited in section 3.1 is first described here for statistical analysis; it also includes a brief outline of the sampling method. Following this, an exact definition of the specific statistical method used in conducting proper analyses is presented.

	NEUFERT	AKOGLAN	RESULTS
SINGLE ROOM	16	16	15
DOUBLE ROOM	24	24	21

Figure 3.6. Comparison of avarage 4-star hotel guestroom w/ regard to single and/or double bed from different authors and observed hotels.

Table 3.1. Quantitive information on sample hotels.

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
Sample ID	Room Floor Organization	Construction Date	Area of Primary Spaces (m²)	Area of Secondary Spaces (m²)	Area of Circulation Spaces (m²)	Net Usable Floor Area (m²) D+E+F	Gross Floor Area (m²)	Construction Area (m²)	Number of Beds	Ratio 01 G/K	Ratio 02 H/K	Ratio 03 D/K	Ratio 04 E/K	Ratio 05 F/K	Ratio 06 J/K	Ratio 07 D/E	Ratio 08 D/F	Ratio 09 G/H
S01	Double Loaded Floor	1998	241,90	2,50	94,90	339,30	387,50	48,30	24,00	14,14	16,15	10,08	0,10	3,95	2,01	96,76	2,55	0,88
S02	Double Loaded Floor	2004	205,00	5,00	70,40	280,40	340,20	59,80	22,00	12,75	15,46	9,32	0,23	3,20	2,72	41,00	2,91	0,82
S03	Double Loaded Floor	1999	202,50	6,00	42,20	250,70	304,00	53,20	27,00	9,29	11,26	7,50	0,22	1,56	1,97	33,75	4,80	0,82
S04	Single Loaded Floor	2002	267,30	3,50	81,60	352,40	402,50	50,10	28,00	12,59	14,38	9,55	0,13	2,91	1,79	76,37	3,28	0,88
S05	Double Loaded Floor	1990	273,40	6,00	70,00	349,40	424,20	68,70	28,00	12,48	15,15	9,76	0,21	2,50	2,45	45,57	3,91	0,82
S06	Single Loaded Floor (with courtyard)	1999	430,10	11,00	169,90	611,00	804,50	193,50	36,00	16,97	22,35	11,95	0,31	4,72	5,38	39,10	2,53	0,76
S07	Single Loaded Floor	2005	274,60	7,00	80,10	361,70	430,10	68,50	26,00	13,91	16,54	10,56	0,27	3,08	2,63	39,23	3,43	0,84
S08	Single Loaded Floor	2003	292,60	10,00	87,30	389,90	442,50	52,60	24,00	16,25	18,44	12,19	0,42	3,64	2,19	29,26	3,35	0,88
S09	Single Loaded Floor	2001	444,10	6,00	123,50	573,60	765,60	192,00	38,00	15,09	20,15	11,69	0,16	3,25	5,05	74,02	3,60	0,75

3.2.1. Sampling Method and Data Compilation

Most of the buildings in the research consist of hotels that belong to private establishments and which are located in main streets suitable for the building scheme for the city. According to the researches made as preliminary preparation, it is shown that 80% of the 4-star hotels made in any city in Turkey are made in accordance with the building schee and they are located in integrity and conformity with the other adjacent buildings. According to the building records examined, most of the touristic buildings (hotel, resort, apart…*etc*.) in the city are seen to be placed in blocks and building lots similar to the other buildings mostly suitable to urbanization.

However; considering the fact that extra floor is permitted for the touristic buildings unified by joining two building lots, it is observed that such buildings were built in a way that is different from the nearby buildings. Most of the touristic facilities, which have approval from the Metropolitan Municipalities, the Ministry of Tourism and Culture, the Turkish Republic Ministry of Public Works and Settlement are located in building lots of different magnitudes and as suitable to the environmental conditions of different types. The main purpose of this study is to investigate the planimetric efficiency of the chosen touristic buildings without informing and reach a conclusion. The statistical analyses are made and a report is written based on the conclusion.

The designated hotels was possible extract on a non-repetitive sample space comprised of 25 designs, from which an approximately 36% random sample of 9 units were chosen with respect to the simply hat-draw method to ensure the necessary randomness.

The compilation procedure starts with designing the data sheets so as to record the quantitative and descriptive properties which were derived from the material for each sample element. The room/space designations both of which were given and categorized by the author and various measurements, areas and ratios cited in section 3.1, dates of design commissioning and completion as well as the type of guestroom floor unit organization were recorded by this way. Data sheets compiled for one of these facilities is given in Appendix A as an example.

The inter-ratio distributions that were considered relevant to the study were formed to serve as a basis for grouping the data. Below, these aforementioned inter-ratio distributions are listed.

(1) efficiency quotient (ratio 09) distribution, respecting ratio 03, *i.e. area of primary spaces per bed;*

(2) efficiency quotient distribution, respecting ratio 04, *i.e. area of secondary spaces per bed;*

(3) efficiency quotient distribution, respecting ratio 05, *i.e. area of circulation spaces per bed;*

(4) distribution of ratio 07 in regard to ratio 06, *i.e. constructional area per bed;*

(5) distribution of ratio 08 (ratio of primary spaces to circulation spaces) in regard to the efficiency quotient;

(6) distribution of ratio 07 (ratio of primary spaces to secondary spaces) in regard to the efficiency quotient.

Table 3.2. Area of primary spaces per bed (ratio 03), with their corresponding efficiency quotient, ranked in ascending order.

SAMPLE ID	Ratio 03	Efficiency Quotient
S03	7,50	0,82
S02	9,32	0,82
S04	9,55	0,88
S05	9,76	0,82
S01	10,08	0,88
S07	10,56	0,84
S09	11,69	0,75
S06	11,95	0,76
S08	12,19	0,88

Table 3.3. Distribution of efficiency quotients with respect to ratio 03.

	Group 1 7.5-9.5	Group 2 9.6-11.5	Group 3 11.6-13.5	ΣX_i
	0,82	0,82	0,75	2,39
	0,82	0,88	0,76	2,46
	0,88	0,84	0,88	2,60
ΣX_j	2,52	2,54	2,39	7,45
n	3	3	3	
X(mean)	0,84	0,85	0,80	
S_x(Standard Error)	0,03	0,03	0,07	
s^2(Variance)	0,001	0,001	0,005	
Coefficient of Variation	4,12%	3,61%	9,08%	

First of all, the sample elements of distributions from 01 to 09 are ranked in ascending order of factor ratio, where the values of corresponding variant ratios are also given. Secondly, the relevant interval ratios are defined for the factor ratios under which variant ratios were accordingly grouped and their statistics (group means-each with its standard error-and variances) given. The coefficients of variations are presented here for a preliminary comparison of the groups. As an example, tabulations for the above mentioned first case are given in Table 3.2 and 3.3, respectively. However; the ones for the remaining distributions are shown in Appendix B.

3.2.2. Data Analysis

The data are analyzed with three different types of statistical investigation, which are two sample Student's *t*-tests; Regression Analyses; and single-factor Analyses of Variance. The data analysis process is briefly explained below.

(a) Student's *t*-test

With an assumption of unequal variances for distribution 09 listed in section 3.2.1, Student's *t*-test is used on a sample basis in order to determine whether there are any differences in efficiency quotient observed in the following analyses that can be attributed to distinctions in plan organization at a prescribed 5% level of significance (α=0.05).

(b) Regression Analyses

Regression Analyses are conducted to find out the level of dependency among key elements of derived data which could have become obscured in the construction of the various ratios subsequently used as analog indicators. The regression of circulation spaces and secondary spaces on primary spaces as well as the regression of net usable area on both primary and secondary spaces are analyzed. The scatter plots were made.

(c) Analyses of Variance

Single-factor ANOVA was conducted on the grouped data of distributions from 01 to 06 that are listed in section 3.2.1 to determine whether there are any differences among sample elements at a prescribed 5% level of significance (α=0.05) by various factors being considered. Null hypothesis were subjected to *F*-tests done based on the facts shown in ANOVA tables constructed thereon. Calculations of these tests were done using MedCalc® Software and Microsoft® Excel Analysis Tool Pak.

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter are presented the results of calculations and statistical analyses conducted on derived data, followed by a discussion on their relevance to the study objectives. For clarity, results have been compiled under three sub-headings where the first covers t-tests for paired data and the second, examining regression analysis to estimate whether or not any relation could be observed between variables and the third, those pertaining F-tests to expose if any significant difference can be found among the obtained means of random selected samples. In the end of the chapter, results are discussed with regard to investigation as a whole.

4.1. RESULTS

The results of each type of analysis are presented under different sub-headings following a brief interpretation on their immediate implications regarding the issue under discussion. For Analysis of Variance, each result is presented with a comprehensive statement of the null hypothesis.

4.1.1. Two-sample Student's *t*-tests

In order to determine whether sample elements with distinctively different planimetric configurations could be considered as belonging to one and the same population, where its respective efficiency quotient was concerned such that subsequent ANOVA would not reflect any original bias respectively showed that there were no prescribed significant differences among the groups in question, the analysis is performed. That is to say, efficiency quotient has not shown any noteworthy difference of having double loaded plan whether or not they involve a courtyard, except the chance factor.

The distribution of the efficiency quotient with regard to two factors and a summary of the test results are given in Tables 4.1 and 4.2, below.

Table 4.1. Distribution of efficiency quotient with respect to their plans.

Single corridor	Double corridor
0,88	0,88
0,76	0,82
0,84	0,82
0,88	0,82
0,75	

Table 4.2. Two-sample Student's t-tests for efficiency quotient, by plan types.

	Variable 1	Variable 2
Mean	0,82	0,84
Variance	0,004	0,0007
Observations	5	4
Hypothesized Mean Difference	0	
df	1	
t Stat	-0,509	
P(T<=t) one-tail	0,315	
t Critical one-tail	1,943	
P(T<=t) two-tail	0,629	
t Critical two-tail	2,447	

4.1.2 Regression Analyses

The results of these analyses, as cited in 3.2.2.b are presented here separately, as they need to be interpreted separately.

(a) The regression of circulation spaces on primary spaces

Table 4.3. Distribution of variables, area of primary spaces and circulation spaces.

Sample ID	Area of Primary Spaces (X)	Area of Circulation Spaces (Y)
S01	241,90	94,90
S02	205,00	70,40
S03	202,50	42,20
S04	267,30	81,60
S05	273,40	70,00
S06	430,10	169,90
S07	274,60	80,10
S08	292,60	87,30
S09	444,10	123,50

Figure 4.1 A scatter plot showing the regression of circulation spaces on the area of primary spaces.

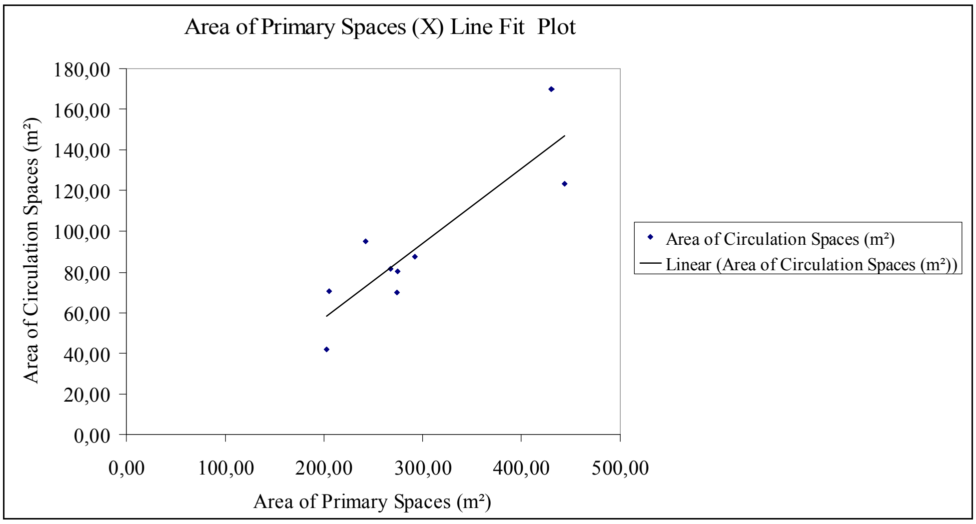


Table 4.4. The results of regression analysis on both dependent Y and independent X.

Regression Statistics	
Multiple R	0,88
R Square	0,77
Adjusted R Square	0,74
Standard Error	18,73
Observations	9

When Figure 4.1 is examined, it is possible to form even little relationship of closeness, between dependent Y (area of circulation spaces) and independent X (area of primary spaces) in the graph formed based on the data gathered from Table 4.5.

The value of Coefficient of determination (R^2) has risen to 0,77, it is possible to assume that with the level of 77%, there is a connection between area of circulation spaces and area of primary spaces.

(b) The regression of secondary spaces on primary spaces

Table 4.5. Distribution of variables, area of primary spaces and secondary spaces

Sample ID	Area of Primary Spaces (X)	Area of Secondary Spaces (Y)
S01	241,90	2,50
S02	205,00	5,00
S03	202,50	6,00
S04	267,30	3,50
S05	273,40	6,00
S06	430,10	11,00
S07	274,60	7,00
S08	292,60	10,00
S09	444,10	6,00

Table 4.6. The results of regression analysis on both dependent Y and independent X.

Regression Statistics	
Multiple R	0,84
R Square	0,71
Adjusted R Square	0,67
Standard Error	5,57
Observations	9

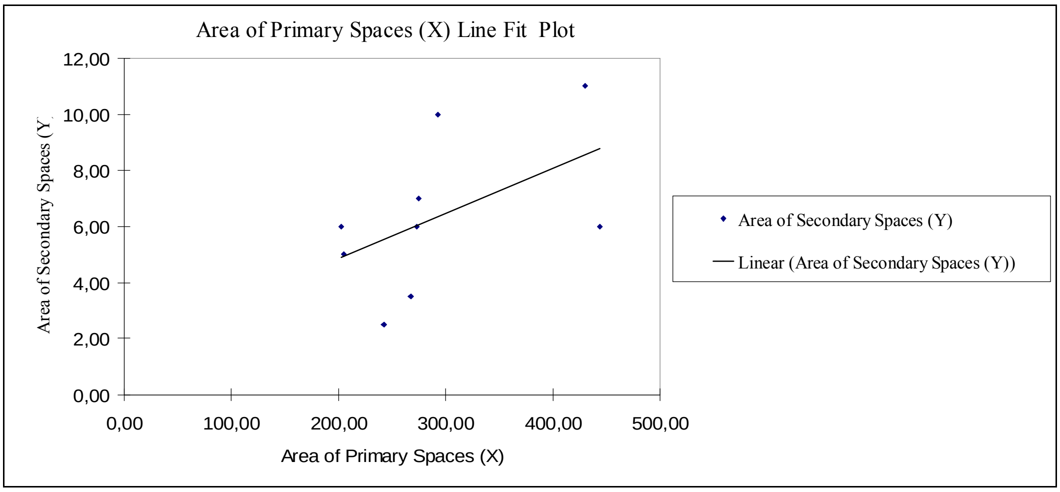


Figure 4.2 A scatter plot showing the regression of secondary spaces on the area of primary spaces.

The corresponding scatter plot of Figure 4.2 fell out from table 4.5. There is a slightly stronger positive relationship between the area of secondary space and area of primary space of two variables examined as evidenced by a high value of coefficient of determination (R^2) at 0,71 .It is seen that there is a relationship between dependent Y (area of secondary spaces) and independent X (area of primary spaces) with the 71% level of confidence. If the results from 9 different hotels are examined, it is found out that there is a relationship between primary spaces and secondary spaces.

(c) The regression of net usable floor area on the area of primary spaces

In the scatter plot 4.3 formed with the paired values given in Table 4.7, a significant harmony between the dependent and independent variables can be seen. The strong relationship between these two variables shows that net usable floor area of 9 hotels was directly proportional with their area of primary spaces. This was found not only by a high coefficient of determination (R^2) value at 0,98, but also by the numerically large gradient for the regression line at 1.4966.

Table 4.7. Distribution of variables, area of primary spaces and net usable floor area

Sample ID	Area of Primary Spaces (X)	Net Usable Floor Area (Y)
S01	241,90	339,30
S02	205,00	280,40
S03	202,50	250,70
S04	267,30	352,40
S05	273,40	349,40
S06	430,10	611,00
S07	274,60	361,70
S08	292,60	389,90
S09	444,10	573,60

Table 4.8. The results of regression analysis on both dependent Y and independent X.

Regression Statistics	
Multiple R	0,99
R Square	0,98
Adjusted R Square	0,98
Standard Error	19,14
Observations	9

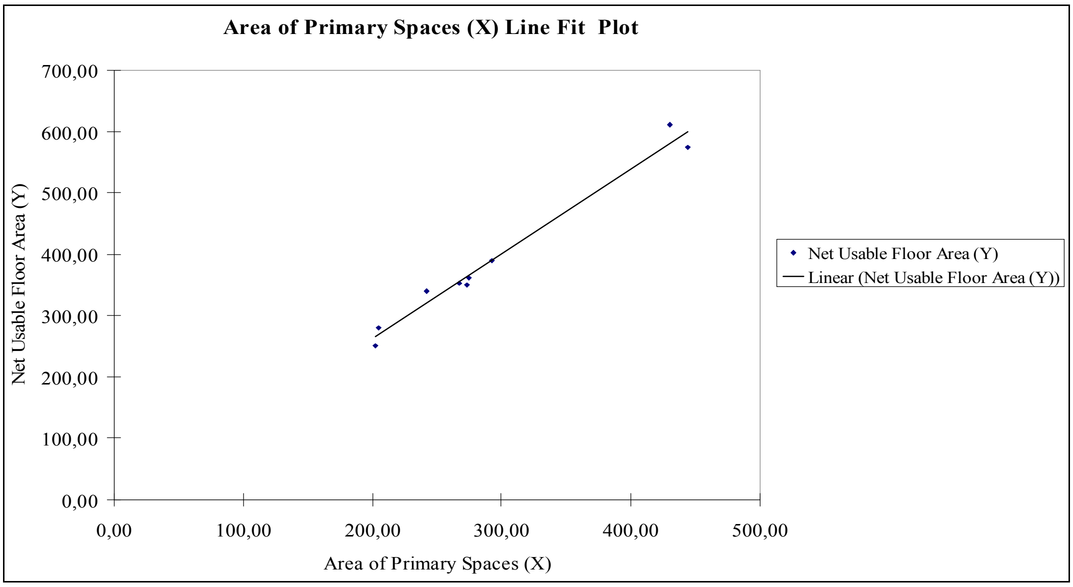


Figure 4.3. A scatter plot showing the regression of net usable floor area on the area of primary spaces.

(d) The regression of net usable floor area on the area of secondary spaces

In the results of regression analysis performed with the data in Table 4.9, it is seen that coefficient of determination (R^2) results are low as 0,29, *i.e.* 29% level of dependency can be found between the bet usable floor area on the area of secondary spaces. Nevertheless, although four sample element appear to be close to each other, it is hard to form a bond between secondary spaces and net usable floor area when the scatter plot in Figure 4.4. is examined. If an assumption is made based on the results obtained, it can be seen that there is no dependency between these two variables. An increase or decrease in dependent Y does not seem to influence the independent X. When S06 is examined, although the net usable floor area is not visibly high, it can be said that area of secondary spaces is close to other samples. In Table 4.9, the regression analysis of the samples found are presented:

Table 4.9. Distribution of variables, area of secondary spaces and net usable floor area.

Sample ID	Area of Secondary Spaces (X)	Net Usable Floor Area (Y)
S01	2,50	339,30
S02	5,00	280,40
S03	6,00	250,70
S04	3,50	352,40
S05	6,00	349,40
S06	11,00	611,00
S07	7,00	361,70
S08	10,00	389,90
S09	6,00	573,60

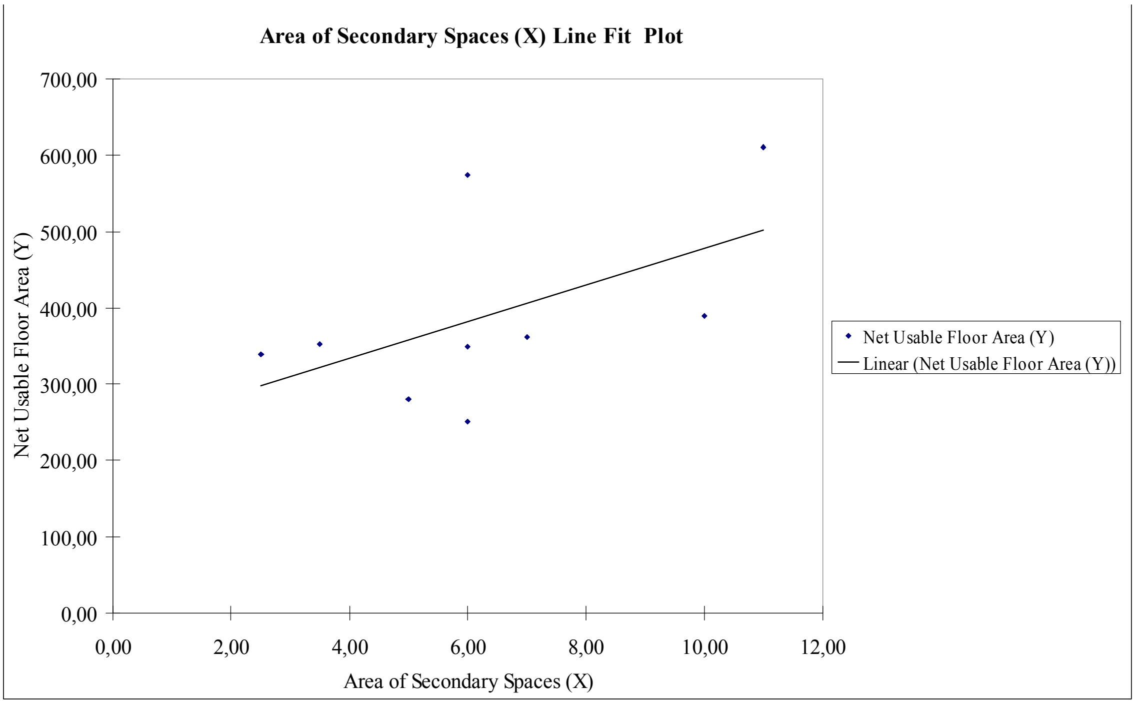


Figure 4.4 A scatter plot showing the regression of net usable floor area on the area of secondary spaces.

Table 4.10. The results of regression analysis on both dependent Y and independent X.

Regression Statistics	
Multiple R	0,54
R Square	0,29
Adjusted R Square	0,19
Standard Error	110,36
Observations	9

4.1.3. Analyses of Variance

In this chapter the results of the analysis reports briefly explained in 3.2.2. are given in detail. Accordingly,

(a) Distribution of Efficiency Quotient with respect to area of primary spaces/bed

Table 4.11. ANOVA for efficiency ratios with respect to Ratio 03

<table>
<tr><th>Source of Variation</th><th>Sum of Squares (SS)</th><th>Degrees of Freedom (df)</th><th>Mean Squares (MS)</th><th>F expected (α=0.05; 2, 6)</th><th>F calculated</th></tr>
<tr><td>Between Groups</td><td>0.004</td><td>2</td><td>0.002</td><td rowspan="3">5.143</td><td rowspan="3">0.900</td></tr>
<tr><td>Within Groups</td><td>0.015</td><td>6</td><td>0.002</td></tr>
<tr><td>Total</td><td>0.019</td><td>8</td><td></td></tr>
<tr><td colspan="6">H_0: $\tau_i = 0$ ($\alpha = 0.05$; $v_1 = 2$, $v_2 = 6$), Fexpected > F calculated
H_0 accepted with 95 % confidence</td></tr>
</table>

As shown in Table 4.11, guestroom floors showed no specific difference in their efficiency quotient with respect to their ratio of primary spaces per bed (Ratio 03); *i.e.* with a 95% level of confidence. Any variation among 9 selected samples shows no significant variance on their efficiency quotients with respect to Ratio 03.

In conclusion, there was not a direct relation between the Ratio 03 and efficiency quotient. To state in a different way, it can be said that the efficiency ratios were formed independent from Ratio 03, *i.e.* area of secondary spaces per bed.

(b) Distribution of Efficiency Quotient with Respect to area of secondary spaces/bed

Table 4.12. ANOVA for efficiency ratios with respect to Ratio 04

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Squares (MS)	F expected (α=0.05; 2, 6)	F calculated
Between Groups	0.000	2	0.000	5.143	0.062
Within Groups	0.019	6	0.003		
Total	0.019	8			
H_0: $\tau_i = 0$ ($\alpha = 0.05$; $v_1 = 2$, $v_2 = 6$), Fexpected > F calculated H_0 accepted with 95 % confidence					

As shown in Table 4.12, guestroom floors showed no specific difference in their efficiency quotient with respect to their ratio of secondary spaces per bed (Ratio 04); *i.e.* with a 95% level of confidence. Any variation among 9 selected samples shows no significant variance on their efficiency quotients with respect to Ratio 04.

In conclusion, there was not a direct relation between the Ratio 04 and efficiency quotient. To state in a different way, it can be said that the efficiency ratios were formed independent from Ratio 03, *i.e.* area of secondary spaces per bed.

(c) Distribution of Efficiency Quotient with respect to area of circulation spaces/bed

Table 4.13. ANOVA for efficiency ratios with respect to Ratio 05

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Squares (MS)	F expected (α=0.05; 2, 6)	F calculated
Between Groups	0.001	2	0.000	5.143	0.111
Within Groups	0.018	6	0.003		
Total	0.019	8			
F expected > Fcalculated H_0 accepted with 95 % confidence					

In Group 1, Group 2 and Group 3, the variations show that there is no significant difference among the groups which is supported by coefficient of variation. Practically, this means that there is no connection between ratio 05, *i.e.* area of circulation spaces per bed, and the given values of efficiency quotient. Nevertheless, the efficiency quotient values were formed independently considered to ratio 05 with a 95% level of confidence.

(d) Distribution of Ratio 07 (Ratio of Primary Spaces to Secondary Spaces) with respect to Ratio 06 (Constructional area per bed)

As shown in Table 4.14, guestroom floors showed no specific difference in their ratio of primary spaces to secondary spaces (Ratio 07) with respect to their constructional area per bed (Ratio 06); *i.e.* with a 95% level of confidence, any variation among the 9 selected samples can not be depicted significant variance on their ratio of primary spaces to secondary spaces with respect to constructional area per bed. To reach a conclusion, there was not any relation between the Ratio 07 and Ratio 06.

Table 4.14. ANOVA for Ratio 07 with respect to Ratio 06

<table>
<tr><th>Source of Variation</th><th>Sum of Squares (SS)</th><th>Degrees of Freedom (df)</th><th>Mean Squares (MS)</th><th>F expected (α=0.05; 2, 6)</th><th>F calculated</th></tr>
<tr><td>Between Groups</td><td>413.034</td><td>2</td><td>206.517</td><td rowspan="3">5.143</td><td rowspan="3">0.309</td></tr>
<tr><td>Within Groups</td><td>4008.300</td><td>6</td><td>668.050</td></tr>
<tr><td>Total</td><td>4421.334</td><td>8</td><td></td></tr>
<tr><td colspan="6">H_0: $\tau_i = 0$ ($\alpha = 0.05$; $v_1 = 2$, $v_2 = 6$), F expected > F calculated
H_0 accepted with 95 % confidence</td></tr>
</table>

(e) Distribution of Ratio of area of primary spaces to circulation spaces (Ratio 08) with respect to Efficiency Quotient

The result of this distribution shown in Table B.8. is that guestroom floors showed no specific difference in their ratio of area of primary spaces to circulation spaces with respect to their efficiency quotient with a 95% level of confidence. Any variation among the 9 selected samples can not be depicted significant variance on their ratio of primary spaces to circulation spaces with respect to efficiency quotient. What this means in practical terms was that there is not any connection between ratio 08; *i.e.* ratio of primary spaces to circulation spaces and the given values of efficiency quotient. Alias, efficiency quotient values were formed independent considered to ratio 08.

Table 4.15. ANOVA for Ratio 08 with respect to Efficiency Quotient

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Squares (MS)	F expected (α=0.05; 2, 6)	F calculated
Between Groups	0.008	2	0.004	5.143	1.983
Within Groups	0.012	6	0.002		
Total	0.020	8			
F expected > F calculated H_0 accepted with 95 % confidence					

(f) Distribution of ratio of primary spaces to secondary spaces (Ratio 07) with respect to Efficiency Quotient

Table 4.16. ANOVA for Ratio 07 with respect to Efficiency Quotient

Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Squares (MS)	F expected (α=0.05; 2, 6)	F calculated
Between Groups	0.000	2	0.000	5.143	0.062
Within Groups	0.019	6	0.003		
Total	0.019	8			
F expected > F calculated H_0 accepted with 95 % confidence					

The result of this distribution shown in Table B.10 is that in Group 1, Group 2 and Group 3, the variations showed that there is no significant difference among the groups, which is supported by coefficient of variation. Practically, this means that there is no connection between ratio 07, *i.e.* ratio of primary spaces to secondary spaces, and the given values of efficiency quotient. The values of the efficiency quotient were formed as being considered independent to ratio 07.

4.2. DISCUSSION

Three different statistical tests performed are explained below in detail with their results. To review these results, the following are presented:

4.2.1. Regarding Student's *t*-tests

The selected hotels have been constructed in recent years and they are located in close regions to each other. Excluding the double-corridor arrangements, single-corridor arrangements show a minor variation with respect to their net usable floor area and gross-floor area. Furthermore, double-corridor plan configurations also show very few differentiations regarding their net usable floor area and gross-floor area.

Upon examining the two sample *t*-test of the selected plans, the efficiency ratios were not formed with respect to double- or single-corridor plan arrangement. In other words, the selected samples showed no significant differences regarding their efficiency ratios.

What is the reason for these 9 selected samples to vary according to their planimetric configuration? Despite the fact that the construction areas, net usable floor areas, and gross floor areas of these samples are adjacent to each other, why do their efficiency ratios show different values? Further analyses were conducted to reveal a response for these variations.

4.2.2. Regarding Regression Analyses

Considering the data presented in section 4.1.2; it is seen that the area of circulation spaces on the area of primary spaces show modest dependency; nonetheless, there was no close relation between the area of secondary spaces on the area of primary spaces and the net usable floor area on the area of secondary spaces. Net usable floor area on the area of primary spaces show the highest dependency compared to other results. To elaborate the examination, the following can be said:

Circulation spaces showed a relation with the area of primary spaces. In table 4.4; the R^2 (coefficient of variation) value was 0,78. A higher R^2 value shows that there is close dependency among the samples with a level of 78%. The reason of close relationship between the areas of circulation spaces on the area of primary spaces can be the ease of flow from one space to another. Hence, it is thought that the designer of these hotels consider connecting the circulation spaces with primary spaces.

Conversely, the lower dependency was found in the area of secondary spaces on the area of primary spaces. A lower R^2 value shows that there is a weak connection between them. From the scatter plot on figure 4.1.2, it can be seen that planimetric arrangements were not be considered in all these 9 hotels during the design of secondary spaces on the primary spaces.

A higher result was found on the net usable floor area on the area of primary spaces. The R^2 value was 0.98 as stated in section 4.1.2.c. It gives the expected dependency between primary spaces and net usable floor areas with a level of 98%. The strong bond between the essentially utilized spaces (primary space) and the net usable floor area point out that the fact that hotel designers care for the *functionality of the volume*.

Figure 4.4. also shows a lower dependency. The related scatter plot and the R^2 value found in Table 4.10, puts fort that there is no connection between the net usable floor area and the area of secondary spaces.

4.2.3. Regarding Analyses of Variance

In general, the examination of variances shows reasonable results. At first, distribution of efficiency quotient with respect to ratio 05 (area of circulation spaces per bed) was given a 0.00 variance which showed insignificant result. The most significant acceptance of the null hypothesis is the one for the distribution of ratio 04 (area of secondary spaces per bed) with respect to the efficiency quotient and the distribution of ratio 07 (area of primary spaces to secondary spaces) with respect to the efficiency quotient.

When the results of analysis of variance (ANOVA) are examined, it is seen that the F values shown as *F* expected are bigger than *F* calculated. Therefore, guest room floors show no specific difference in their efficiency quotient based on per-bed ratios with a 95% level of confidence, which means the numerator of per-bed basis ratios is not affected by the higher and/or the lower efficiency quotient. Nevertheless, there is not any significant difference can be found between ratio 06 (ratio of area of primary spaces to area of secondary spaves) with respect to ratio 07 (constructional area per bed).

CHAPTER 5

CONCLUSIONS

To reach a rational solution, conclusions are constituted of two different but interrelated structures. First as subject matter and the second is methodology. Subject matter section covers the closing remarks of the research as one dealing with that of guestroom floor areas in 4-star hotels in Ankara. The other section, *i.e.* methodology, covers the design efficiency of the guest room floor. The two distinct sections are presented below.

5.1. CONCLUSION ON METHODOLOGY

The major study involved within, is measuring the efficiency of standard hotel floor plans. In total, more than one hotel and their standard room floors were studied in regard to their planimetric efficiency. Therefore, to obtain the samples differences and similarities within; bar-charts, tables and graphics have been constituted. To valuate these samples, some analogue indicators have been used. With the help of these indicators, the planimetric efficiency of the hotel rooms were evaluated and commented within each other. Besides, while composing this thesis, one of the handicaps foreseen is that the selected 25 hotels and the 9 hotels that were studied come from the same geographical location and constitutional norms. Therefore, the study enlightens on the basis boundary of geographical, geological and constitutional likeliness. The differences between countries geographical locations, the geological variations and also different government laws and restrictions are the reason conclusion can not be analyzed to be the same. The statistical valuations achieved were from hotels within Turkey; for this reason, the thesis and its conclusion invole only hotels of Turkey.

Within this study which requires lots of effort, patience and time, there are some indicators that are helpful generating the methodology. These are net-usable floor area, gross-floor area, construction area, and primary, secondary, circulation spaces. To obtain the data, a ratio between the total bed numbers in one hotel guestroom floor unit and indicators which are aforementioned above has been formed. However, with regret, the author faced some obstacles while finding a conclusion to the study. These obstacles are; the missing measurements and clerical errors within some architectural projects of hotels.

Studied from the literature point of view; “efficiency quotient”, *i.e* ratio of net usable floor area to gross floor area, is the major variable along the text. Since the efficiency quotients of the random selected 9 hotels were estimated, the variance analyses of the other ratios were studied on account of finding some solutions to the study. Also, while obtaining various ratios, so much effort was put in forming group intervals. Where the overall range of the ratios allowed, three group intervals have been formed.

Due to the extent that the ratios used can themselves be considered tenable, alternatively, the efficiency quotient itself can be used as the base factor against which the variation of all the other ratios are analyzed. Ratio 01 (the ratios of net usable floor area to the number of beds) and ratio 02 (the ratio of gross floor area to the number of beds), are other analysis such. There were some significant differences among these ratios; however, despite ratio 01 and ratio 02, the other ratios studied within table 3.1 do not show much variation among each other.

5.2. CONCLUSION ON SUBJECT-MATTER

This study involved the space design efficiency of the guestroom floor within 4-star hotels in the city of Ankara, Türkiye. The aim was to study certain ratios deemed to be relevant indirect indicators and therefore establish if existent, salient factors to which observed variations in these can be ascribed. The purpose is providing apt feedback for future designers involved. The ratios considered were derived on the basis of areas calculated from the drawings of which were obtained from archives of Munucipality of Çankaya, Ankara.

The primary concern of this study was how the efficiency quotient (ratio of net usable floor area to gross floor area) varied according to a series of other area allocation ratios and whether or not this showed any statistical significant difference in terms of their magnitudes. In other words, the ratios were studied within and to obtain major differences if any. In chapter 4, the detailed statistical analyses of ratios are studied. It is seen that efficiency quotient showed no significant difference with respect to the factor ratios in question. It was also noted that from the linear regression analysis, with the percentage of 98%, the strong relation could be found between the net usable floor area of hotel guestroom floors directly proportional with their area of primary spaces. Not only this, approximately with the percentage of 75%, the slightly close relation could be found between the area of circulation spaces on area of primary spaces; and the area of secondary spaces on area of primary spaces. However, no close relation was observed between the net usable floor area and the area of secondary spaces. The observations existed from analysis of variance was that, with the 95% level of confidence, efficiency quotient ratios did not show any significant difference with regard to primary spaces per bed, secondary spaces per bed and circulation spaces per bed.

In conclusion, with practical terms, from the calculated data, excluding the net usable floor area on the area of primary spaces; the area of circulation spaces on area of primary spaces; and the area of secondary spaces on area of primary spaces; derived ratios; *i.e* analogue indicators, were not shown any significant difference with regard to their efficiency quotient. In order to provide best services in terms of client needs, hotel managements should be considered the relation between the net usable floor area with the area of primary spaces; the area of circulation spaces with the area of primary spaces; and the area of secondary spaces with the area of secondary spaces. Most preferable, for analyzing the design efficiency of guestroom floors, from different populations, further researches should be taken so as to reach different conclusions for the subject.

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APPENDIX A

SAMPLE DATA SHEET

Table A.1. Data sheet for general information about selected samples

Hotel ID:___S01________________ Floor ID:_2______						
Gross Floor Area:_387.5 m^2__ Net Usable Floor Area:_339.3 m^2__ Construction Area:_48.3 m^2__ Number of Beds:_24_						
	Space ID & description	Width (w) m	Length (l) m	Height (h) m	Net usable area m^2	Total net usable area m^2
1	2-bed guest	3.6	4	2.8	14.2	
		1.8	2.4		4.2	
		0.3	1.2		0.4	
		0.2	1.1		0.2	19
2	WC-shower	1	2.3	2.7	2.3	
		0.6	0.9		0.5	2.8
3	2-bed guest	3.6	4	2.8	14.2	
		1.8	2.4		4.2	
		0.3	1.2		0.4	
		0.2	1.1		0.2	19
4	WC-shower	1	2.3	2.7	2.3	
		0.6	0.9		0.5	2.8
5	2-bed guest	3.6	4	2.8	14	
		1.8	2.4		4.2	
		0.3	1.2		0.4	
		0.2	1.1		0.2	19
6	WC-shower	1	2.3	2.7	2.3	
		0.6	0.9		0.5	2.8

APPENDIX B

DATA GROUPED FOR ANOVA

Table B.1. Areas of secondary spaces per bed (ratio 04) with their corresponding efficiency quotients, ranked in ascending order.

SAMPLE ID	Ratio 04	Efficiency Quotient
S01	0,10	0,88
S04	0,13	0,88
S09	0,16	0,75
S05	0,21	0,82
S03	0,22	0,82
S02	0,23	0,82
S07	0,27	0,84
S06	0,31	0,76
S08	0,42	0,88

Table B.2. Efficiency distribution quotients in regard to ratio 04.

	Group 1 0.10-0.20	Group 2 0.21-0.30	Group 3 0.31-0.42	ΣX_i
	0,88	0,82	0,76	2,46
	0,88	0,82	0,88	2,58
	0,75	0,82		1,57
		0,84		0,84
ΣX_j	2,51	3,30	1,64	7,45
n	3	4	2	
X(mean)	0,84	0,83	0,82	
S_x(Standard Error)	0,075	0,010	0,085	
s^2(Variance)	0,0056	0,0001	0,0072	
Coefficient of Variation	8,97%	1,21%	10,35%	

Table B.3. Areas of circulation spaces per bed (ratio 05) with their corresponding efficiency quotients, ranked in ascending order.

SAMPLE ID	Ratio 05	Efficiency Quotient
S03	1,56	0,82
S05	2,50	0,82
S04	2,91	0,88
S07	3,08	0,84
S02	3,20	0,82
S09	3,25	0,75
S08	3,64	0,88
S01	3,95	0,88
S06	4,72	0,76

Table B.4. Distribution of efficiency quotients in regard to ratio 05.

	Group 1 1.51-2.50	Group 2 2.51-3.50	Group 3 3.51-5.00	ΣX_i
	0,82	0,88	0,88	2,58
	0,82	0,84	0,88	2,54
		0,82	0,76	1,58
		0,75		0,75
ΣX_j	1,64	3,29	2,52	7,45
n	3	4	3	
X(mean)	0,55	0,82	0,84	
S_x(Standard Error)	0,000	0,054	0,069	
s^2(Variance)	0,0000	0,0030	0,0048	
Coefficient of Variation	0,00%	6,61%	8,25%	

Table B.5. Constructional areas per bed (ratio 06) with their corresponding ratio 07, ranked in ascending order.

SAMPLE ID	Ratio 06	Ratio 07
S04	1,79	76,37
S03	1,97	33,75
S02	2,01	96,79
S08	2,19	29,26
S05	2,45	45,57
S07	2,63	39,23
S02	2,72	41,00
S09	5,05	74,02
S06	5,38	39,10

Table B.6. Distribution of ratio 07 in regard to ratio 06.

	Group 1 1.51-2.50	Group 2 2.51-3.50	Group 3 3.51-5.50	ΣX_i
	76.37	39.23	74.02	189.62
	33.75	41.00	39.10	113.85
	96.79			96.79
	29.26			29.26
	45.57			45.57
ΣX_j	281.74	80.23	113.12	475.09
n	5	2	2	
X(mean)	56.35	40.12	56.56	
S_x(Standard Error)	29.142	1.252	24.692	
s^2(Variance)	849.2576	1.5665	609.7032	
Coefficient of Variation	51.72%	3.12%	43.66%	

Table B.7. Ratio of primary spaces to circulation spaces (ratio 08), with their corresponding efficiency quotients, ranked in ascending order.

SAMPLE ID	Ratio 08	Efficiency Quotient
S06	2,53	0,76
S01	2,55	0,88
S02	2,91	0,82
S04	3,28	0,88
S08	3,35	0,88
S07	3,43	0,84
S09	3,60	0,75
S05	3,91	0,82
S03	4,80	0,82

Table B.8. Distribution of efficiency quotients in regard to ratio 08.

	Group 1	Group 2	Group 3	
	2.50-3.00	3.01-3.50	3.51-5.00	ΣX_i
	0.76	0.88	0.75	2.39
	0.88	0.88	0.82	2.58
	0.82	0.84	0.82	2.48
				0.00
				0.00
ΣX_j	2.46	2.6	2.39	7.45
n	5	2	2	
X(mean)	0.49	1.30	1.20	
S_x(Standard Error)	0.060	0.023	0.040	
s^2(Variance)	0.0036	0.0005	0.0016	
Coefficient of Variation	12.20%	1.78%	3.38%	

Table B.9. Ratio of primary spaces to secondary spaces (ratio 07), with their corresponding efficiency quotients, ranked in ascending order.

SAMPLE ID	Ratio 07	Efficiency Quotient
S08	29,26	0,88
S03	33,75	0,82
S06	39,10	0,76
S07	39,23	0,84
S02	41,00	0,82
S05	45,57	0,82
S09	74,02	0,75
S04	76,37	0,88
S01	96,76	0,88

Table B.10. Distribution of efficiency quotients in regard to ratio 07.

	Group 1 25.00-40.00	Group 2 40.01-55.00	Group 3 55.01-85.00	ΣX_i
	0,88	0,82	0,75	2,45
	0,82	0,82	0,88	2,52
	0,76		0,88	1,64
	0,84			0,84
				0,00
ΣX_j	3,3	1,64	2,51	7,45
n	4	2	3	
X(mean)	0,83	0,82	0,84	
S_x(Standard Error)	0,050	0,000	0,075	
s^2(Variance)	0,0025	0,0000	0,0056	
Coefficient of Variation	6,06%	0,00%	8,97%	

APPENDIX C

SCHEMATIC FLOOR PLANS OF THE 9 SAMPLES

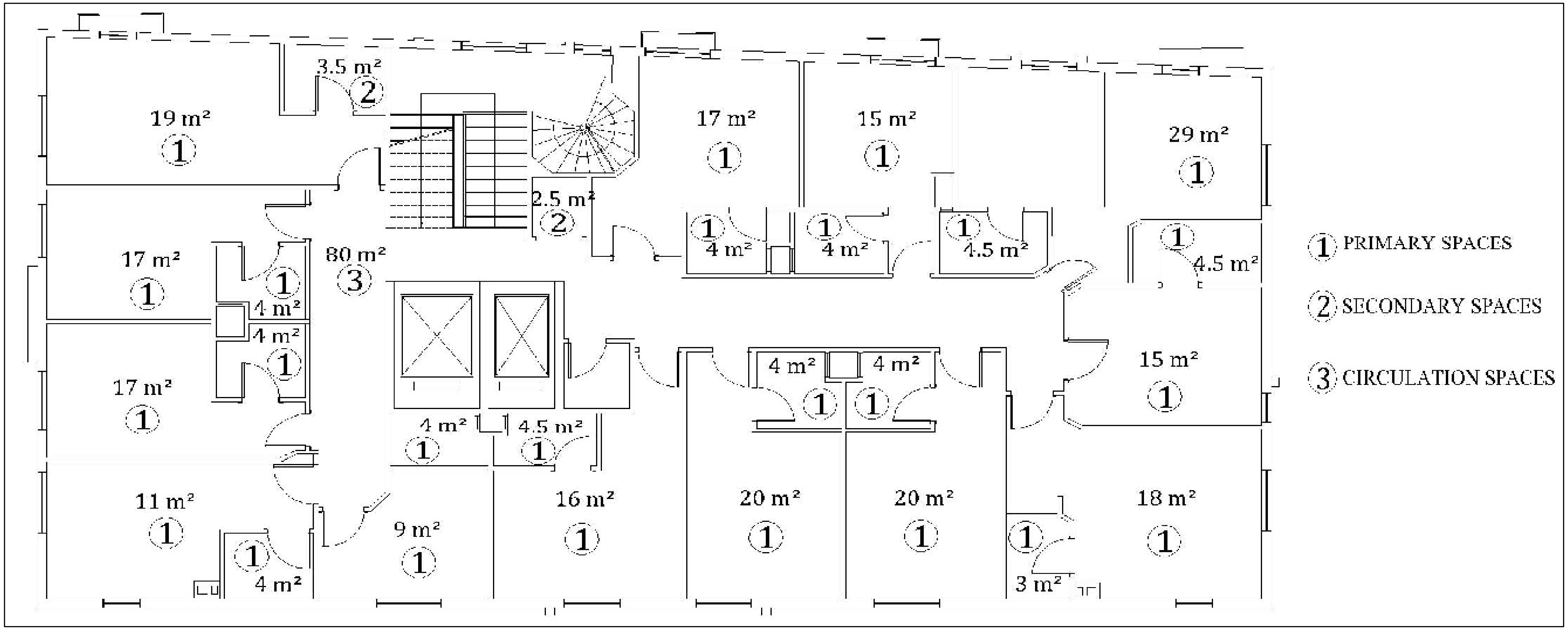

Figure C.1. Floor plan of Sample 01 (S01) displaying, primary, secondary and circulation spaces.

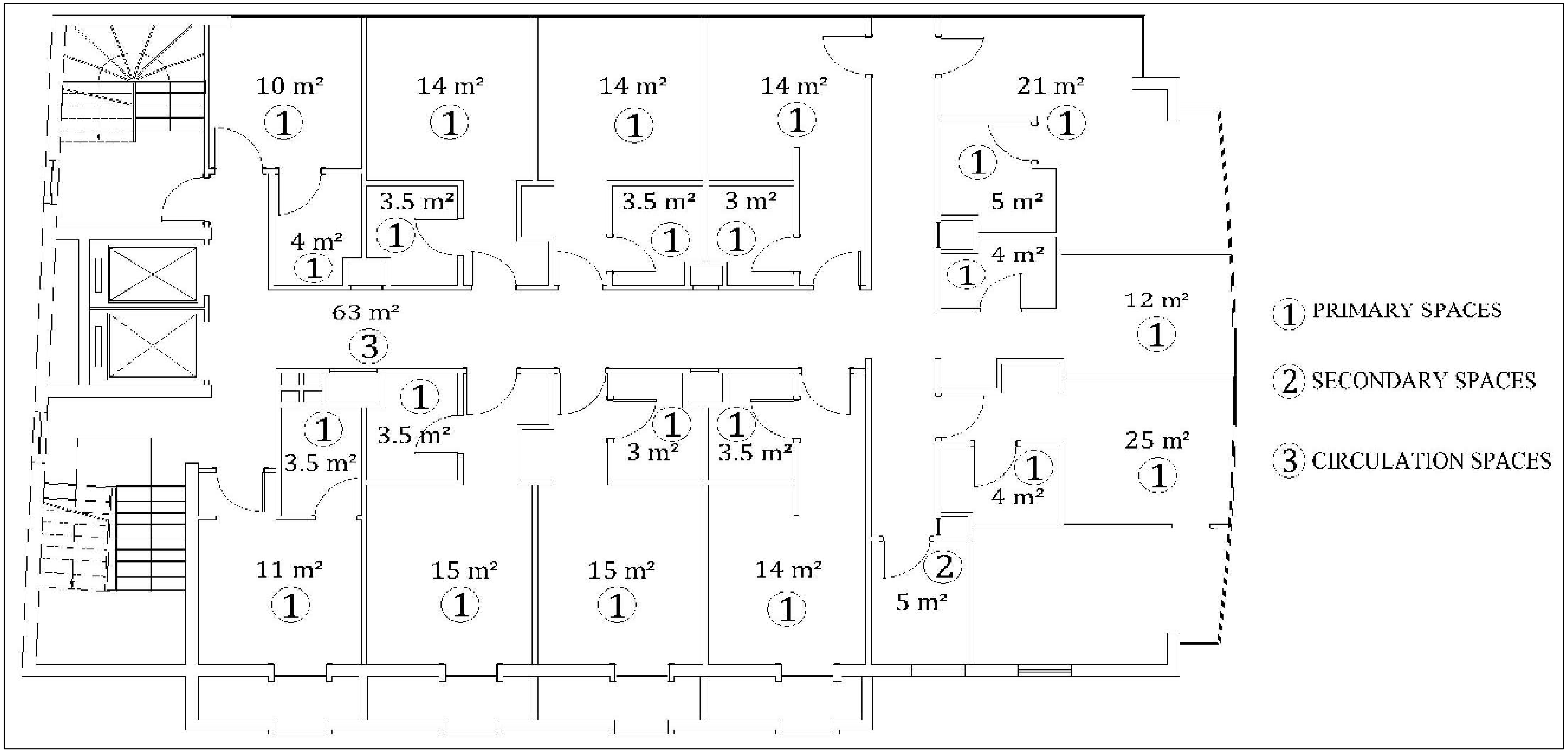

Figure C.2. Floor plan of Sample 02 (S02) displaying, primary, secondary and circulation spaces.

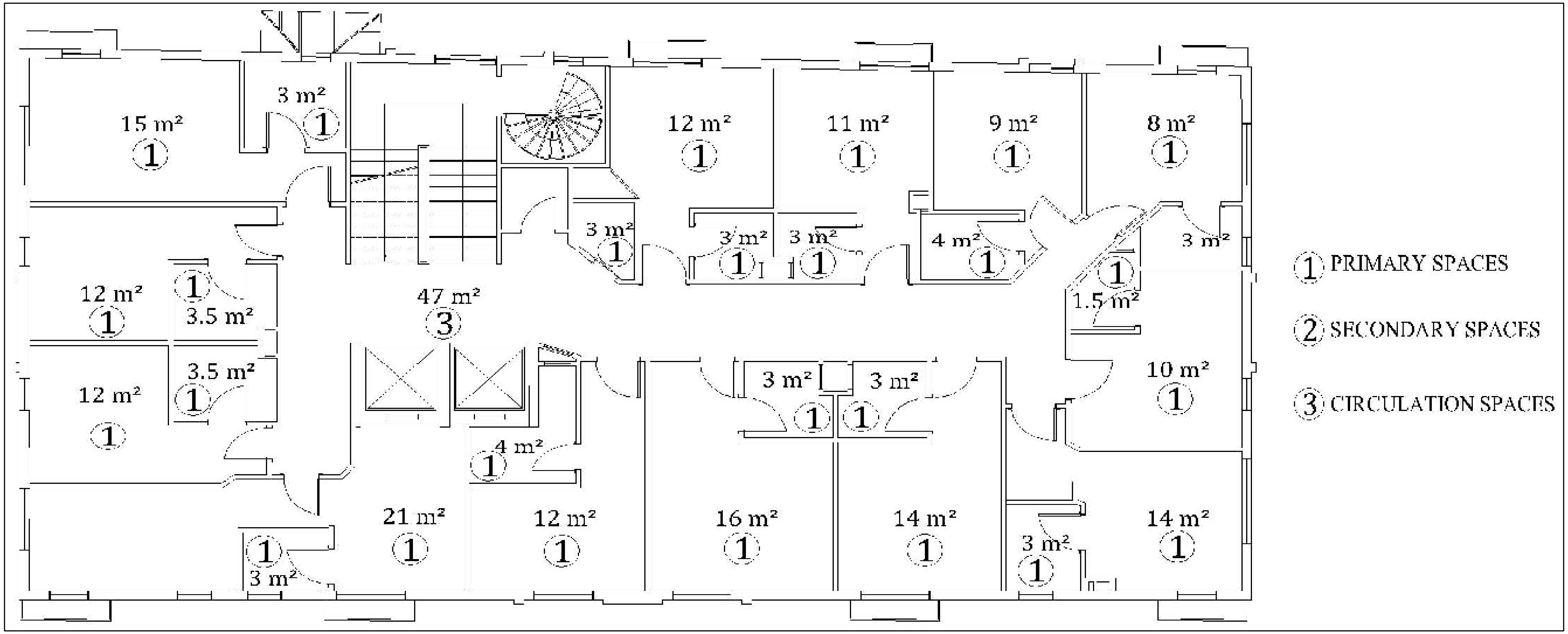

Figure C.3. Floor plan of Sample 03 (S03) displaying, primary, secondary and circulation spaces.

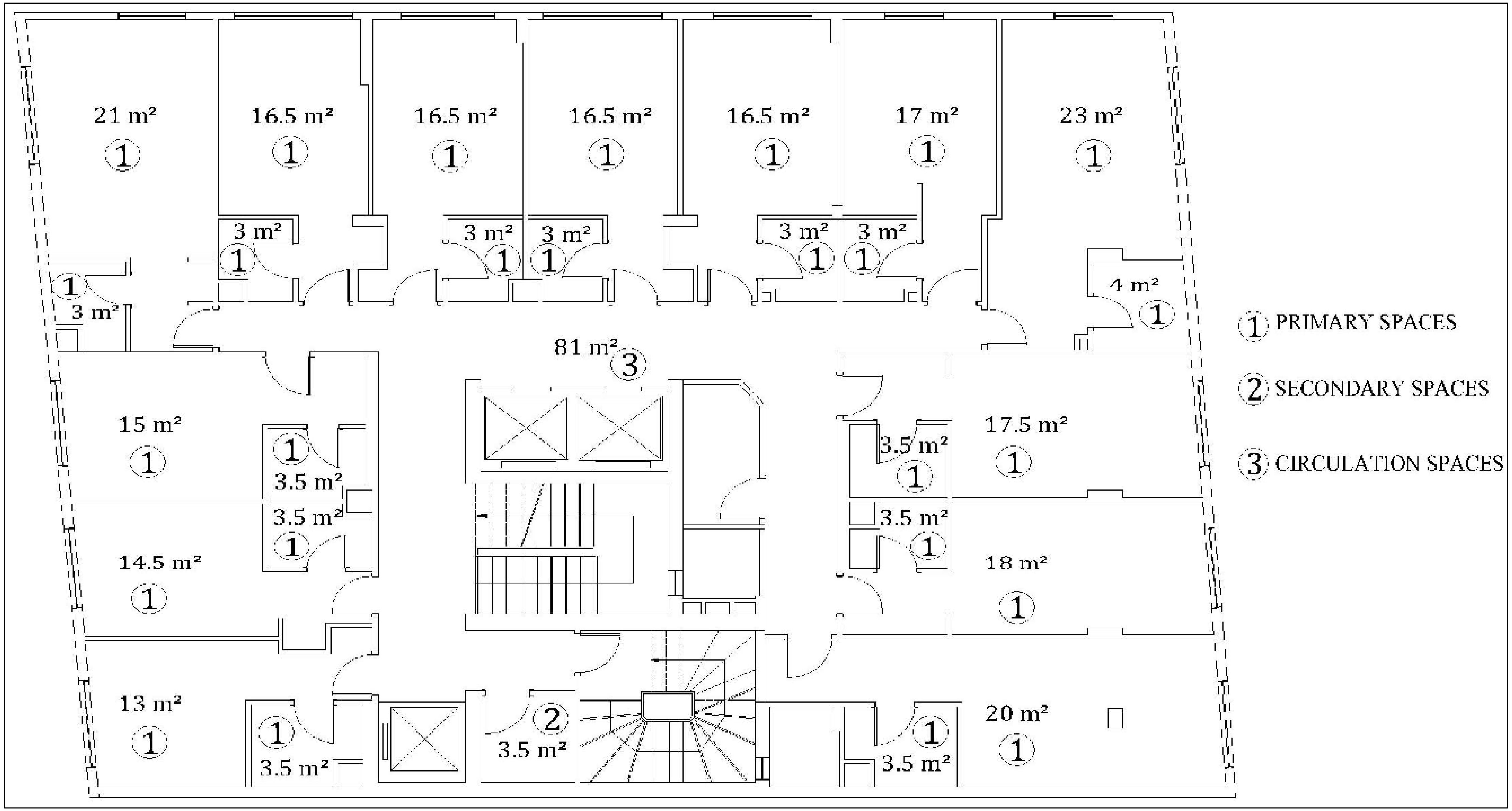

Figure C.4. Floor plan of Sample 04 (S04) displaying, primary, secondary and circulation spaces.

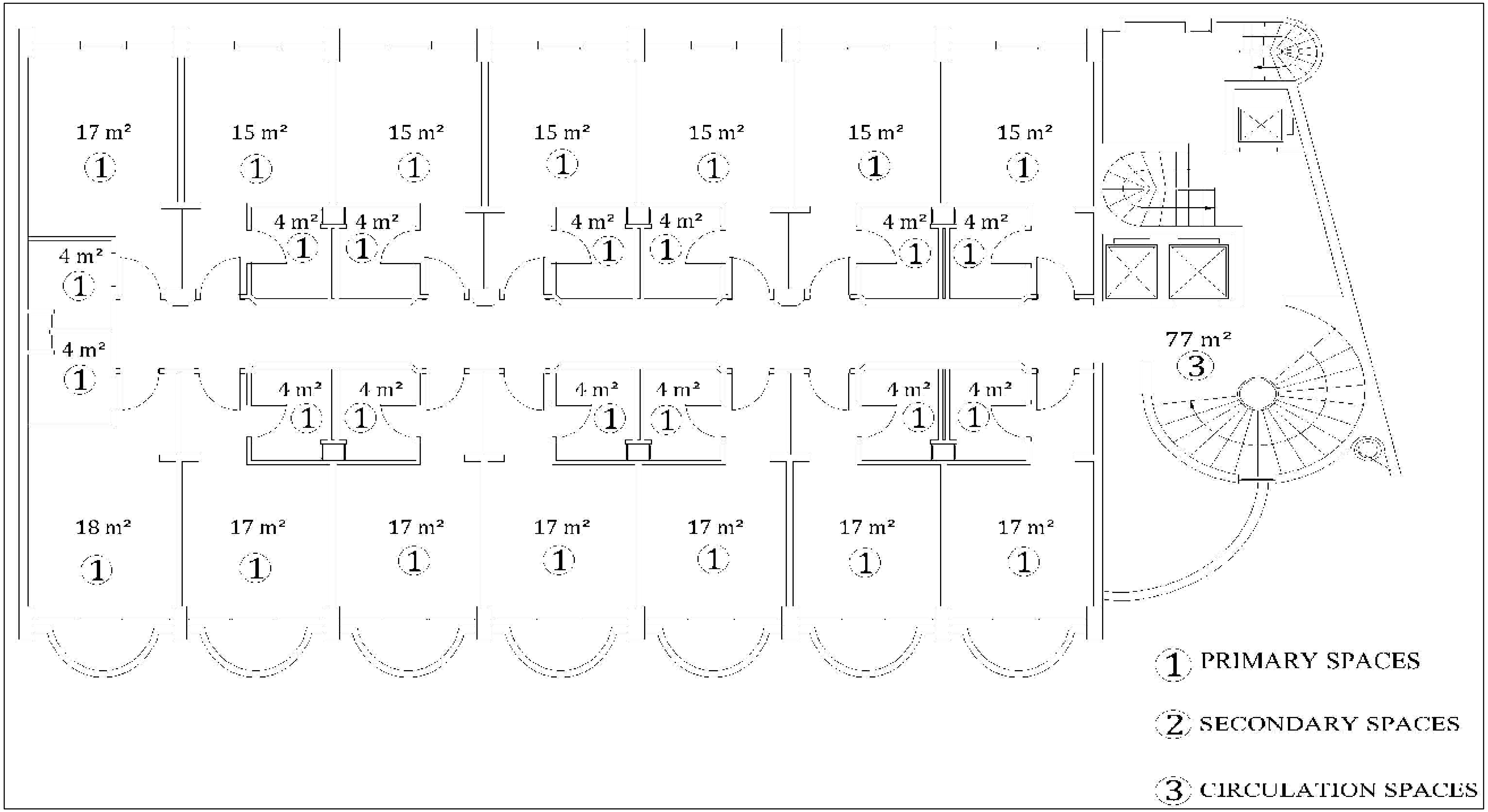

Figure C.5. Floor plan of Sample 05 (S05) displaying, primary, secondary and circulation spaces.

SCHEMATIC FLOOR PLANS OF THE 9 SAMPLES

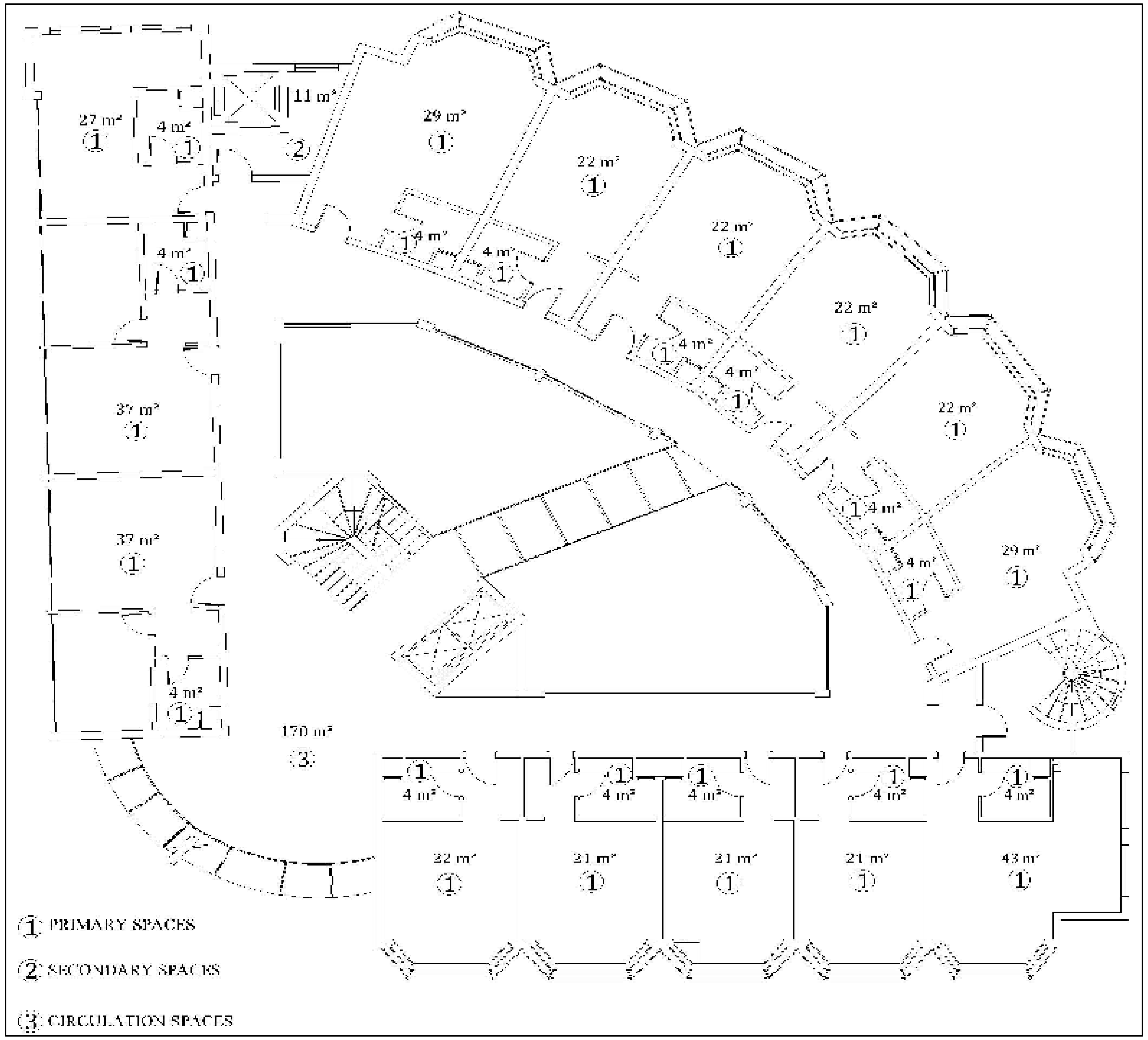

Figure C.6. Floor plan of Sample 06 (S06) displaying, primary, secondary and circulation spaces.

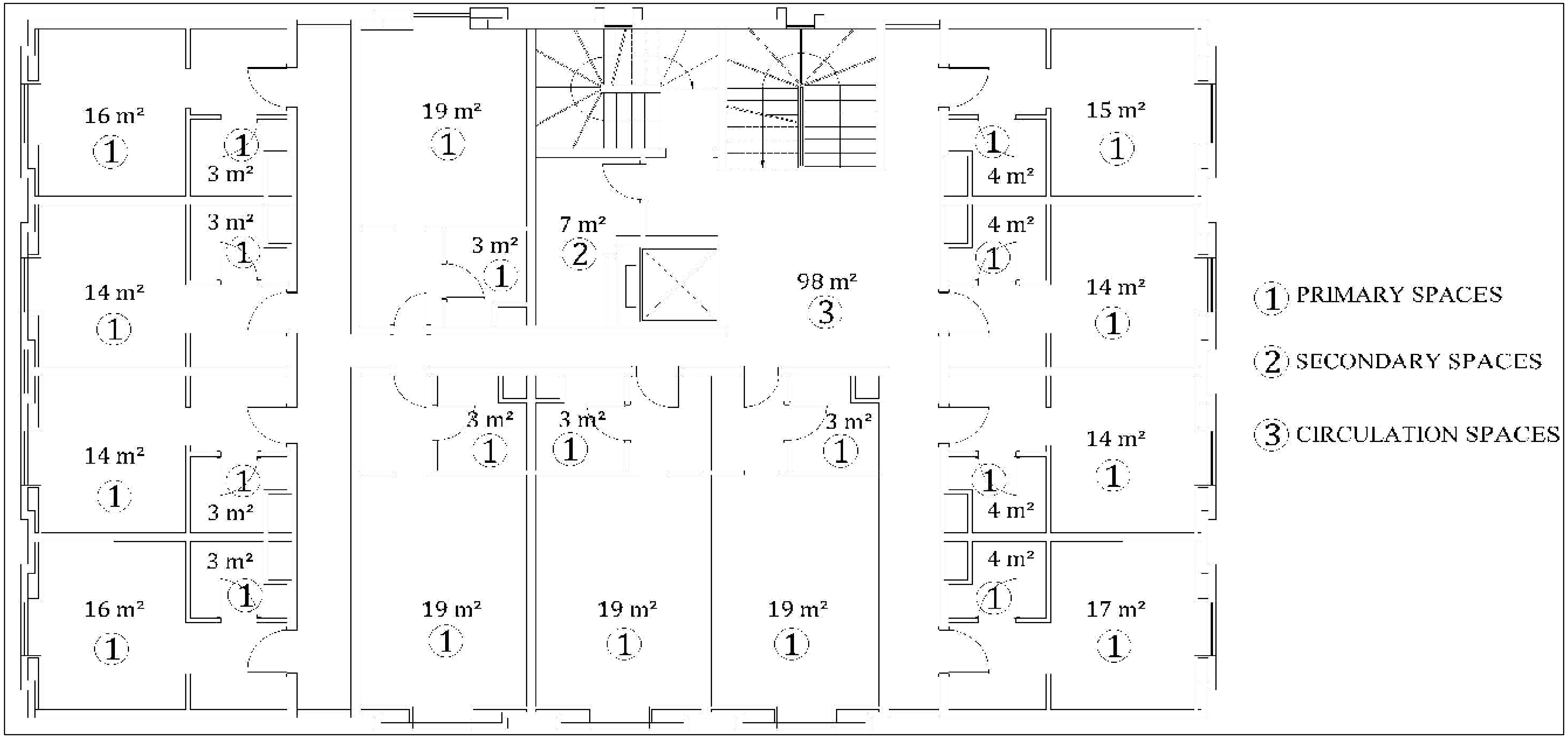

Figure C.7. Floor plan of Sample 07 (S07) displaying, primary, secondary and circulation spaces.

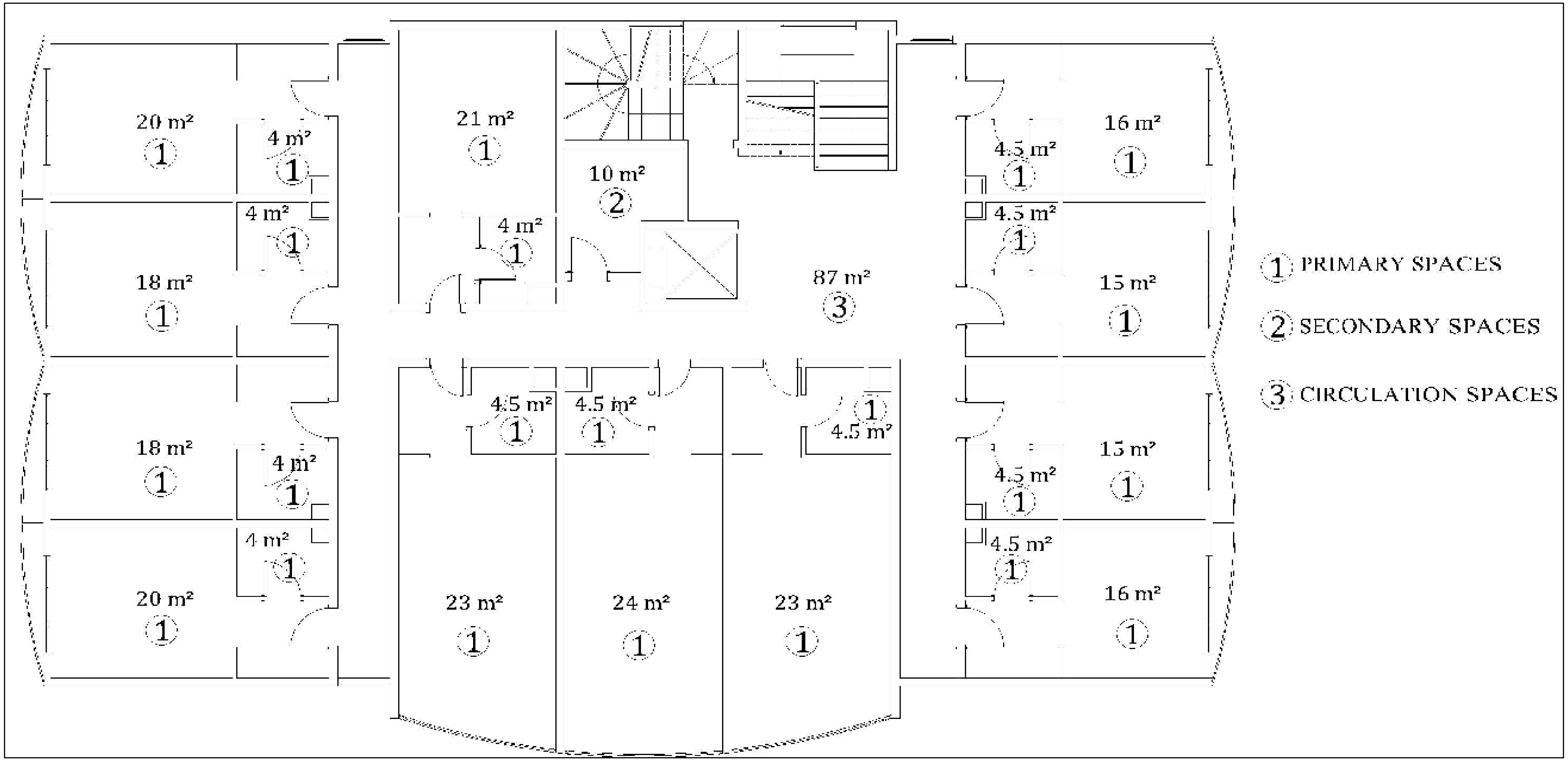

Figure C.8. Floor plan of Sample 08 (S08) displaying, primary, secondary and circulation spaces.

SCHEMATIC FLOOR PLANS OF THE 9 SAMPLES

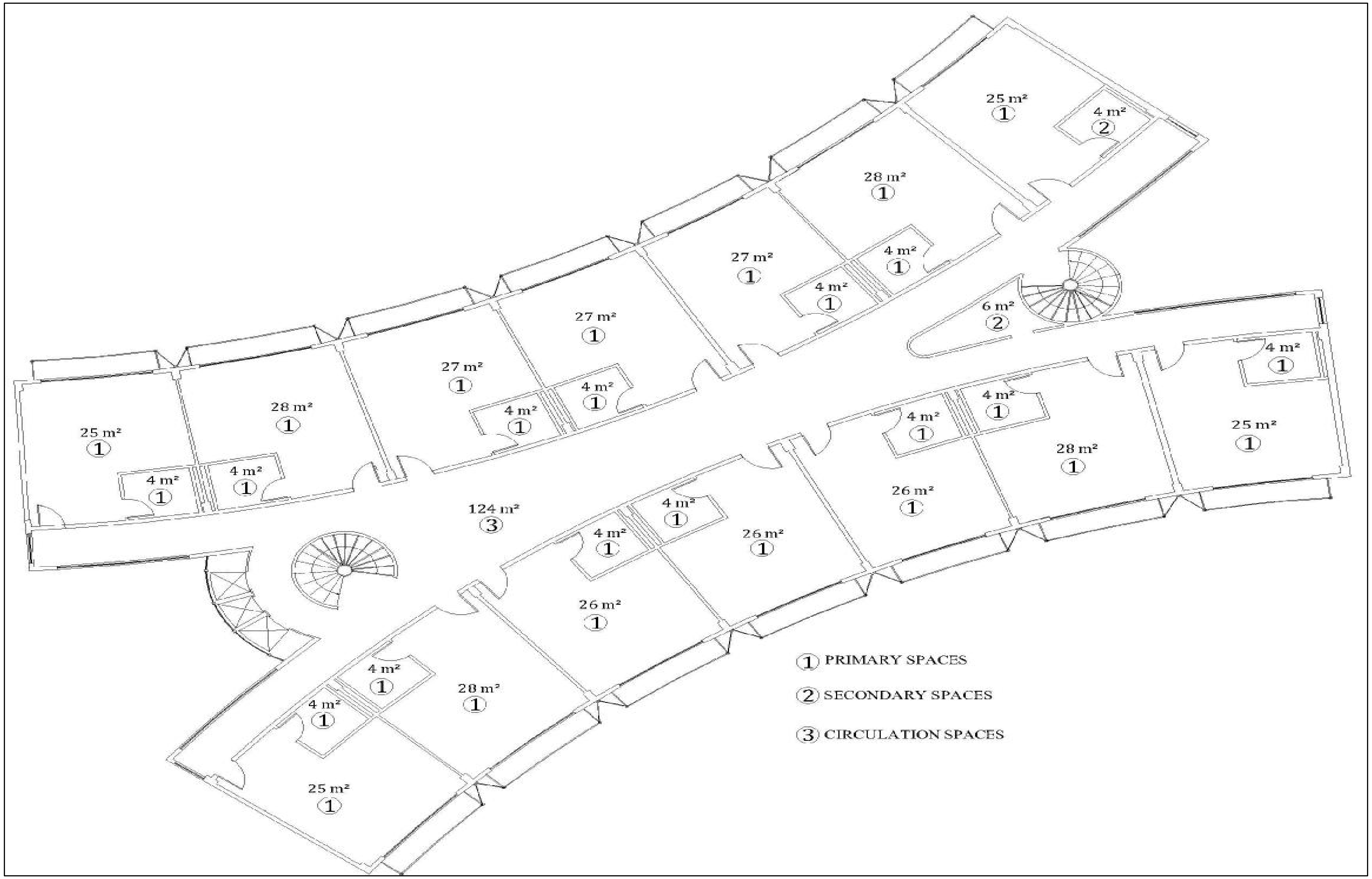

Figure C.9. Floor plan of Sample 09 (S09) displaying, primary, secondary and circulation spaces.