

## LIFE HOSPITAL

Hala I. Masri<sup>1</sup>, Aida Nayer<sup>2</sup>, Mohammed Fekry<sup>3</sup>

<sup>1,2,3</sup>Department of Architecture, College of Architecture and Design, Effat University, Jeddah, Saudi Arabia  
E-mail: [hmasri@effatuniversity.edu.sa](mailto:hmasri@effatuniversity.edu.sa), [anayer@effatuniversity.edu.sa](mailto:anayer@effatuniversity.edu.sa), [mfekry@effatuniversity.edu.sa](mailto:mfekry@effatuniversity.edu.sa)

Received: 12.04.2020

Revised: 11.05.2020

Accepted: 08.06.2020

### Abstract

The goal of the life hospital is to maintain an appropriate life for our children and mothers. It is also concerned of saving the life of many neonates that are in danger because of maternity hospitals' shortage in Jeddah. This hospital cares about the mothers in all stages and also neonates. It provides the needed care for mothers before pregnancy, during pregnancy and after delivery. It aims to make the maternity experience as safe as possible. Awareness will be raised through having different lectures and classes. Fathers and other member family members will be involved in many activities and processes. Several case studies were conducted to organise the construction of project. The project has three main departments which is maternity department, infants department and family enhancement department. The proposed project consist of seven main zones namely teaching classes, consultation room, women fitness center, recreational therapeutic facility, women spa center, loungers cafes and administration. The selected site is located near Al Mohammediah district, based on the eleven evaluation criterion. The proposed project fulfils the sustainable goals of the United Nations development program in Saudi Arabia (UNDP) which is reduce child mortality and improve maternal health.

**Keywords**--Life Hospital, Maternity Hospitals, Mothers, Neonates, Pregnancy, Maternity

© 2020 by Advance Scientific Research. This is an open-access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>)  
DOI: <http://dx.doi.org/10.31838/jcr.07.08.59>

### INTRODUCTION

The hospital is a health care institution providing the patients with care and treatment by specialized doctors and staff [1, 2]. It is set up to deal with different kinds of injuries and diseases. There are many kinds of hospitals according to three classifications [3]. First, according to the level of care, hospitals are classified as primary care centers, secondary care centers and territory care centers. Second, according to the regions, hospitals are classified as teaching hospital, rural hospital, central hospital and field hospital. Third, according to hospital's types, hospitals are classified as general hospital, specialized care center, ambulatory care center, women and children hospital (maternity hospital) and psychiatric hospital. Maternity and infants hospital takes care of pregnant women and new-born infants. It provides help for women and facilities for childbirth [4]. This hospital is also concerned about the psychological feelings of women and their families [5, 6]. It prepares the newly parents to deal with this wonderful stage in life.

The proposed life hospital will provide the following departments. They are maternity department, infants department and family enhancement department. These departments will allow conserving the children and protecting their health. In addition, they will affect the general health of women during various stages of life. Finally, several programs that are offered in the hospital will strengthen the bonds between family members and help to raise the awareness of various problems.

### CASE STUDIES

There are three similar kinds of case studies were considered as the guiding for project's program, site selection and zoning relationships, also the sustainability, context, interior and exterior design. The chosen case studies are carefully design to fulfil the project requirement.

- Maternity and Pediatrics hospital, Madrid, Spain
- Neker Enfants Malades Hospital, France
- Rey Juan Carlos Hospital, Madrid, Spain

### Maternity and Pediatrics hospital, Madrid

Maternity and Pediatrics hospital located in Madrid is designed by architect Jose Rafael Moneo and Jose (Figure 1). The main concept was to design a comfortable environment for the mothers and their babies. The design of the maternity ward was inspired from the domestic style. It emphasizes on providing privacy for the patients. Maternity and infants wards are designed to ensure closeness between mothers and their babies. In addition, the inpatient rooms are located deep in the plan to avoid the street noise and congestion sound [7, 8]. The architect created a more comfortable environment by allowing natural light to penetrate to different spaces and corridors. The natural light is coming through courtyards and atriums by using the transparency glass and openings. Patients are more connected with the exterior natural environment and this adds positive feelings and thoughts. The interior design is based on the off-white and beige colours. These colours spread calmness and smoothness across the hospital's environment [7].

### Neker Enfants Malades Hospital, France

Neker Enfants Malades Hospital located in France is designed by Philippe Gazeau (Figure 2). The architect created an external skin to cover the façade. It is a transparent volumetric skin. This skin will give purity sense and it will allow the natural light to penetrate to the interior. In addition, the hospital's environment is opened and connected with the exterior environment [9]. The hospital has 404 beds including 120 for intensive care and intermediate care in all paediatrics disciplines. The landscape of the hospital is striking through its diversity: of scales, colours and materials of the buildings, placed side by side with no attempt to create unity or integrate in the existing urban environment. The different types of relations with neighbouring constructions and plots are ignored [9].

### Rey Juan Carlos Hospital, Spain

Rey Juan Carlos Hospital located in Madrid, Spain designed by Rafael De La-Hoz (Figure 3). This new hospital model is using three basic elements: efficiency, light and silence. Conceptually, the new hospital is organized in a way that gives structure to the health care units, outpatient diagnosis and treatment. The hospital's main concerns are flexibility, expansion, functional

clarity and horizontal circulations [10]. The overall concept is based on the connection between hospital and nature. It provides adaptation to the requirements of the program needs, and expected financial requirements. The hospital responds to the complex functional program with contemporary and attractive architecture. It is designed based on the human scale and solar protection [10].



Figure 1. Maternity and Pediatrics hospital, Spain [8]



Figure 2. NekerEnfantsMalades Hospital, France [9]



Figure 3. Rey Juan Carlos Hospital, Madrid, Spain [10]

### SPACE PROGRAM

An architect should formulate a detailed functional and space programs for the proposed hospital project. Consideration of the patient, visitor, support staff, volunteers and suppliers is very important. A sufficient hospital design integrates functional requirements with the human needs. The design depends on complex functional requirements. The form and layout of hospital have to meet some criteria such as segregation of workflow, un-obstruction of emergency routes, nurse observation of the patients, patient and staff safety and other individuals and patients' privacy. The activities and flow from outside to inside the hospital can be divided to different departments such as out patients' department, administration, diagnostic services, therapeutic services, internal medical treatment, inpatient department and services.

The GFA of the proposed project is 23000 m<sup>2</sup>, where maternity hospital takes 18000 m<sup>2</sup>, enhancement center takes 4000 m<sup>2</sup> and the infants center takes 1000 m<sup>2</sup>. Table 1 tabulates the space program of maternity hospital. This hospital will have 150 beds to serve the patients. The GFA for the hospital is about 18000 m<sup>2</sup>, and the building ratio is 18000/150=120.

Table 1. Space Program of Maternity Hospital

Departments	Percentage (%)	GFA (m <sup>2</sup> )	NFA (m <sup>2</sup> )
Inpatients	45	8100	5256
Logistics, admin, amenities	18	3240	2106
Out-patients clinics	7	1260	819
Maternity and nursery	10	1800	1170
Emergency	5	900	585
Operating department	5	900	585
Radiology	4	720	468
ICU+NICU	4	720	468
Laboratory	2	360	234
<b>Total</b>	<b>100</b>	<b>18000</b>	<b>11691</b>

The inpatient unit provides suitable accommodation for the care and treatment of inpatients. In addition, this unit provides facilities and conditions for the staff's needs and requirements. The hospital is a complex technical system of many actions, material flows and people. The logistics are storage, laundry, kitchen, administration, laboratory, sterilization, cleaning, disposal and more. The out-patients clinics provides diagnosis and care for patients that do not need to stay overnight in the hospital. The obstetric clinics take care of the pregnant women during and after pregnancy. The main components of the outpatient department are consultation room, treatment room, examination room, waiting area and staff station. Maternity or Obstetrics is the department that cares and provides services for the management of pregnancy, birth and the postnatal period, and care of the new-born. It includes the total needs of the pregnant woman and her family, including the physical, educational and psycho-social requirements. The emergency department of a hospital is responsible of medical and surgical care to patients arriving at the hospital in need of immediate care. Emergency department staff may also respond to some situations within the hospital such cardiac arrests. During the design for patients who may be behaviourally disturbed or cognitively impaired, the safety issue should be considered very well.

The operating department is a physically and environmentally controlled facility comprising of operating rooms. In addition, it has rooms to provide anaesthesia. Recovery rooms will also be located in this department. Radiology department (medical imaging), which is a unique unit of the hospital which offers radiological investigations, both diagnostic and therapeutic. According to the maternity hospital, this department includes screening (fluoroscopy) –ultrasound, mammography (to support of a breast service, not screening), chest screening, MRI and X-ray. Intensive care unit (ICU) is a designated area of a hospital that is dedicated to the care of patients who are seriously ill. NICU means neonates intensive care units. These units are specialized in the care of premature born infants. Laboratory department is a place where tests and examinations are usually done on clinical specimens in order to get information about the health of a patient. These tests are delivered in order to specify the diagnosis, treatment, and prevention of disease. The main laboratories are chemical lab, bacteriological lab, histology lab and pathology lab.

Table 2 tabulates the space program of the infants center. The center is about 1000 m<sup>2</sup>, which capable for 100 users. The center's capacity (building ratio) is 1000/100= 10 m<sup>2</sup> /user. The circulation is assumed to be 20 % of each zone.

**Table 2.** Space program of Infants Center

Zones	Percentage (%)	GFA (m <sup>2</sup> )	NFA (m <sup>2</sup> )
Clinic (for babies)	40	400	320
Photo-shoot studios	25	250	200
Shops	10	100	80
Staff	15	150	120
Hand/ Foot casting	10	100	80
<b>Total</b>	<b>100</b>	<b>1000</b>	<b>800</b>

The outpatient clinics which for babies has a wide service coverage such as cardiology clinics, ENT ear/nose/throat clinics, GIT Gastroenterology clinics, CNS central nervous system clinics, endocrinology, and general and development clinic. The photo-shoot studios allow parents and their babies to record the wonderful moments. These specialized studios are placed for taking photos for the families. The shops display many goods and stuff that are linked with the needs of baby. It will have cribs clothes, toys, bottles and more. These shops will make an easy life for parents. Doctors will ensure that all goods are beneficial and no harm for baby. The hand and foot casting service for babies, children and adults will produce beautiful bespoke framed presentations, standalone statues and solid silver jewellery. Every print will be unique and parents can select from a vast array of presentation styles and finishes to compliment interiors.

Table 3 tabulates the space program of the enhancement center with site area of 4000m<sup>2</sup>, which is capable for 250 users. The center's capacity (building ratio) is  $4000/250 = 16\text{m}^2/\text{user}$ . Also, the circulation is assumed to be 20 % of each zone.

**Table 3.** Space program of Family Enhancement Center

Zones	Percentage (%)	GFA (m <sup>2</sup> )	NFA (m <sup>2</sup> )
Teaching classes	25	1000	800
Consultation room	15	600	480
Women fitness center	15	600	480
Recreational therapeutic facility	10	400	320
Women spa center	15	600	480
Loungers cafes	10	400	320
Administration	10	400	320
<b>Total</b>	<b>100</b>	<b>4000</b>	<b>3200</b>

The classes aim to spread awareness among newly parents. Motherhood and fatherhood are a hard stage in life. Parents will need support from other specialists or individuals who have experienced this journey. Lectures will be given to help parents in dealing with their babies. Parents will feel more convenient and calm after these lectures. In addition, this will develop strong relationships among the family members. The clinics are specialized in the psychological issues in life. Parents can speak freely about their problems and conflicts. The specialist will provide advises and tips to solve the situations. This step is very important in sustain families life and ensure a comfortable life for children. The women fitness centers take cares of the health of a woman during her pregnancy and after pregnancy. They aim to make the women more health and proud of their body shape. They are also concerned with the psychological part of women. Yoga classes will ensure a relaxation environment for women. Administration department will manage registrations, appointments and meeting. Staff should ensure the best quality for visitors by providing sufficient services and facilities. Any problems or concern will be solved by this department.

#### SITE SELECTION AND ANALYSIS

There are three site location were proposed for the project development. Figure 4 shows site 1 with site area of 40000 m<sup>2</sup>. This site is located near Al Mohammediah district. It is surrounded by four streets to serve the hospital. It can be

accessed from the prince sultan road or from King Abdulaziz road. It is surrounded by different functions such as shopping mall, residential compound, car showroom and an international school.

Figure 5 shows site 2 with site area of 40000 m<sup>2</sup>. This site is located in Obhur al Janobia near al- Jamal roundabout. It can be accessed from the king Abdul-Aziz main road. It has a very nice view towards the beach. It is surrounded by 4streets to serve the entrances and exits of the project. This site is serving the Obhur area because there is a lack in the medical services there. People are nowadays moving towards Obhur for living purposes, so they really need good medical services to serve the public.

Figure 6 shows site 3 with site area of 42000 m<sup>2</sup>. This site is located near al corniche of Jeddah. It can be accessed from the king Abdul-Aziz main road through Prince Faisal bin Fahd secondary road. In addition, this site can be accessed from the corniche road. The site has four streets surrounding it. So that will benefit the accessibility of the hospital and its main centers. In addition this site has the advantage of being located near the new developments of al corniche area as well as having a nice sea view. It can be easily accessed by families as it is located near their popular activities and functions. The development of hospital can serve the corniche area which has a lack of medical services.

**Figure 4.** Site 1 [11]**Figure 5.** Site 2 [12]**Figure 6.** Site 3 [13]

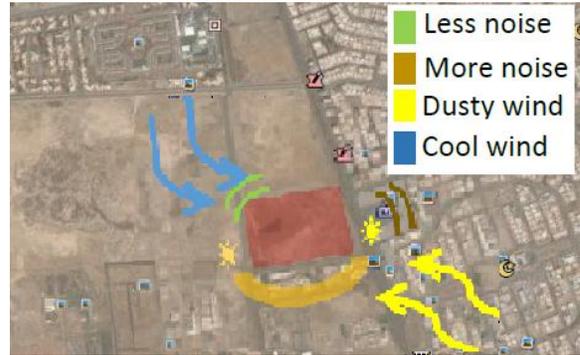
Several site evaluation criteria are considered and the weighting factor is defined for each criterion, where 1 is not very important, 2 is somewhat important and 3 is very important. The first criteria is site capacity, where it consideration of setbacks and vegetative buffers around the perimeter of the site. The land should capable for parking drop-off spaces and future expansions. Second is shape of the site is better to be rectangle or square and appropriate size for the project's area. Third is site accessibility, where it is located near residential districts and easy access to the site should for the families. Fourth is noise level, where the site should have minimum noise from air traffic and high speed vehicular traffic and noisy industrial areas. Fifth is visual quality, where the site should have a good view. For example, locate the site near the sea or green gardens. This is done to give positive feelings to the mothers and fathers. Sixth is future development plan, where the site should have the capacity of horizontal expansion. Seventh is surrounding of the site, where surrounding buildings may be residential districts, shopping malls and restaurants. Eighth is a cultural issue, similar culture background is encouraged in order to reduce misunderstanding between people of different cultural backgrounds. Ninth is a demographic pattern, where it's covered wider age range of population. Next is legislative and the site should be less crime. Last is site context, where the topography of the site must suitable for the project. The site evaluation result is tabulated in Table 4.

**Table 4. Site Evaluation**

Criteria	Weighing factor	Site 1	Site 2	Site 3
Site Capacity	3	15	9	6
Shape/proportional	3	15	9	15
Accessibility	3	15	6	15
Noise levels	2	6	10	2
Image/visual quality	2	6	10	10
Future development plans	1	2	3	5
Surrounding	3	15	9	15
Cultural issues	1	5	3	3
Demographic patterns	1	5	4	4
Legislative	2	6	6	10
Site context	3	15	6	6
<b>Total</b>		<b>105</b>	<b>75</b>	<b>91</b>

Based on the site evaluation result shown in Table 4, the selected site is in Al Mohammediah district with site area of 40000 m<sup>2</sup>. The site area's has a possibility of a future expansion. Jeddah has a tropical arid climate. Figure 7 shows the site climate analysis. The cool wind will come from the North-West side, while the dusty wind will come from the South-Eastern side. Noise sources come mainly from the eastern side, especially from the commercial mall.

This site can be accessed by the prince Sultan main road. In addition, it can be accessed from the king Abdul-Aziz main road through Fatima al Zahraa secondary road. This will make the site very accessible for the public. The site can be accessed through four streets surrounding it. This site is located in al Mohammediah district. This district is famous for residential uses as well as commercial ones. The hospital aims to serve this district as it has a wide range of population that really needs to improve the medical services there. Figure 8 demonstrates the site has different buildings and activities that are surrounding it. This will make the hospital easily accessible for the families. In addition, the hospital aims to increase the value of this district by creating sufficient medical services.



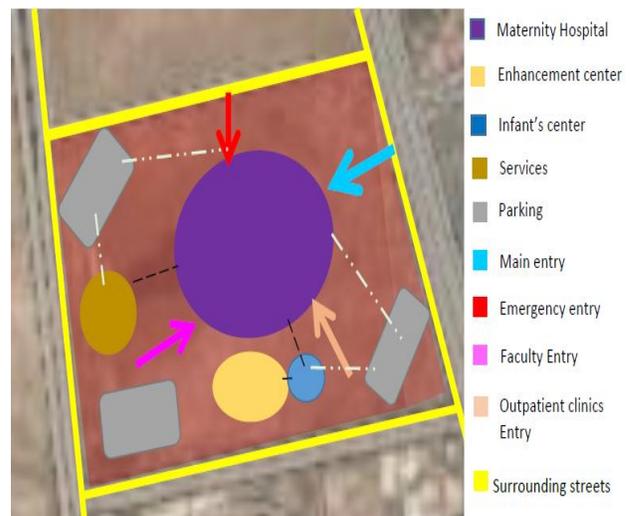
**Figure 7. Site climate analysis**



**Figure 8. Site surrounding (Auto Mall, Al-Basateen Compound, Jarir Mall and Saudi Council for Engineer)**

**ZONING AND PROJECT DESIGN**

Figure 9 and Figure 10 demonstrate the preliminary zoning on site and the site plan of the project respectively. The main concept is to design a comfortable and welcoming medical environment. That is to say a true healing environment filled with nature, light and harmony. This hospital has a central courtyard which acts as peaceful public spaces for patients and visitors. This courtyard creates interactive and pleasant inner views in order to help the patients to interact with the nature and relieve their stress. The structural systems used in this project were two types of structures. The first one is flat slab within 8.4m x 8.4 m Grid span. The second structure is truss structure for the entrance mass.



**Figure 9. Preliminary zoning on site**



Figure 10. Site plan

Regarding the sustainable considerations, the design should consider the natural light as an important element in the interior design of the hospital's spaces. Shading elements can be used including vertical and horizontal shading elements. Green roofs are introduced to minimize the amount of heat absorbed by the building roof. Gray water collection is considered and utilised to watering the plants. Water features is implemented in order to make the air current more humid and fresh. The design should take the advantage of wind flow such as to orient the courtyard towards the North West direction, in order to have air circulation inside the courtyard space. Figure 11 and Figure 12 demonstrate the aerial view and 3D view from the back side of the project respectively.



Figure 11. Aerial view



Figure 12. 3D view from the back side

## CONCLUSION

The proposed project aims to improve health and quality of life for the babies and their mothers by provide safe and quality care for the babies, also make the maternity journey as safe as possible. The suggested space program consists of seven main zones namely teaching classes, consultation room, women fitness center, recreational therapeutic facility, women spa center, loungers cafes and administration. Besides that, the selected site is located near Al Mohammediah district, based on the eleven evaluation criterion which is site capacity, shape/proportional, accessibility, noise levels, image/visual quality, future development plans, surrounding, cultural issues, demographic patterns, legislative and site context. The proposed project expected directing Saudi Arabia to reach the best maternal, neonates and infant's medical care in sustaining generations, through having numerous technological developments.

## REFERENCES

1. Babiker A, El Husseini M, Al Nemri A, Al Frayh A, Al Juryyan N, O Faki M et al. Health care professional development: Working as a team to improve patient care [Internet]. PubMed Central (PMC). 2014 [cited 21 June 2019]. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4949805/>
2. Hospital Departments List and Section Definitions [Internet]. Disabled World. 2013 [cited 21 June 2019]. Available from: <https://www.disabled-world.com/definitions/hospital-departments.php>
3. Torrey T. Understanding the Different Levels of Medical Care [Internet]. Verywell Health. 2019 [cited 21 June 2019]. Available from: <https://www.verywellhealth.com/primary-secondary-tertiary-and-quaternary-care-2615354>
4. Ben-Joseph E. Birthing Centers and Hospital Maternity Services (for Parents) - KidsHealth [Internet]. Kidshealth.org. 2018 [cited 21 June 2019]. Available from: <https://kidshealth.org/en/parents/birth-centers-hospitals.html>
5. Olza I, Leahy-Warren P, Benyamini Y, Kazmierczak M, Karlsdottir S, Spyridou A et al. Women's psychological experiences of physiological childbirth: a meta-synthesis. *BMJ Open*. 2018;8(10):e020347.
6. O. Fahey J, Shenassa E. Understanding and Meeting the Needs of Women in the Postpartum Period: The Perinatal Maternal Health Promotion Model [Internet]. Onlinelibrary.wiley.com. 2013 [cited 21 June 2019]. Available from: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/jmwh.12139>
7. Testado J. Rafael Moneo wins 2017 Praemium Imperiale Award [Internet]. Bustler. 2017 [cited 21 June 2019]. Available from: <https://bustler.net/news/5940/rafael-moneo-wins-2017-praemium-imperiale-award>
8. File:Maternidad de O'Donnell (Madrid) 07.jpg - Wikimedia Commons [Internet]. Commons.wikimedia.org. [cited 21 June 2019]. Available from: [https://commons.wikimedia.org/wiki/File:Maternidad\\_de\\_0%27Donnell\\_\(Madrid\)\\_07.jpg](https://commons.wikimedia.org/wiki/File:Maternidad_de_0%27Donnell_(Madrid)_07.jpg)
9. Neker Enfants Malades Hospital / Philippe Gazeau [Internet]. ArchDaily. 2015 [cited 21 June 2019]. Available from: <https://www.archdaily.com/617321/neker-enfants-malades-hospital-philippe-gazeau>
10. Rey Juan Carlos Hospital / Rafael de La-Hoz [Internet]. ArchDaily. 2012 [cited 21 June 2019]. Available from: <https://www.archdaily.com/238728/rey-juan-carlos-hospital-rafael-de-la-hoz>
11. Google Maps [Internet]. Google Maps. 2019 [cited 18 June 2019]. Available from: <https://www.google.com/maps/place/21%C2%B038'19.7%22N+39%C2%B007'42.3%22E/@21.638806,39.1262203,773m/data=!3m2!1e3!4m1!4m6!3m5!1s0x0:0x0!7e2!8m2!>

- 3d21.6388015!4d39.1284086
12. Google Maps [Internet]. Google Maps. 2019 [cited 18 June 2019]. Available from: <https://www.google.com/maps/place/21%C2%B046'01.6%22N+39%C2%B008'32.0%22E/@21.767112,39.1400323,772m/data=!3m2!1e3!4b1!4m6!3m5!1s0x0:0x0!7e2!8m2!3d21.7671073!4d39.1422212>
  13. Google Maps [Internet]. Google Maps. 2019 [cited 18 June 2019]. Available from: <https://www.google.com/maps/place/21%C2%B038'56.0%22N+39%C2%B006'18.3%22E/@21.6488829,39.1038066,447m/data=!3m2!1e3!4b1!4m6!3m5!1s0x0:0x0!7e2!8m2!3d21.6488797!4d39.1050722>