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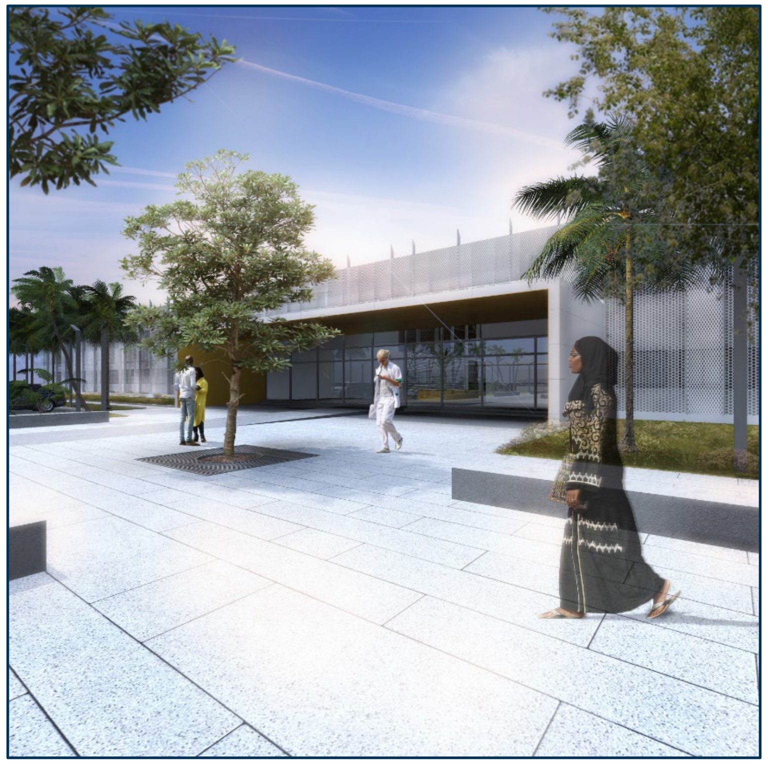
Health Technology Solutions



Modular Hospital with 110 Beds

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DESCRIPTION – MODULAR SYSTEM

Modular systems with varying degrees of mobility are nowadays an increasingly demanding solution for building implementation. Their main advantages include speed of construction, economic economy, ease of use and also their variability and mobility. The construction system of the structure is made up of individual prefabricated modules, which are then placed next to each other on the prepared site. This way of realization of the building its unrivaled speed, mobility, affordability and, last but not least, it also protects the environment.

The solution is simple because the new construction thinking is:

FAST,	therefore cost-effective.
INDUSTRIAL,	therefore price-effective.
FLEXIBLE,	therefore convenient for planning.
REMOVABLE,	therefore environmentally friendly.
SOPHISTICATED,	verifiable in practice and reliable.

The success of building modular systems is the logical consequence of a sophisticated, modern way of construction with many advantages in use.

MODULE
6058 x 3600 x 2453 mm

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What is off-site construction?

Off-site construction involves assembling complete buildings using individual steel-framed modules that are built in the factory under controlled conditions. The modules are fully fitted with all electrics, plumbing, heating and internal finishes before they leave the factory. They are delivered to site by road and craned into position ready for final fitting out.

Modules can be connected side-by-side and end-to-end, as well as in multiple storeys, to create buildings of any size, shape or configuration.

What are the benefits of off-site construction?

Off-site construction creates quality-assured buildings that can be completed quickly and safely to meet tight deadlines. The simple installation process is safe, clean and unobtrusive, causing minimal disruption to the site and minimal environmental impact.

Materials

Modules may be constructed from many different materials including: wood framing, cold-formed steel framing, hot rolled steel, concrete, or a combination of material assemblages. Not all manufacturers will manufacture in many materials; rather manufacturers tend to focus on a particular type of construction to maximize factory efficiencies. The choice of material by stakeholders is usually contingent upon project demands, site forces, and project cost. Further, projects may have a hybrid of material solutions such as traditional site built structure, bathroom modules, or structural modules and a portion of the building that is traditionally site built due to programmatic demands such as large openings, spans or other that are difficult to pre-assemble in the factory.

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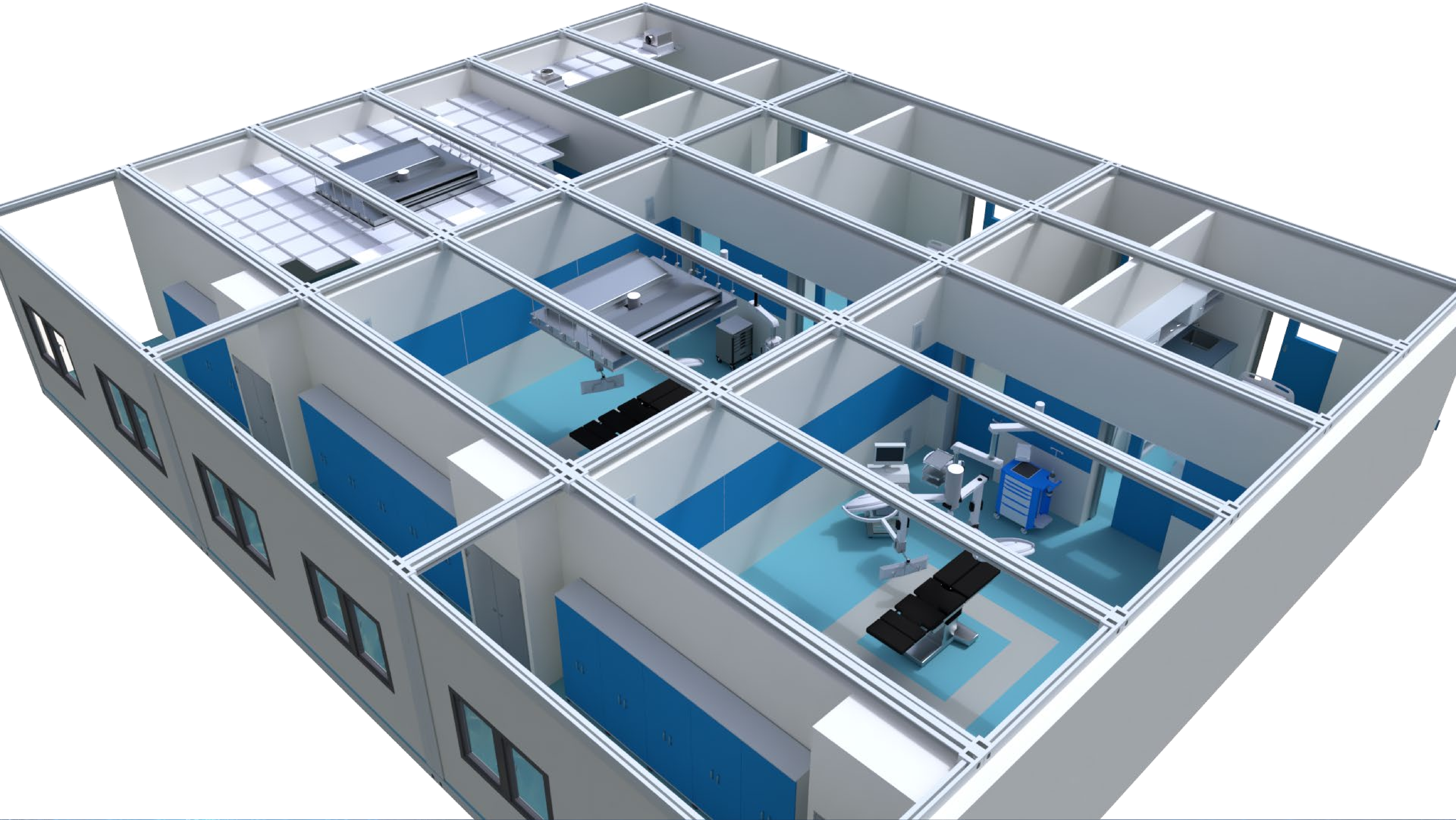


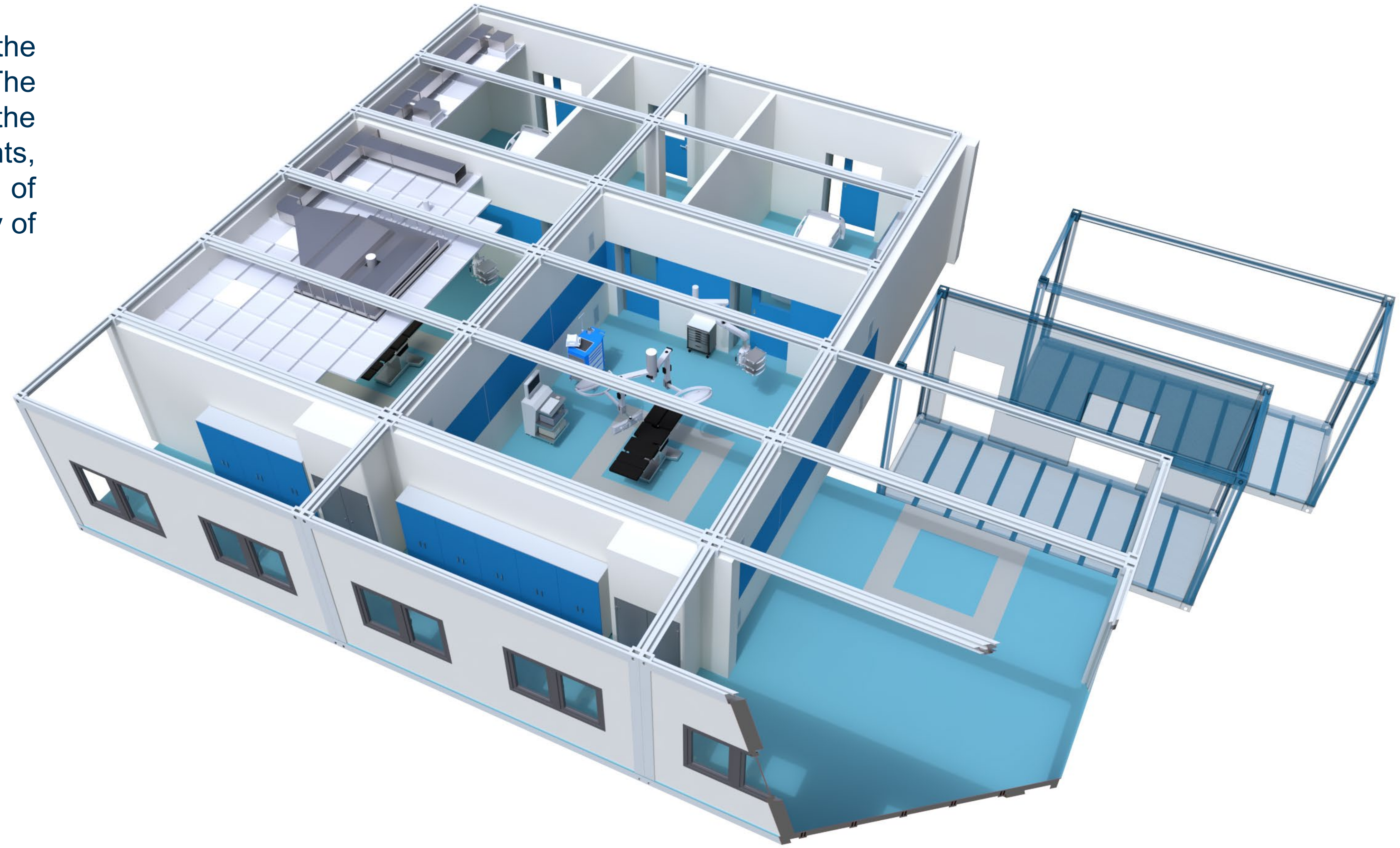
DESCRIPTION

1. Objective of the Conceptual project

The purpose of this study is to present a hospital with about 100 beds, the distribution of various operations and a rough proposal of layout solution, while respecting contemporary surface standards and required operational links.

2. Purpose

The study of the General Hospital solves the completeconstruction of a new hospital. The hospital is divided into three basic parts - the central building itself with medical departments, technical background ensuring the operation of the hospital and gatehouse ensuring the safety of the premises.



3. Suggested capacities

Built-up area

Central object - monoblock

Building A – Hall and Main comunication
Built-up area ....841m^2
Number of floors 2

Building B1 – Pharmacy, Radiodiagnostic, Orthopedics and Rehabilitation
Built-up area ....652m^2
Number of floors 2

Building B2 – Ambulatory, Urology and Gynecology department
Built-up area ....664m^2
Number of floors 2

Building C1 – Emergency, Endoskopy and Dental
Built-up area ....531m^2
Number of floors 2

Building C2 – Kitchen, Bistro, Shop, Office of hospital
Built-up area ....496m^2
Number of floors 2

Building D1 – Dialysis and Internal department
Built-up area ....496m^2
Number of floors 2

Building D2 – Laboratory and Infection department
Built-up area ....531m^2
Number of floors 2

Building E1 – Pathology, Utility, Laundry and Surgical department
Built-up area ....475m^2
Number of floors 2

Building E2 – Delivery, Neonatology ICU, Children department
Built-up area ....524m^2
Number of floors 2

Building F1 – Intensive care unit and Personal changing room
Built-up area ....880m^2
Number of floors 1

Building F2 – Operathing theaters and CSU
Built-up area ....1001m^2
Number of floors 1

Building H – Pray room
Built-up area ....117m^2
Number of floors 1

3. Suggested capacities

Built-up area

Technical buildings

Building J1 – Energo block
Built-up area ....181m^2
Number of floors 1

Building J2 – Energo block
Built-up area ....181m^2
Number of floors 1

Building J3 – Energo block
Built-up area ....181m^2
Number of floors 1

Building K – waste water treatment
Built-up area ....71m^2
Number of floors 1

Building L – water treatment with reservoir
Built-up area ....71m^2
Number of floors 1

3. Suggested capacities

Capacities of medical departments

Inpatient deparment – standard

Orthopedics inpatient department – (Building B1 - 2nd Floor)	8 beds
Urology inpatient department – (Building B2 - 2nd Floor)	9 beds
Internal inpatient department – (Building D1 - 2nd Floor)	15 beds
Infection inpatient department – (Building D2 -2nd Floor)	10 beds
Internal inpatient department – (Building D1 - 2nd Floor)	15 beds
Surgery inpatient department – (Building E1 -2nd Floor)	12 beds
Children inpatient department – (Building E1 -2nd Floor)	12 beds
Summary	**81 beds**

Inpatient deparment – ICU

Intensive care unit department – (Building F1 – 1st Floor)	10 beds

Obstretrics and neonatology

Delivery room – (Building E1 – 1st Floor)	2 beds
Room for mothers – (Building E1 – 1st Floor)	6 beds
Intensive care - neonatology – (Building F1 – 1st Floor)	4 beds
Cesarien operathing theater – (Building F2 – 1st Floor)	1 pc

Other medical facilities

Operating theaters department – (Building F2 – 1st Floor)	3 operating rooms, sterilization
Dental department – (Building F2 – 1st Floor)	2 dental chairs
Endoscopy deprtment – (Building C1 – 2nd Floor)	2 exam rooms, recovery 3beds
Hemodialysis – (Building D1 – 1st Floor)	6 chairs, 2beds
Emergency – (Building C1 – 1st Floor)	observation 3 beds, emergency OT, 4 exam rooms
Ambulatory – (Building B2 – 1st Floor)	16 exam rooms
Radiodiagnostic – (Building B1 – 1st Floor)	CT 64slice, RTG general, 2xSONO
Laboratory – (Building D2 – 1st Floor)	central blood collection, biochemical, haematological
Pharmacy – (Building B1 – 1st Floor)	store and dispensing drugs
Hospital management – (Building C2 – 2nd Floor)	headquarter, doctors room
Pathology – (Building C2 – 2nd Floor)	cooling boxes, autopsy
Other premises (1st floor and 2nd floor)	dressing rooms, warehouses, receptions

3. Suggested capacities

Capacities of medical departments

Other facilities

Laundry – (Building E1 – 1st Floor) ………………………..……………………….…...……cooling boxes, autopsy

Kitchen – (Building C2 – 1st Floor) …………..…………..……………..…kitchen, dinning room, bistro for visitors

Pray room – (Building H – 1st Floor)

Gatehouse – (Building I – 1st Floor)

Technical facilities

Energo block – (Building J1-J3 – 1st Floor) …………...…transformer, spare source, medical gases, cooling

Water Treatment plant – (Building L – 1st Floor) …………...……………..………...water tank, treatment plant

Waste water treatment plant – (Building K – 1st Floor)

4. Overall solution

Urban solution

The area under consideration is approx. 35.000 m². The hospital area is considered to be connected to the surrounding road network through two entrances and one gateway. The entrance door of the gatehouse is situated on the border of the land. There is a large parking lot and a paved area with water basin before entering the hospital. The dominant of the whole area is the monoblock of the hospital itself. Around the monoblock there is a all-area roundabout, which brings the system into the inland traffic and guarantees tranquility in its central part. On the rear part of the land there are buildings of enero block, wastewater treatment plant and water treatment plant with storage tank. Three entrances are considered in the area. One for pedestrian patients, the second option is to arrive to the hospital by their own vehicle and the third is a service entrance, where the ambulances, logistics, or staff will enter the area.

Land area	35.000 m²
Roads	5.300 m²
Sidewalks	2.800 m²
Buildings	8.300 m²
Green areas	18.600 m²

Architectonic solution

The basic idea of the layout and volume solution of the monoblock is above all the rational and functional layout of the buildings along the main road that follows the main entrance of the main object. Buildings are erected in up to two floors. All the examination and therapeutic components of the hospital are primarily located on the first floor, with a decreasing number of public persons from the main entrance. Respectively, patients, who arrive to the hospital, can move freely mainly in the front of the monoblock. On the second floor there are mainly dormitories/inpatient deparments. The main entrance to the building is highlighted by a large entrance portal, which as such will be the shadow element of the main entrance. The facades are designed with a profiled sheet, and from the front entrance to the hospital will be used with a prefabricated front panel. The color and material solution is considered in a "quiet" design. Windows are designed to allow natural ventilation of individual rooms. The construction height of the floor is approximately 3.3 m with a ceiling height of 2.5 m to 3.0 m depending on the operation, department.

Hospital operational solution

Hospital operation can be characterized as an optimal multiblock system when single spatially compact and operationally disposed disposition subsystems are grouped into groups located in individual buildings optimized to their size so that each object receives an operationally related group of dispositional subsystems with strong mutual operating links.
Internal and external horizontal and vertical communications allow easy and short connections between departments and components that are operationally related to each other, and prevent connections in cases where the connection is not desirable for hygienic or operational reasons. The individual departments creates, as far as possible, an undisturbed units. It is a civic construction with a focus on health care. All modifications will therefore meet the technical requirements ensuring the barrier-free use of buildings. Exceptions will be of an exclusively technical and operational nature, which will be permanently secured against entry of unauthorized persons.

Connection to public technical infrastructure - engineering networks

All utilities necessary for the operation of the planned buildings are expected to be available in the immediate vicinity of the plot and their connection is ensured by the clienton relevant surveys.

Construction solutions and building solutions

The earthworks and foundation of the buildings are delivered by the client. No hydrogeological survey is available at the time of preparation of this part of the project documentation, and therefore the type of foundation will depend on the specific geological conditions of the site based on relevant surveys.

Monoblock (Buildings A-H)

The main building is two-storey, without cellars. Structurally, this is a modular structure that consists of metal modules. In this case, there are mainly considered modules of 6,048 x 2,435 x 3,500 metres. The modular set contains individual, mutually interconnected modules. Their installation is carried out using a crane. Standardized modules are considered, however, atypical modules shall be also used.

Standard height of ceilings:

hospital corridors (patient's and operational): min. ≥ 2,4 m,
ICU: min. ≥ 2,6 m,
operating theatres: 2,6 – 3,0 m,
laboratories: 2,4 – 2,8 m,
Inpatient departments: 2,4 – 2,8 m.

Outside walls will be made with ready-made facades (160 mm thick, with internal facing). Floors with the 500 kg / m2 bearing capacity will be ready-made (100 mm thick with standard floor layer). Reinforcing will be applied to the spots where technology will be fitted. For other spaces (except for the cleanrooms) these modules will be completed with a system of interior partition walls (for example plasterboard with dustless paint), electrical installations (light fittings and sockets, switchboards), with sanitary technology (furnishings and drinking water and Hot Utility Water HUW mains). Windows with plastic frames will be used, exterior doors will be of full layout, made of metal, with insulation; interior doors will be either full or glazed, made of metal and wood. After fitting to the base, the module will be attached to one another and completed (technical outfit and equipment). Upon fitting, the slot between a module and a terrain will be closed by perforated sheets.

Description of the individual module:

Steel frame
welded construction of steel, pre-treatment:grit blasting, circuit bottom console with zinc-coated external side, anticorrosion treatment

Ceiling
vapor barrier: PE - foil th. 0,2 mm, inside coating: plasterboard, th. 13 mm, white

Walls
outside coating: zinc-coated trapezial metal plate th. 0,55 mm, thermal insulation: mineral wool A1 – 120 mm, λ = 0,032, vapor barrier: PE - foil th. 0,2 mm, inside coating: plasterboard, th. 13 mm, white

Floor
bottom covering: zinc-coated steel metal plate th. 0,55 mm, thermal insulation: mineral wool A1 - 100 mm, λ = 0,032, vapor barrier: PE - foil th. 0,2 mm, chipboard E1 - th. 22 mm, floor covering: PVC, th. 1,4 mm, payload of floor: 2,5 kN /m2

Window standard
made of plastic, insulating - glazing, white frame
window 1 210 / 1 200 mm, opening / tilting, u=1,1 Wm2/K, window 1 810 / 1 200 mm, double - casement, opening, external roller blind, made of plastics

Partition walls
The premises with the undefined cleanliness class will be laid out in the form of plasterboard partition walls with washable, sanitary unobjectionable coats. Bearing walls will be provided with plasterboard casing with washable coats.

Soffits
In these premises soffits will be of a waffle type (based on plasterboard) with embedded floodlights of an untight, fluor lamp layout.

Technical buildings

We are considering construction from local materials and according to local customs and standards. However, this can be changed during the ellaboration of the project documentation.

Air-conditioning

It depends on the type of premise and department. It consist of natural ventilation and climatization and the system of HVAC for clean rooms and departments with higher requirements for cleanliness of air (Operating theatres, ICU, CSSD, etc.). The type of the climate adjustment shall be shown in the conceptual project, see further.
To secure air-conditioning in given rooms, for individual sections will be fitted separate HVAC units; they will be completed with automatic control systems and with electric power wirings. The HVAC units are designed for the common indoor temperature and humidity standards. For the operating theatres themselves a large-area operating filtration diffuser was considered (laminar flow fields for OTs). In other rooms at the operating theatres and for the ICUs diffusers with HEPA filters are considered, fitted in the soffits. The air will be exhausted near the floor or above the pollution sources through the soffits. For the air supply are considered ducts made of galvanised steel, with tight layout.

Measurement and control

For the AC unit, source of heating water, and for the chill source, has been designed the autonomous automatic control device, type Siemens, which ensures: the temperature control, the humidity control, the constant air flow, the control and indication of the air overpressure in the cleanrooms, the indication of the filter choking, the anti-freeze protection of water heat-exchangers.

Chill source

For the cooling of air the cooling appliance will be installed.

Heating water source

Included and will be elaborated in the project documentation stage.

Electric installations

Included and will be elaborated in the project documentation stage.

Light current distribution mains

Included and will be elaborated in the project documentation stage.

Equipment of premises and accessories

Included and will be elaborated in the project documentation stage.

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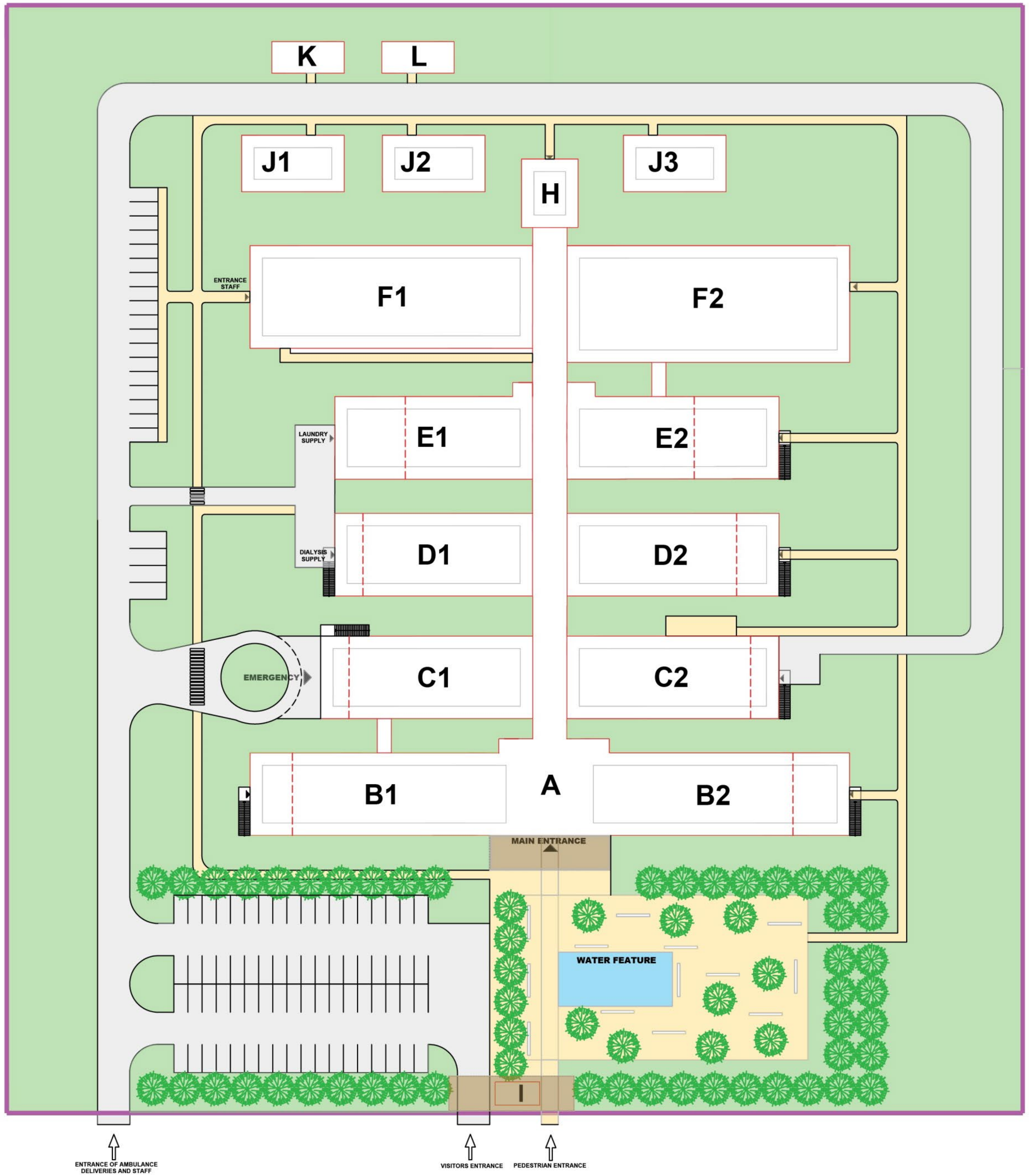
SITUATION

CONCEPTUAL PROJECT
SCALE: 1_750_A3

A	HALL, COMUNICATIONS
B1	PHARMACY, RADIODIAGNOSTIC, ORTHOPEDICS, REHABILITATION
B2	AMBULATORY, UROLOGY AND GYNECOLOGY DEPARTMENT
C1	EMERGENCY, ENDOSCOPY, DENTAL
C2	KITCHEN, BISTRO, SHOP HEADQUATERS, DOCTOR ROOMS
D1	DIALYSIS, INTERNAL DEPARTMENT
D2	LABORATORY, INFECTION DEPARTENT
E1	PATHOLOGY, UTILITY, LAUNDRY
E2	DELIVERY, NEONATOLOGY ICU
F1	INTENSIVE CARE UNIT
F2	OPERATHING THEATERS, CSU
H	PRAY ROOM
I	GATEHOUSE
J1-J3	ENERGOBLOCK DIESEL AGGREGATE, UPS, TRANSFORMER STATION
K	WASTE WATER TREATMENT PLANT
L	WATER TREATMENT PLANT WITH TANK



MAIN DISPOSITION 1ST FLOOR

CONCEPTUAL PROJECT

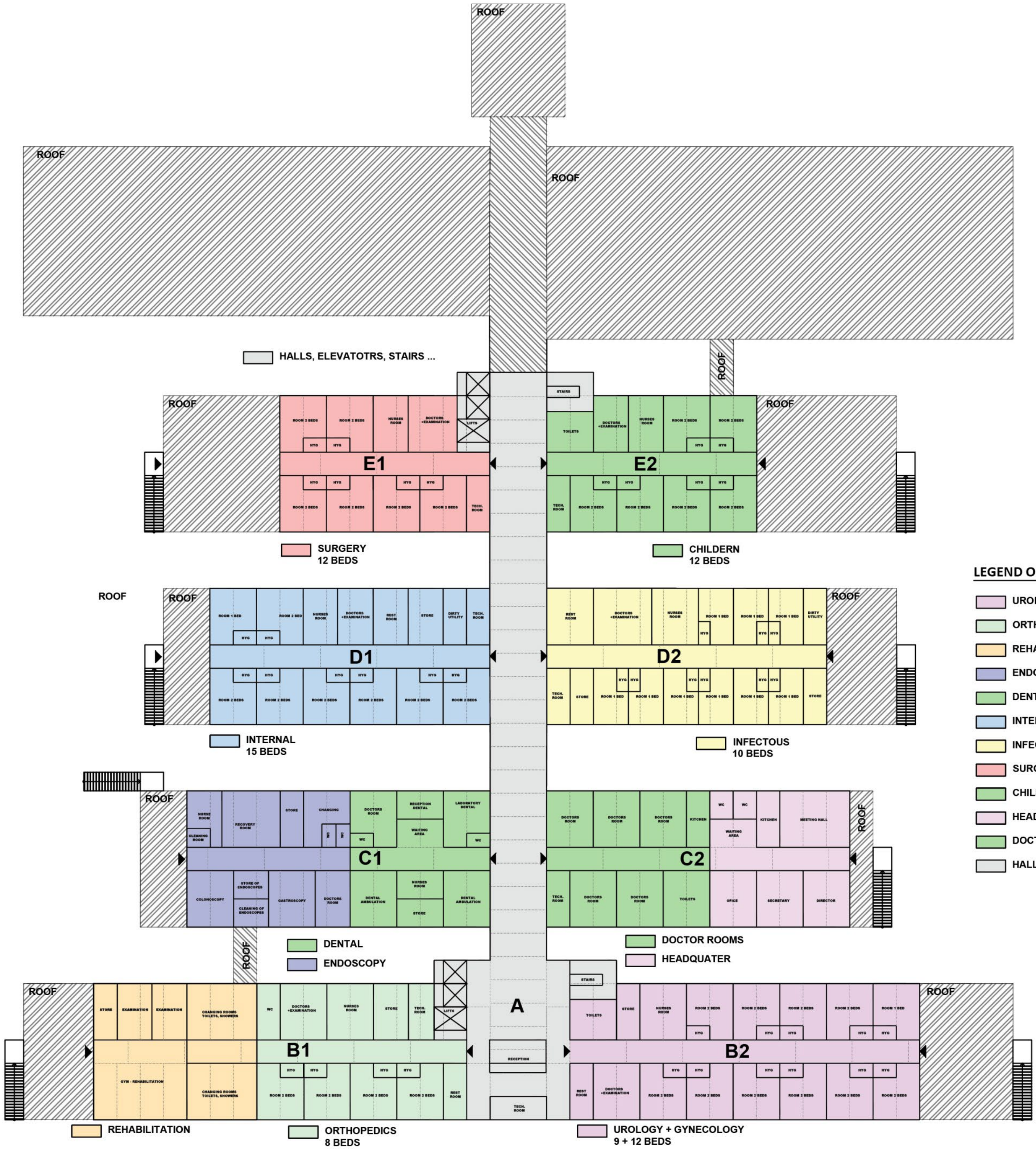
SCALE: 1_500_A3

LEGEND OF DEPARTMENTS

- AMBULATORY (664 m²)
- PHARMACY (132 m²)
- RADIODIAGNOSTIC (520 m²)
- EMERGENCY (531 m²)
- KITCHEN, BISTRO, SHOP (531 m²)
- DIALYSIS (496 m²)
- LABORATORY (531m²)
- DELIVERY (406 m²)
- NEONATOLOGY INTENSIVE CARE UNIT (118 m²)
- OPERATING THEATERS (717 m²)
- INTENSIVE CARE UNIT (660 m²)
- CENTRAL STERILIZATION (284 m²)
- LAUNDRY (177 m²)
- PERSONAL CHANGING ROOMS (220m²)
- PRAY ROOM (117 m²)
- PATHOLOGY (187 m²)
- UTILITY (111 m²)
- HALLS, ELEVATOTRS, STAIRS ... (841 m²)
- ENERGOBLOCK

MAIN DISPOSITION 2ST FLOOR

CONCEPTUAL PROJECT
SCALE: 1_500_A3



LEGEND OF DEPARTMENTS

- UROLOGY + GYNECOLOGY (523 m^2)
- ORTHOPEDICS (298 m^2)
- REHABILITATION (248 m^2)
- ENDOSCOPY (248 m^2)
- DENTAL (213 m^2)
- INTERNAL (425 m^2)
- INFECTOUS (425 m^2)
- SURGERY (319 m^2)
- CHILDERN (319 m^2)
- HEADQUATER (213 m^2)
- DOCTOR ROOMS (248 m^2)
- HALLS, ELEVATOTRS, STAIRS ... (650 m^2)

CONCEPT OF HVAC 1ST FLOOR

CONCEPTUAL PROJECT

SCALE: 1_500_A3

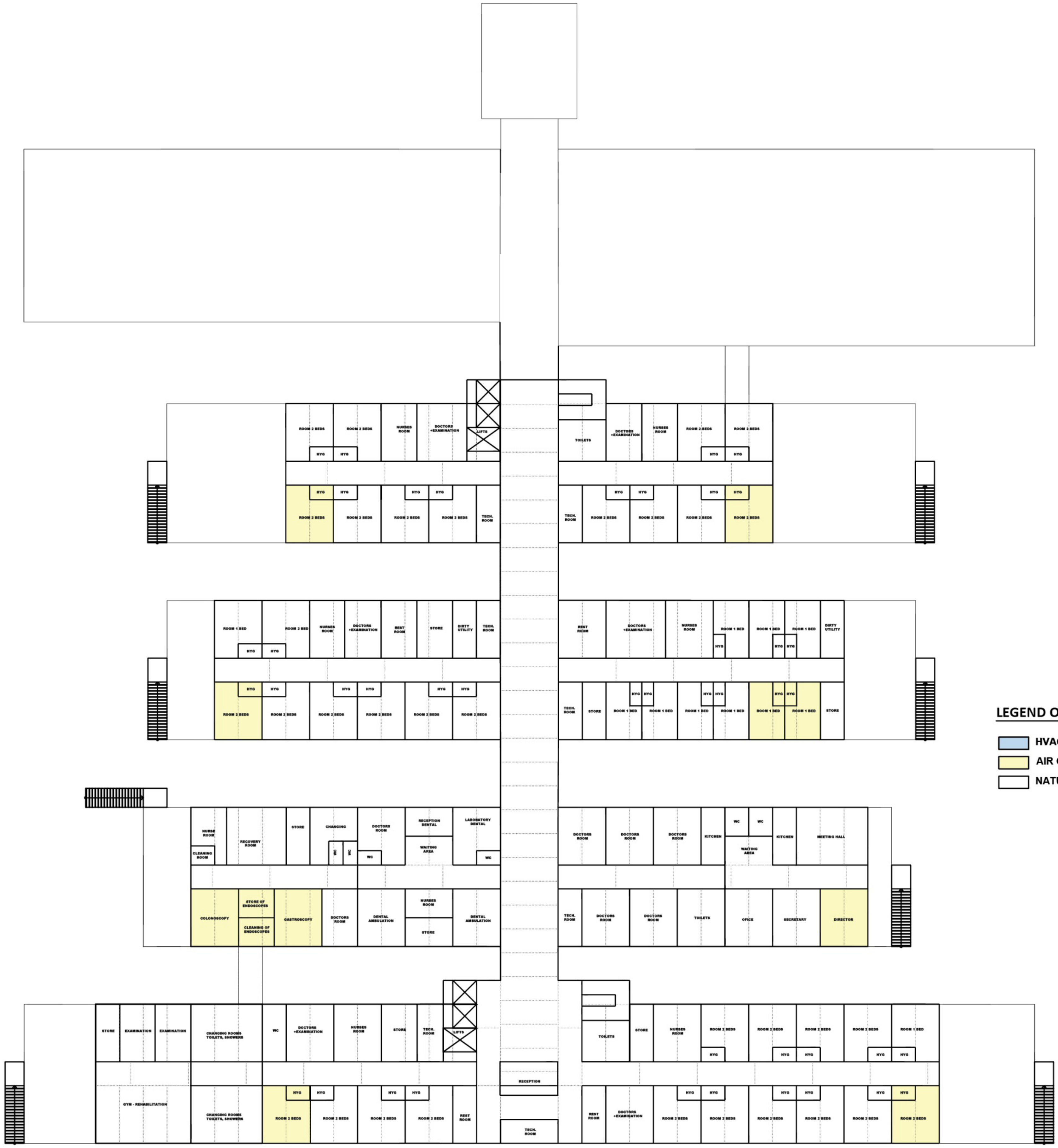
LEGEND OF HVAC

- HVAC
- AIR CONDITIONING
- NATURAL VENTILATION

CONCEPT OF HVAC 2ST FLOOR

CONCEPTUAL PROJECT

SCALE: 1_500_A3



LEGEND OF HVAC

- HVAC
- AIR CONDITIONING
- NATURAL VENTILATION

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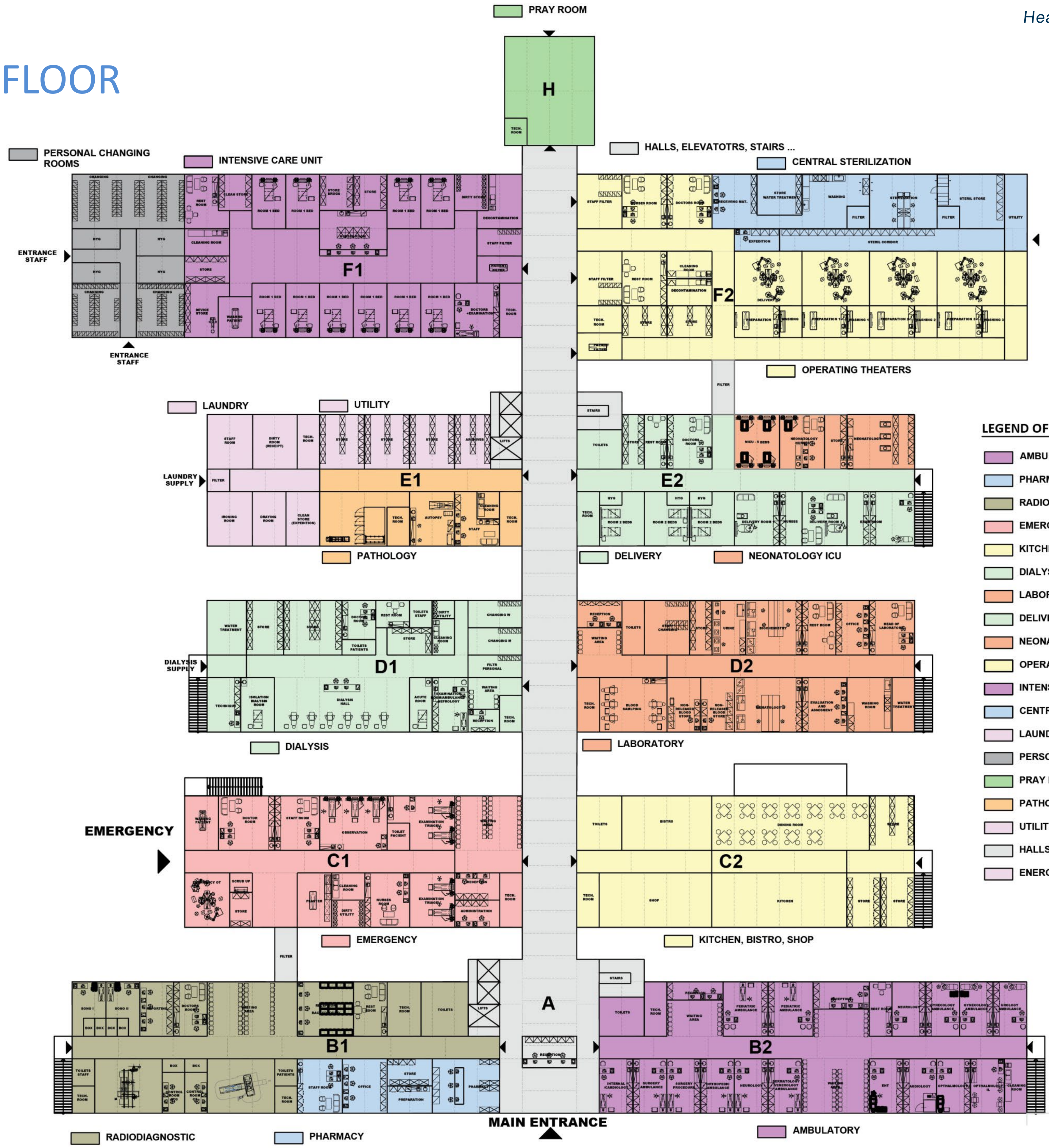
MEDICAL TECHNOLOGY 1ST FLOOR

CONCEPTUAL PROJECT
SCALE: 1_500_A3



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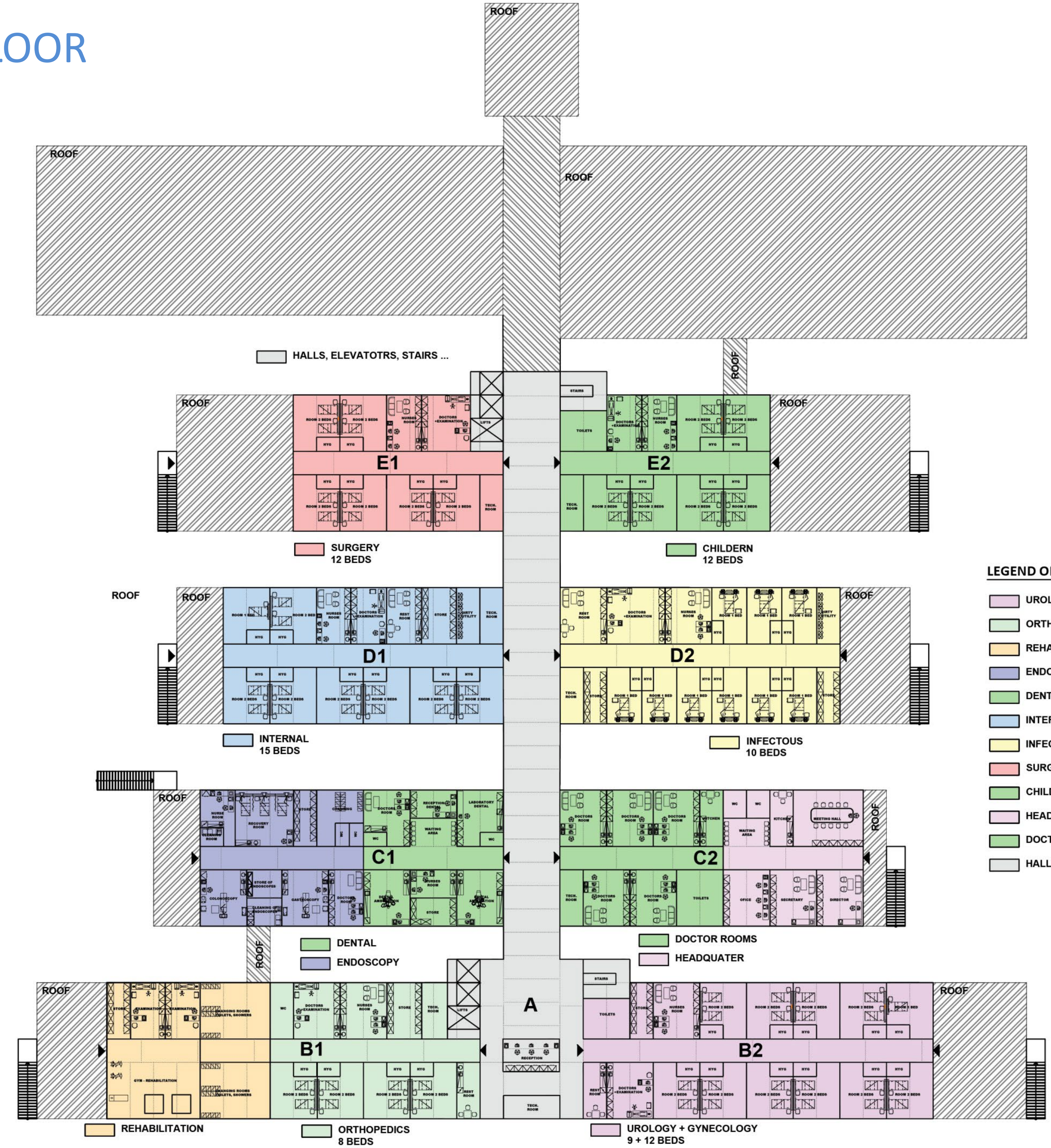
- ENERGOBLOCK

MEDICAL TECHNOLOGY 2ST FLOOR

CONCEPTUAL PROJECT
SCALE: 1_500_A3



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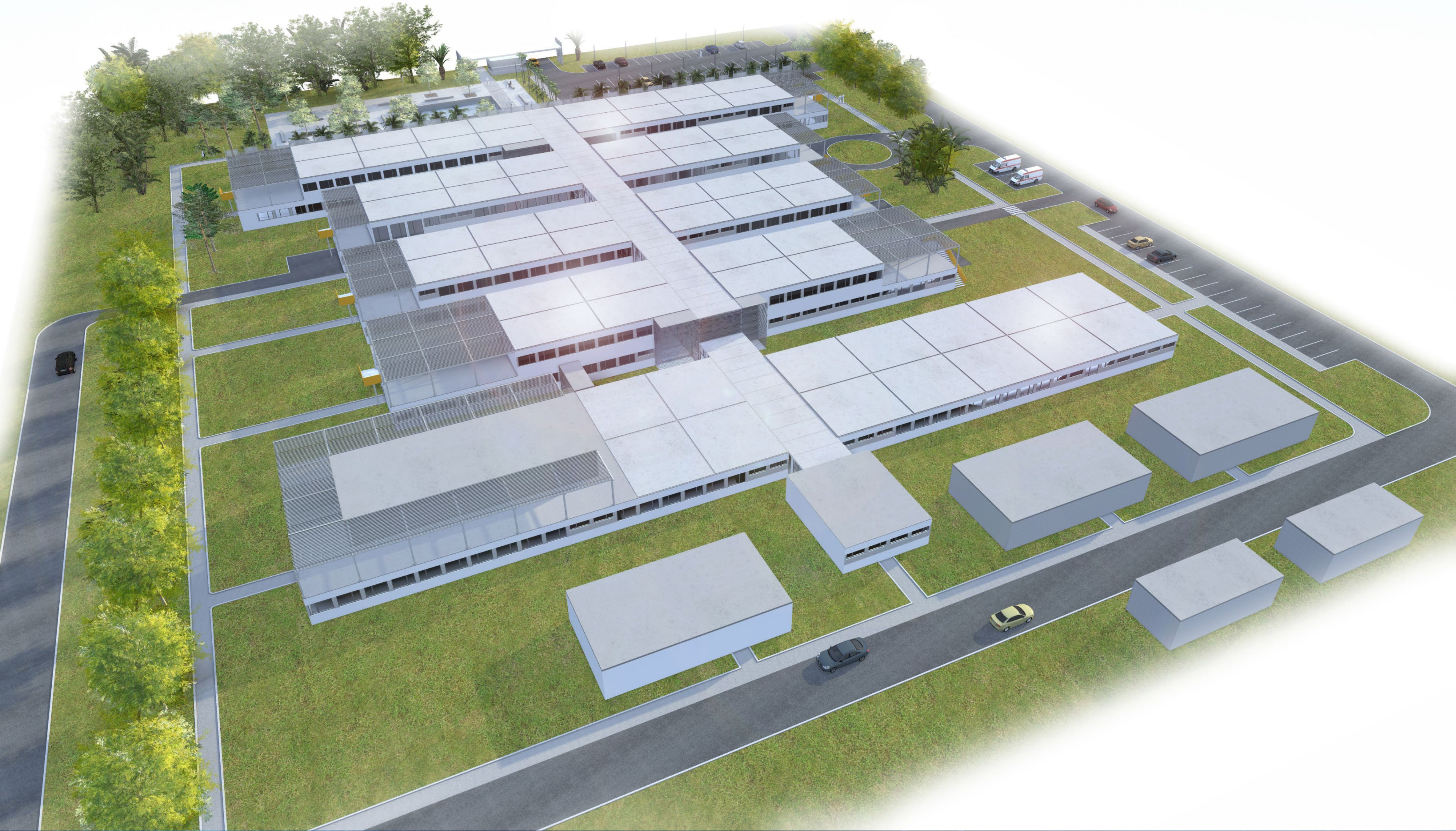
VISUALIZATION

VISUALIZATION



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IMPLEMENTATION PLAN
24 months from contract to finish

Signing contract

Documentation of conceptual project

Project documentation for building construction permit

Processing of building construction permit

START	month 0	month 1	month 3	month 4

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Construction documentation

month 6

month 8

Construction readiness

Realization of the main object – hospital campus

month 10 – 20

month 16 – 20

Realization of medical technology and equipment

Commissioning, regulation, testing, training, as-built documentation

month 20 – 24

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