Modular hospital design – saving time and costs

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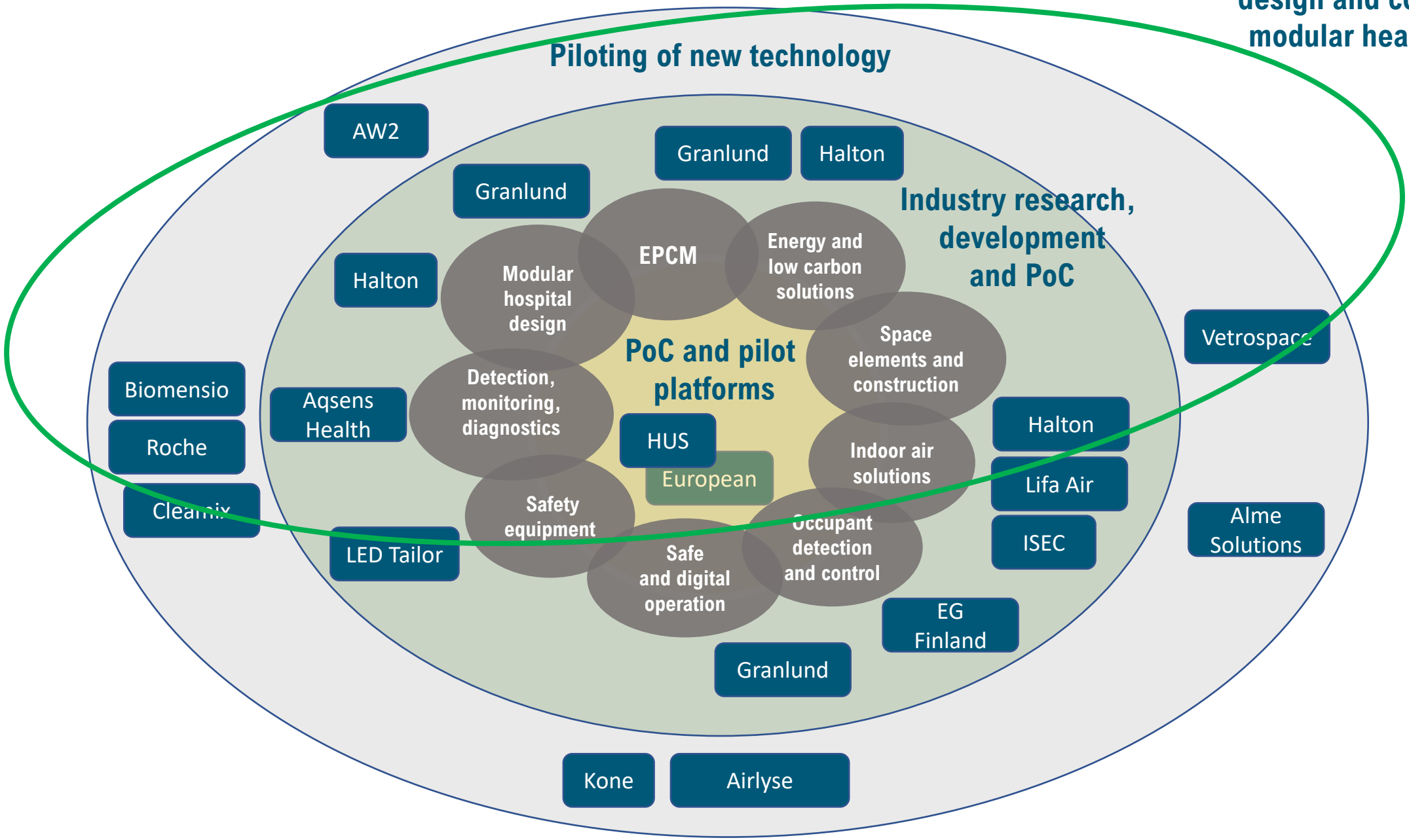
31.10.2024 E3 Final Seminar

Granlund

Use Case 1 – Smart Modular Healthcare

Solutions and concepts for design and construction of modular healthcare units



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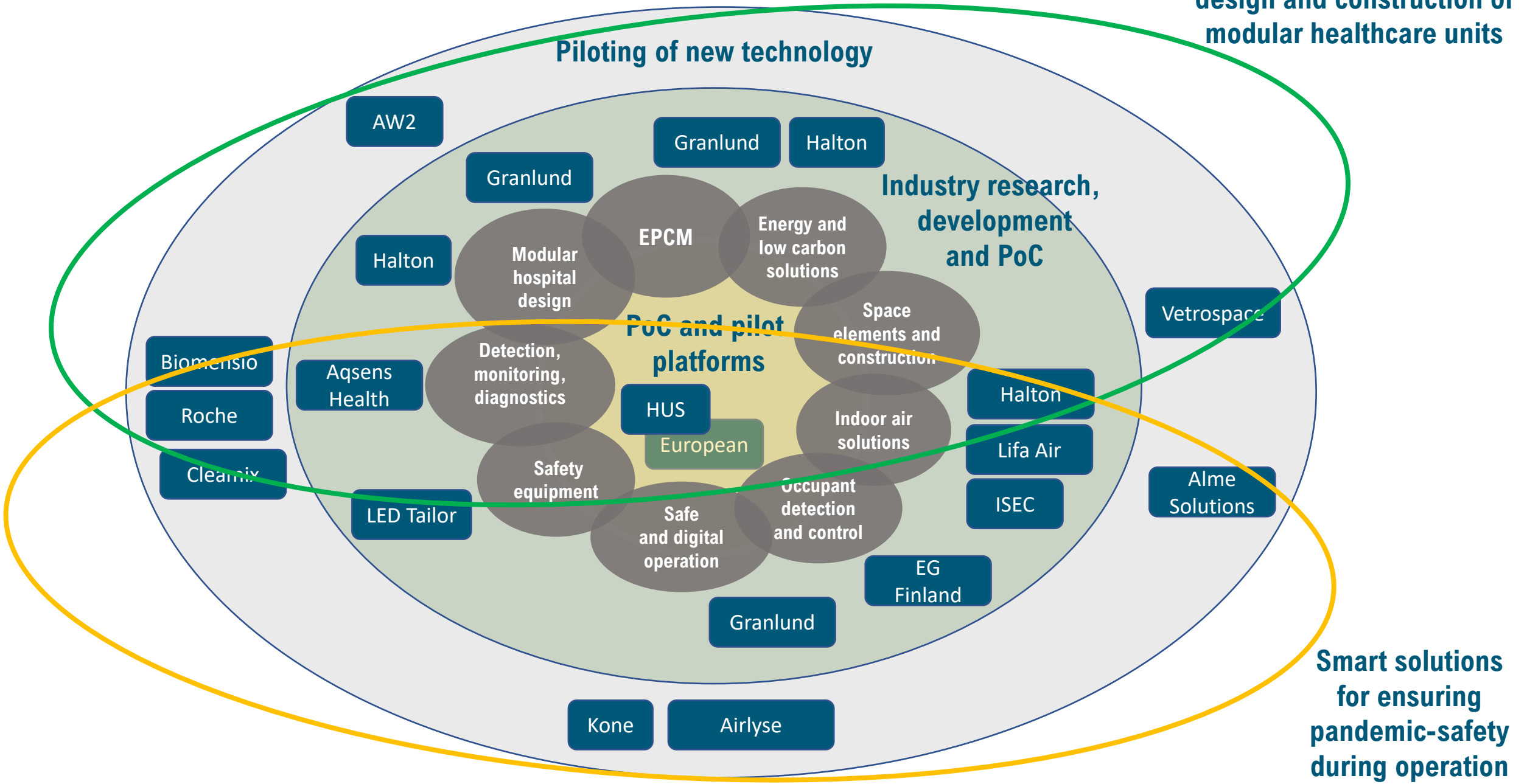


Smart solutions for ensuring pandemic-safety during operation

Modular Hospital Design

Problem

- Big hospital design take about 2 years and construction about 3 years
- Hospitals are usually designed individually
- Standardization is not generally used
- Hospital costs are very high
- The share of technology in the costs of the project is very large
- Technology gets complicated and develops quickly

Target

- Speed up design process
- Exploit standardized modular solutions
- Reach cost benefits faster with the process
- Health promote design solutions
- With modular design solutions is obtained more efficient space use and users steps number decreases
- Simulations and standardisations through more cost-effective solution

Modular hospital design

- Type rooms and their technical and functional descriptions
- Model departments and their technical and functional solutions
- Hospital complex modular solution
- Technical solution principles (ventilation, heating, cooling, water pipes, drainage, hospital gases, building automation, electrical systems, ITC systems, special systems)
- Health and safety support ventilation solutions

Source

Modular hospital ward`s type rooms

Type rooms
01 Modular hospital
01.01 WARD
01.01.01 Patient rooms
01.01.01.01 Patient room 2 p
01.01.01.02 Bathroom
01.01.01.03 Patient isolation 1p 14.6/17.8 m2
01.01.01.04 Sluice 6.7/8.2 m2
01.01.01.05 Bathroom shared
01.01.02 Examination rooms
01.01.02.01 Examination room
01.01.04 Employee rooms
01.01.04.01 Office 1-2 p
01.01.04.02 Open office
01.01.04.03 Silent workspace
01.01.04.04 Nursing station
01.01.04.05 Staff canteen/break room
01.01.04.06 Staff wc
01.01.04.07 Phone/meeting
01.01.04.08 Office/meeting
01.01.04.09 Back office
01.01.05 Supporting rooms
01.01.05.01 Storage linen
01.01.05.02 Janitor
01.01.05.03 Storage equipment
01.01.05.04 Utility dirty
01.01.05.05 Utility clean
01.01.05.06 Medication room
01.01.05.07 Storage nursing accessories
01.01.05.08 Kitchen
01.01.05.09 Dining
01.01.05.10 Waste
01.01.05.11 Accessible wc

Operating theatre

VAATIMUSTILAKORTTI

Type rooms

modelspace

Projektin tunnus	Projektin nimi	Asiakas			
	E3 kehityshanke	AINS Group			
Tunnus	**Nimi**	**Huonenumero**	**kpl**	**Tav. m²**	**Tav. m²**
01.02.01.01	Operating theatre type 1		4	60,00	240,00

GENERAL INFORMATION

Vaatimus	Kommentti
In the operating room, surgical procedures are performed on a patient who has been sedated or anaesthetized. The surgical team typically consists of at least five people. Aseptic and sterility are emphasized in the operation. The staff wears sterile protective clothing and works in such a way that harmful contamination does not occur in the surgical area. The equipment needed for surgery is gathered around the operating table. In terms of operation, it is important that there is enough room to move around the sterile operating tables. In the operating room, it must be safe to use a mobile imaging device (e.g. C-arm) so that the x-ray radiation does not affect people in the adjacent rooms. In addition to good general lighting, separate ceiling-mounted, movable surgical lights are needed above the operating table. It must be possible to connect devices to electrical plugs or hospital gases from above so that the connection points are easily accessible. The staff must have the opportunity to view different image	

DOORS, WINDOWS

Vaatimus	Kommentti
Operating room doors must be touch-free. Side and full opening functions in the door.The width of the free passage of the patient door is 1700 mm. The width of the free access opening of the logistics door is 1100 mm. The doors must not have thresholds. Door frame protection.	

SURFACE MATERIALS

Vaatimus	Kommentti
The surfaces of the operating theater must be easy to keep clean and must be resistant to conventional detergents used in operating theater cleaning.	

AIR CONDITIONING, AIR QUALITY

Vaatimus	Kommentti
The ventilation of the operating theater should support maintaining the sterility of the operation.	

GAS SYSTEMS

Vaatimus	Kommentti
The following hospital gases are always needed in the operating room: oxygen and compressed breathing air. Depending on the needs of the operation, carbon dioxide, nitrous oxide and instrument compressed air may also be needed.The gas points are placed near the operation area, e.g. in the ceilingg supply units. In addition, spare points for both walls on the sides of the operating table. Anesthesia gas extraction points are required in all operating theatres. If necessary, a gas target removal system is planned. Alarm if there is a malfunction in the operation of the hospital gases in the operating room.Possibility to close the entry of hospital gases into operating points of the operating room.	

Vaatimus	Kommentti
Electric plugs for ceiling supply unit and side walls. The part of the electrical supply of the devices in use at the time of surgery must be uninterrupted. Part for backup power. Operating room doors must be touch-free. You must be able to film the operations of the operating theater with a ceiling-mounted camera. Separate sockets are needed for devices used by maintenance. The cealing supply units electrically adjustable in height.wall clock with seconds display.	

LIGHTING

Vaatimus	Kommentti
Efficient general lighting in the operating room. In general light, the possibility to choose different situations (e.g. lighting of scoping surgery).	

TELE- AND SECURITY SYSTEMS

Vaatimus	Kommentti
The operating room must be able to make announcements within the operating unit. Warning lights for corridors when the mobile imaging device is in use. Alarm if there is a malfunction in the operation of the hospital gases in the operating room.	

ICT REQUIREMENTS

Vaatimus	Kommentti
ATK plugs for ceiling supply units and side walls. Wireless data network.	

OTHER SYSTEMS

Vaatimus	Kommentti
Reservation for space reservation screen.	

MEDICAL EQUIPMENTS

Vaatimus	Kommentti
Several different medical devices are used in the operating room. Some of the devices are for maintaining vital functions, e.g. a ventilator. Different types of fixed hospital equipment attached to the ceiling are needed in the operating area. The well-equipped operating room has, for example, the following fixed hospital equipment: two operating lights, 2-4 ceiling supply units and 2-4 monitor arms. In addition, there are wall-mounted monitors on both side walls. warming cabinet for intravenous fluids and medicine refrigator if needed.	

LOOSE FURNITURE

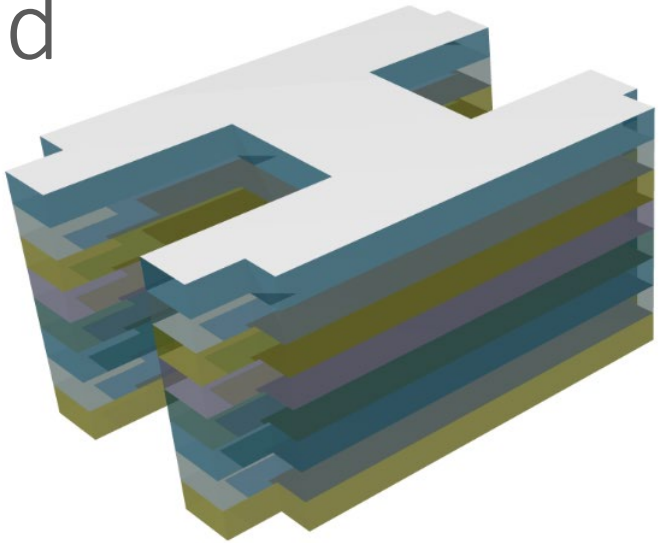
Vaatimus	Kommentti
The operating theater must have space outside the operating area for mobile storage furniture.	

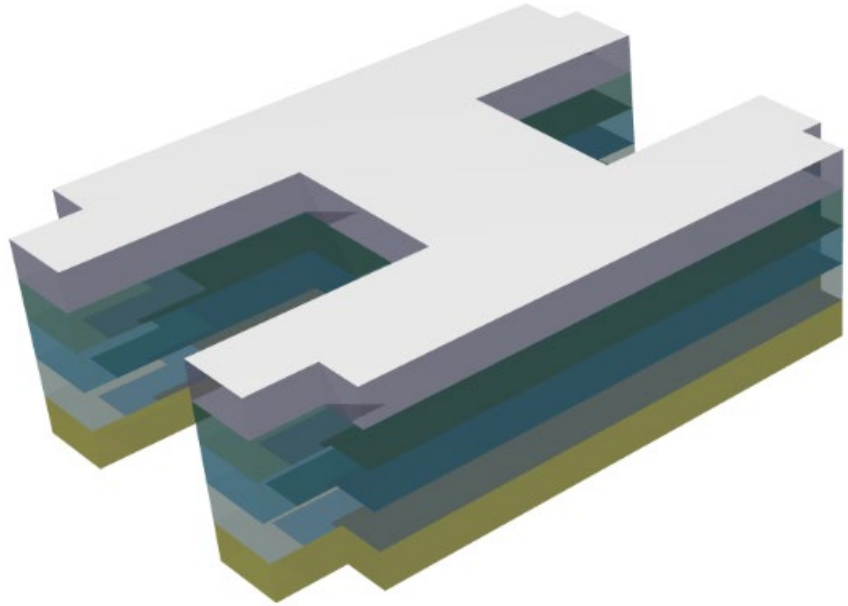
FIXED FURNITURE

Vaatimus	Kommentti
One walk-through cabinet is needed in the operating room, through which the equipment needed in the operating room can be delivered during the operation without entering the operating room. In the cabinet space for roller coaster,	

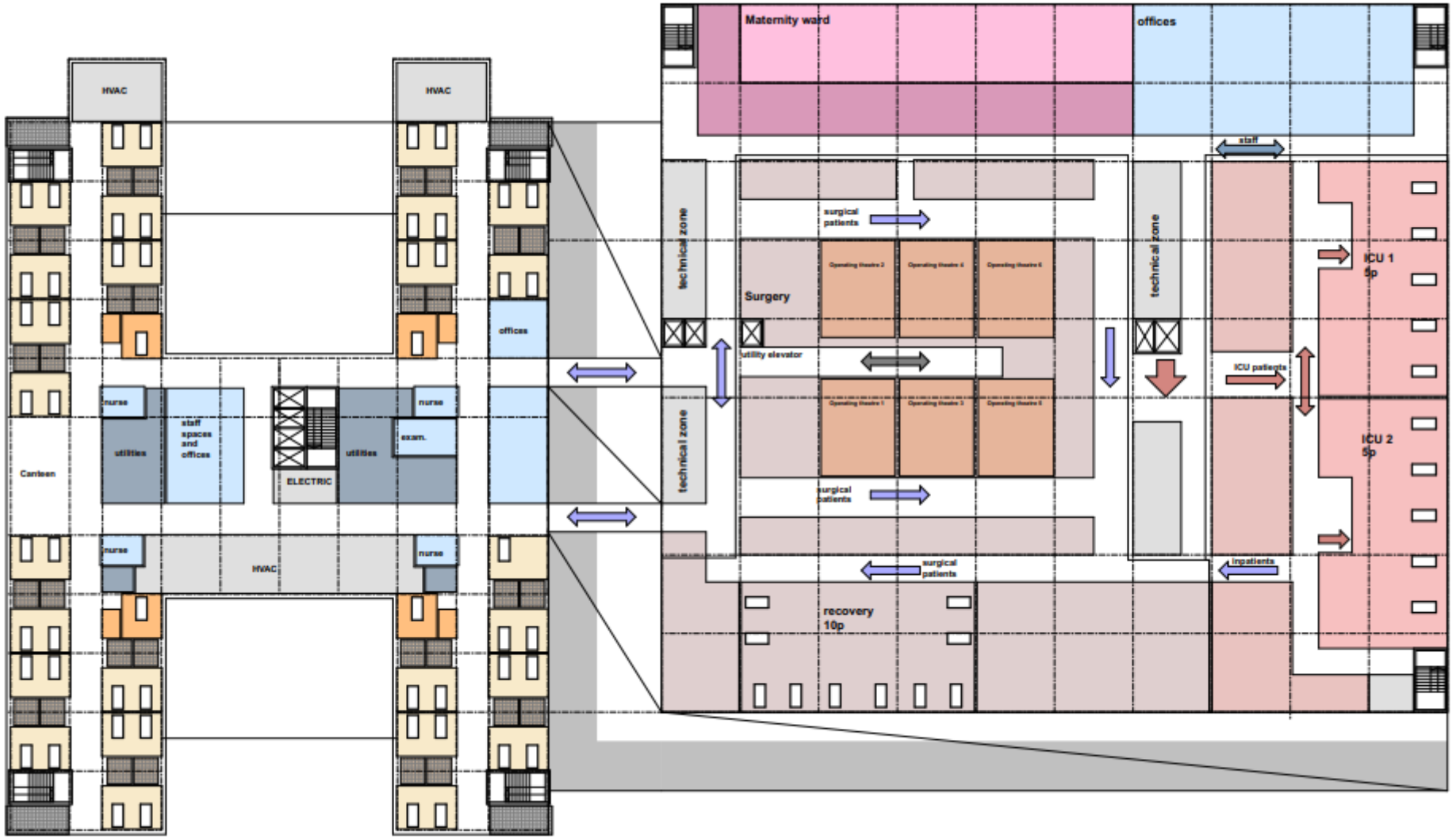
Patient ward

Duplication of the type section as needed



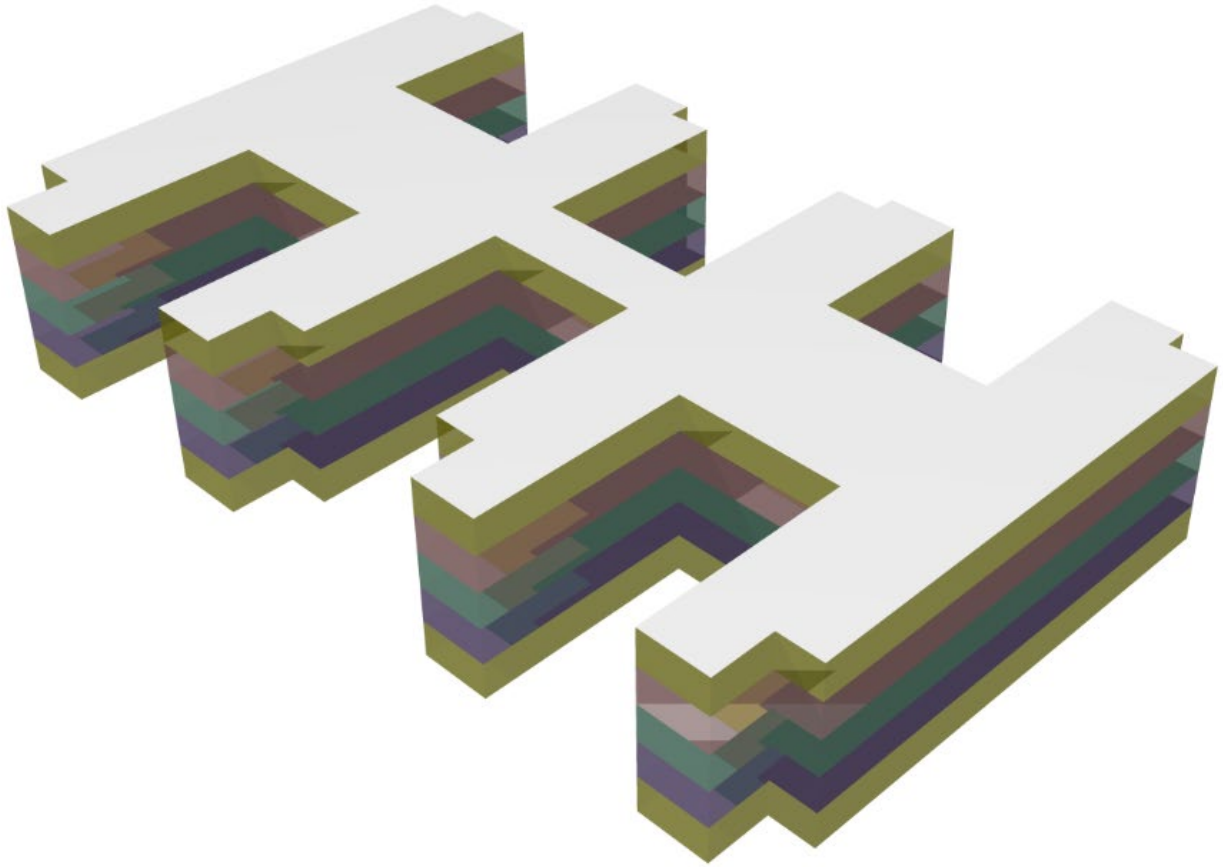


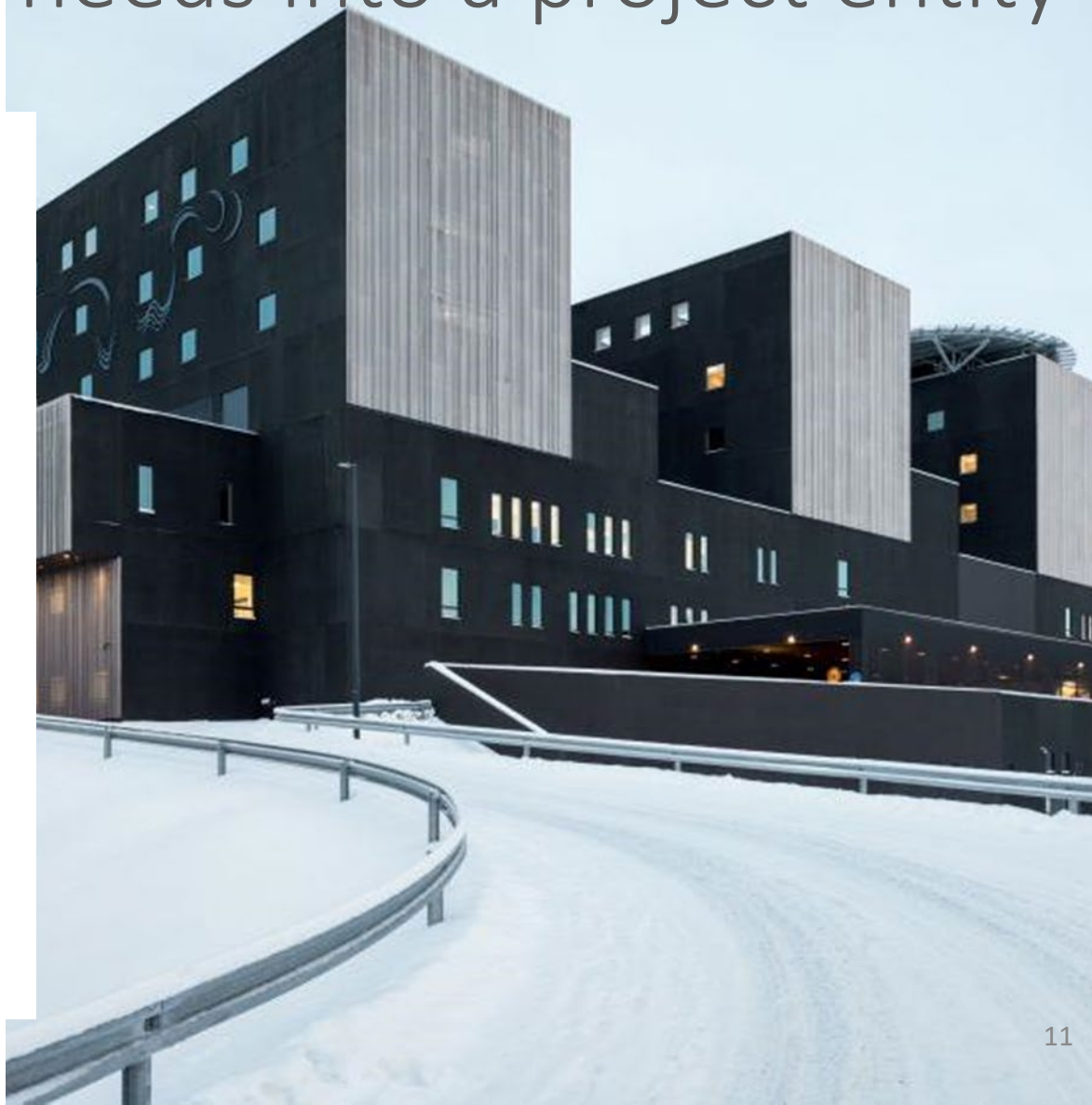
Economic Model 2st floor example



Source

Merging the functional needs into a project entity





Time and Cost savings

Time savings during design and construction

- The idea is that you don't have to plan everything over and over again.
- Latest hospital design information
- Standardization
- Modular design solutions that have been tried and tested

Cost savings in construction and during Lifecycle

- Wide experience from dozens of Hospitals in Nordics , Baltics and other European countries
- Simulated $C0_2$ footprint and handprint
- Health-promoting ventilation solutions bring personnel cost savings
- New evidence-based research data can produce modern, efficient, save and patient-friendly facilities

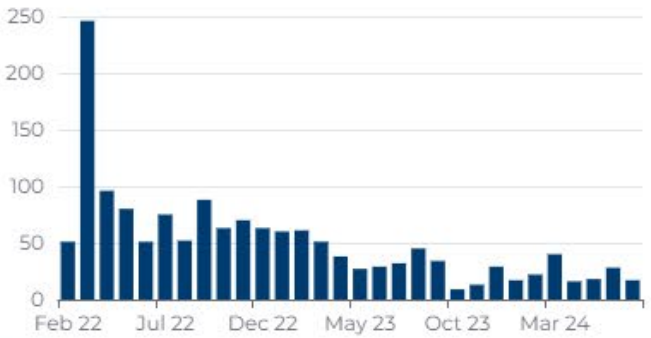
First localization: Modular Hospital Pilot to Ukraine

All Attacks

From: 24/02/2022 To: 31/07/2024

Only attacks with photos

1521 total attacks on health care



773 attacks damaged or destroyed hospitals

234 health workers killed

166 health workers injured

Czechia
Slovakia
Uzhhorod
Lviv
Ivano Frankivsk
Chernivtsi
Khmelnytskyi
Vinnytsia
Ukraine
Chernihiv
Kharkiv
Dnipro
Zaporizhzhia
Mariupol
Mykolaiv
Odesa
Simferopol
Sevastopol
Moldova
Romania
Bulgaria
Black Sea

Single attack
Grouped attacks


Video E3 Modular hospital.mp4