

# Global Disaster Management Team

## MULTISPACE TRAILER HOSPITALS AND NORBASE HOSPITAL IN CONTAINERS AND TENTS



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## MULTISPACE TRAILER HOSPITALS

### MultiSpace hospitals - Background

The Hajj pilgrimage to Mecca in Saudi Arabia takes place once a year, and the number of pilgrims to make this strenuous journey has just past 1,5 million, and is still increasing. Such an enormous crowd reaching for the same destination has caused numerous accidents and many lives have been lost in the past.

For humanitarian reasons and to provide much needed medical help during these pilgrimages, the Ministry of Finance in Saudi Arabia requested, in August 2008, from Normeca AS two mobile hospitals, each consisting of seven MultiSpace expandable trailers, which interconnected make up a complete, fully equipped hospital. The first hospital was delivered complete in Saudi Arabia within three months, while the second hospital was delivered in early April of 2009.

One of the MultiSpace trailers, the main module, forms the center corridor to which all other expandable trailers are interconnected, and which also acts as the main entrance to the hospital as well as the waiting area. See illustration below.

The x-ray/ultrasound MultiSpace trailer is, although insulated per prevailing standards, a stand-alone module by choice.



# Global Disaster Management Team

## MULTISPACE TRAILER HOSPITALS

### The MultiSpace Hospital

The self contained individually specialized MultiSpace semi trailers, (each designed for a special function), can be interconnected to form a fully equipped 500 square meter complete hospital.

A single MultiSpace trailer, the main module, forms the corridor to which all specialized MultiSpace trailers are connected, and also acts as the main entrance and the waiting area for the assembled hospital.

Two MultiSpace trailers, i.e. the patient wards, one devoted to females and one for the males, are each containing a reception area, examination and emergency rooms as well as bedposts and a restroom with shower. Operating Theatre based in a MultiSpace trailer is fully equipped with most advanced anesthesia, surgical and diagnostic equipment, including mobile x-ray and ultrasound devices.



Connected together, the 7 Multi Space trailers forms a complete hospital



All departments are very well equipped. The picture shows the Operating Theatre

Adjacent to the OT is a two beds Post Operative, (recovery), room equipped with high tech multi parameter patient monitoring and resuscitating apparatus as well as an very up to date sterilization facility.

A state-of-the-art laboratory is located in the MultiSpace trailer across the main module corridor from the Operating Theatre trailer. This modern laboratory, with its own blood bank is equipped with some of the most advanced instruments for highly extensive testing.

The laboratory trailer also houses a well stocked pharmacy and a doctors furnished lounge/meeting room with TV and kitchenette facility.

An extremely modern ICU, (Intensive Care



The lab is very modern, and it is possible to do extensive testing.



The Recovery room



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# Norwegian Mobile and Semi Permanent Hospitals

## MULTISPACE TRAILER HOSPITALS

### The MultiSpace hospital

female patients, is located in the MultiSpace trailer connected to the Main Module at the end of the corridor.

The mobile hospital also includes a stand-alone MultiSpace diagnostic trailer, completely insulated with lead, and with built in x-ray and ultrasound machines.

Gas panels and oxygen supply are installed and readily available in all the departments of the hospital where required, and in the patient wards. All the MultiSpace units are out fitted with dedicated emergency exits.

All trailers are, if required, self-served with power- and water supply which greatly extends the mobility of the hospital. Each trailer is equipped with a generator and a fire detection and prevention system in order for each department to function independently.

A view of the very well-equipped Operating Theatre.



Inside the state-of-the-art Laboratory



Inside the Pharmacy



Inside the ICU



View of the examination room



Inside a ward



Inside the doctor's lounge



From the emergency room



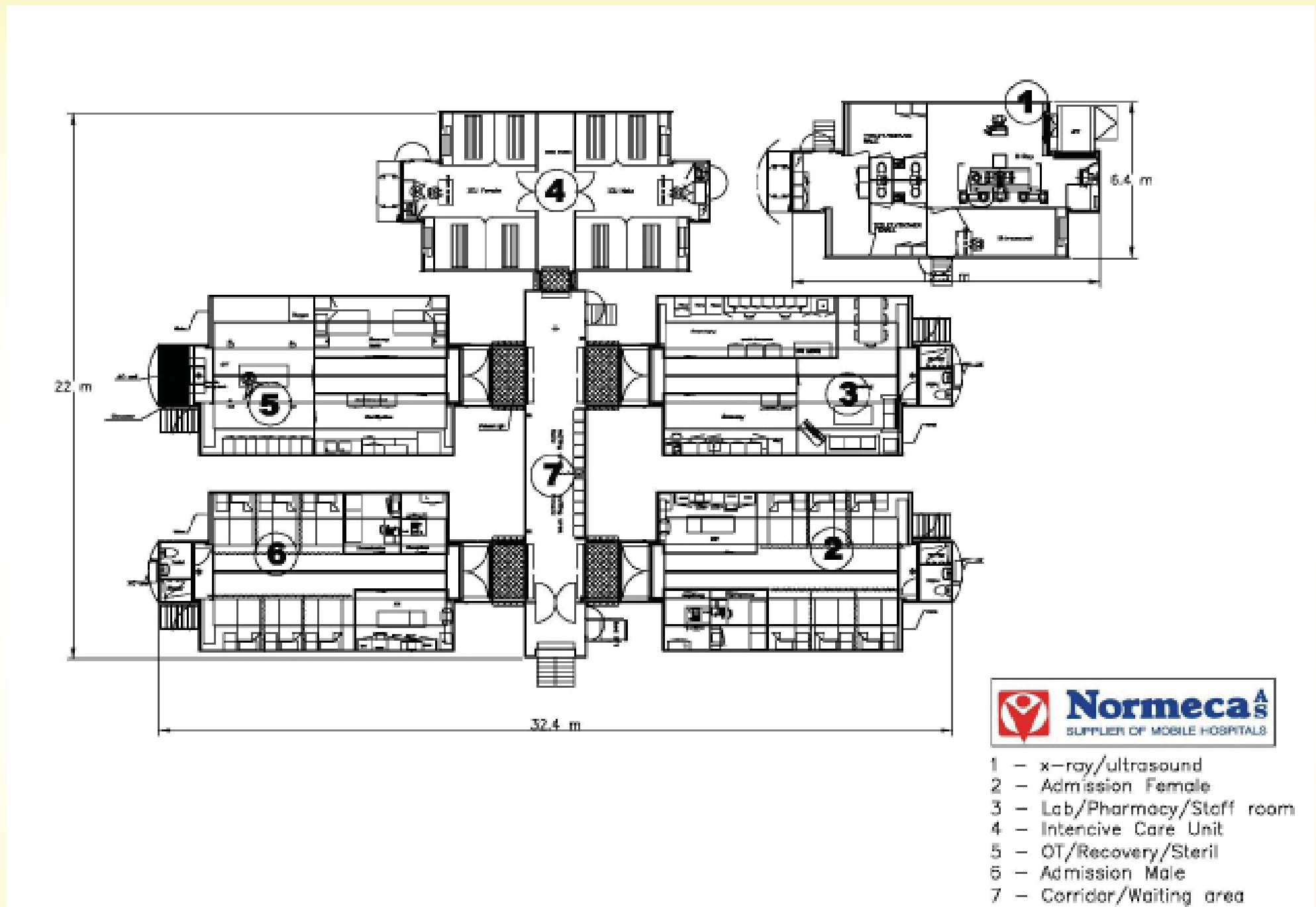
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## MULTISPACE TRAILER HOSPITALS

### Layout of the MultiSpace hospital

The hospital layout is designed to provide the best patient care and work environment as possible for the hospital staff. Patient flow, precautions due to sterile environments and general safety has been taken into consideration while designing this hospital layout. Following the Islamic traditions, the hospital layout also provides a respectable environment by separating males and females into different wards, each with bedposts, examination and emergency rooms.



Drawing of the layout-plan for the hospital

Patient lifts have been installed at the main entrance in the Main Module trailer, and the OT trailer as well as in the stand alone x-ray trailer for easy and safe transportation of patients with reduced mobility.

A central oxygen generator is located in the Main Module trailer supplying oxygen throughout the hospital. Independent Air Conditioning units serve each room in the hospital.

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## MULTISPACE TRAILER HOSPITALS

### X-ray and Ultrasound

The stand alone dedicated x-ray and ultrasound MultiSpace trailer serving the hospital has its own entrance and is therefore not connected to the corridor in the Main Module.

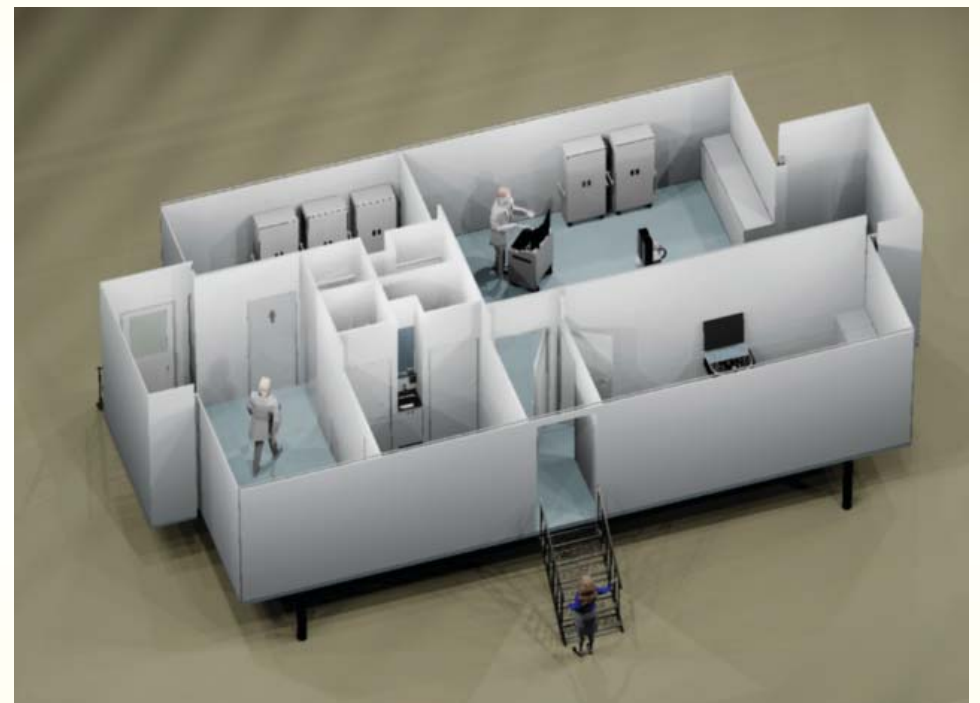
The unit is equipped with its own patient lift, providing easy and safe transportation for incapacitated patients. All walls surrounding the x-ray room are insulated with lead to protect the adjoining environments from electromagnetic radiation, if any.

The state-of-the-art x-ray machine is utilizing digital imaging technology, thus excluding the use of disposable films and chemicals as well as the need for a dark room.

This MultiSpace trailer also houses large male and female wardrobes allowing for storage and change of clothing.



Top-view drawing of the x-ray and ultrasound trailer



A birds eye view of the stand alone MultiSpace trailer with x-ray and ultrasound rooms.



View of the X-ray



Inside the ultrasound room

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## MULTISPACE TRAILER HOSPITALS

### The Wards

Viewing a bedpost with modern adjustable beds.



Male and female patients are separated into two wards, each with a six bed capacity.

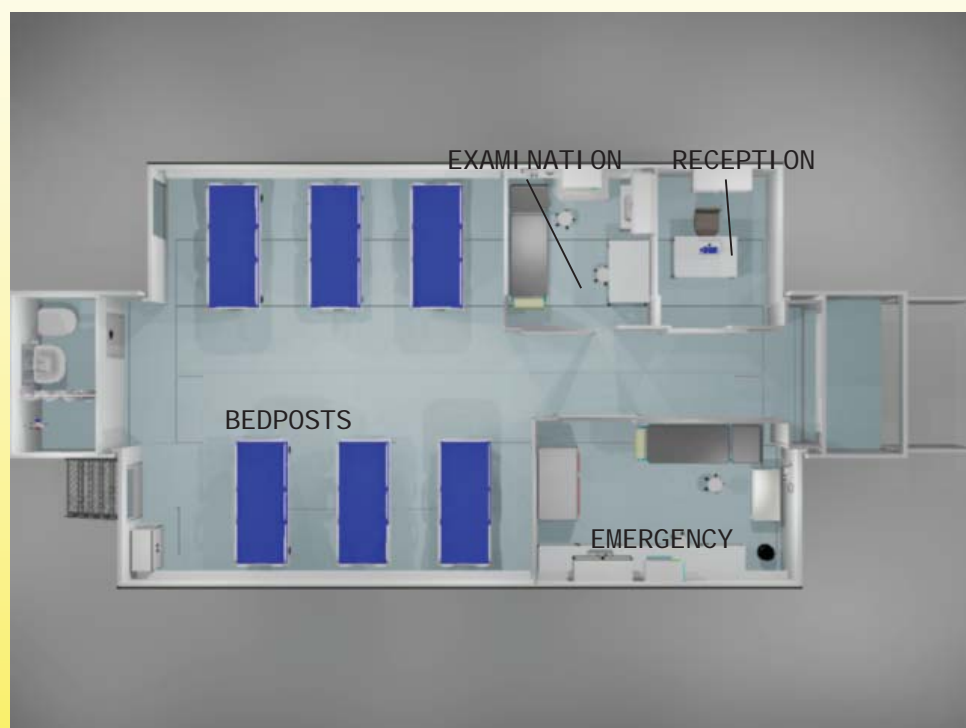
The wards are designed to ensure for best patient flow, privacy and care possible. The reception area, with its installed computer patient system software, is immediately adjacent to the entrance to the ward.

Inside an Examination room

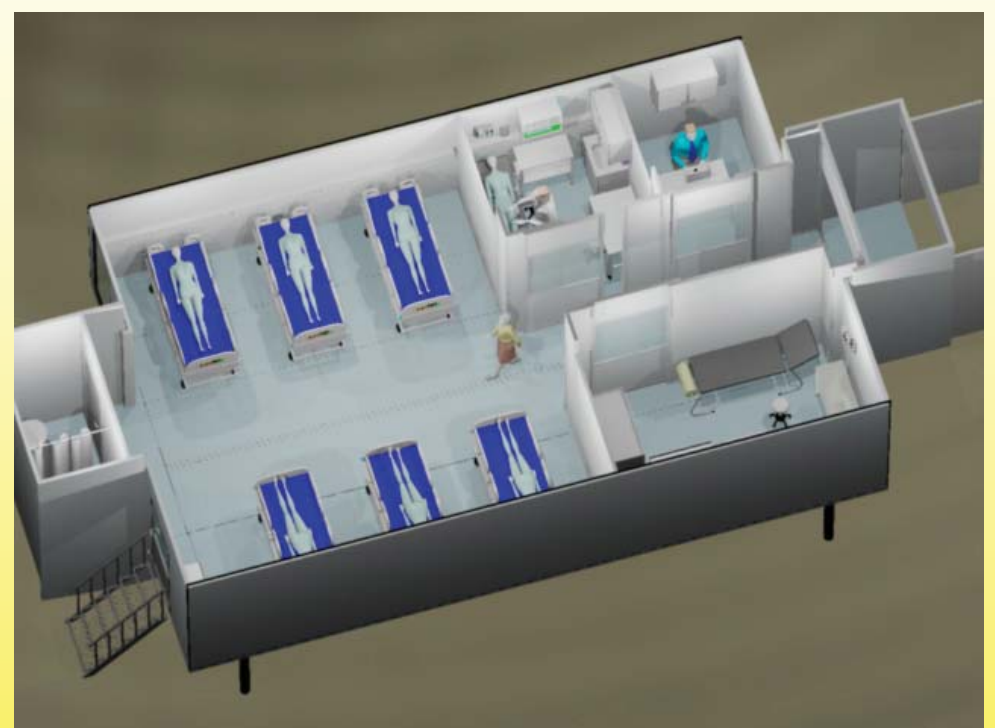


The wards also contain an examination room as well as an emergency room. The wards can deal with serious injuries and unexpected complications as they are equipped with high tech patient monitoring systems, defibrillators and other emergency resuscitating devices. The beds are modern with adjustable height, leg and back supports. The bedposts, each containing a nightstand, are separated by draw curtains for patient privacy. If necessary, wheelchairs and stretchers provide for safe and easy transportation of patients in the wards. For ease of access, blood pressure gauges and diagnostic ear, nose and throat instruments are wall mounted by each bedside.

The ER is equipped for life-saving treatment of critical ill patients



Top-view drawing of a ward with bedposts.



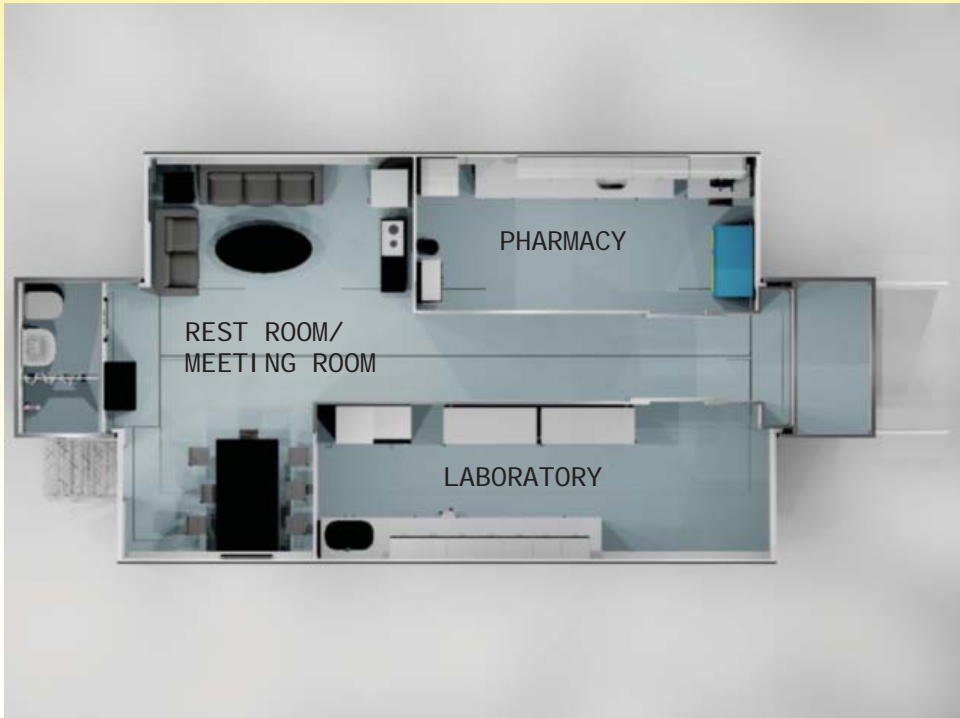
Birds-eye view drawing of a ward with bedposts.

# Norwegian Mobile and Semi Permanent Hospitals

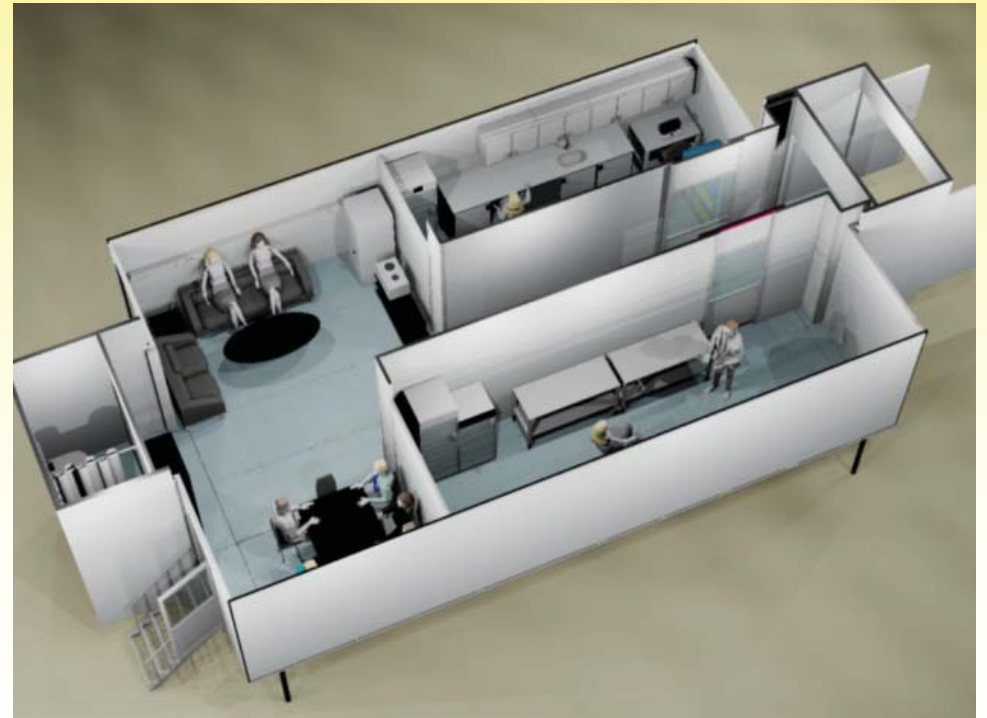
## MULTISPACE TRAILER HOSPITALS

### Lab, pharmacy and staff room

The Laboratory MultiSpace unit houses a highly modern laboratory, a well stocked pharmacy and a combined doctor's lounge/meeting room. The doctor's lounge also includes rest room and shower facilities for the staff.



Top-view drawing of the laboratory MultiSpace unit with pharmacy, laboratory, lounge/meeting room and restroom.



Birds-eye view of the laboratory MultiSpace trailer

### Doctors rest room

The lounge/meeting area consists of a sofa set, a dining table and a kitchenette, (including a table stove, microwave, coffee-/tea maker and a refrigerator), and a TV. The lounge is intended for meetings as well as a staff rest area. The TV serves as an entertainment centre and as a communication aid for presentations during meetings.



Inside the Doctor's Lounge/Meeting room





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## MULTISPACE TRAILER HOSPITALS

Lab, pharmacy and staff room

### The Laboratory

The Laboratory is well suited for extensive testing and blood analysis when coupled with a complete range of disposables provided for the sampling process. All instruments are state-of-the-art with advanced software offering a wide range of functionalities and with multi capable features.

Upon delivery, all of the equipment was installed and tested by qualified Normeca personnel and subsequently disassembled and repacked in Norway before shipment of the hospital to Saudi Arabia.

Equipment for testing and blood bank analysis.



There is ample storage space in the Laboratory



Inside the Laboratory.



### The Pharmacy

The pharmacy is designed for storage and distribution of pharmaceuticals. It offers well organized work space; a temperature controlled secured environment as well as a drug distribution trolley system for transporting drugs on demand safely to the different departments of the hospital.



Inside the Pharmacy with organized work place and ample storage facilities



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## MULTISPACE TRAILER HOSPITALS

### The Operating Theatre

The OT is very well equipped with ultra-modern surgical instruments both for conventional or advanced laparoscopic surgeries.

Adjoining an automated operating table are the very technological advanced anesthesia machine, multi parameter patient monitoring systems, as well as state-of-the-art resuscitating equipment.

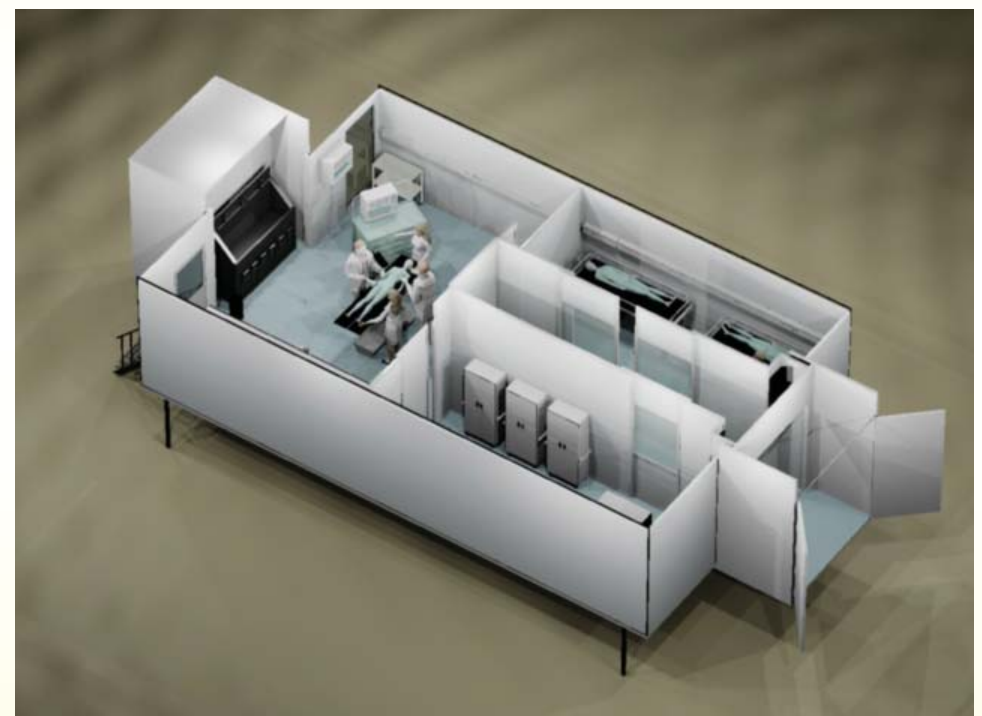
Immediate adjacent to the OT are the Pre Operating and Post Operating room with two recovery beds with modern automated patient monitoring equipment, life support and resuscitating equipment readily available.

A mobile oxygen-concentrator is on hand in addition to the main oxygen-line which serves the OT, the Post OP i.e. the recovery room and the Intensive Care Unit. The central oxygen generator supply is situated in the corridor of the Main Module.

A sterilization facility, for authorized personnel only, is located in the MultiSpace surgical unit, in very close proximity thus insuring easy access to the OT.



Top-view drawing of the MultiSpace unit with Operating Theatre, Recovery and sterilization.



A birds-eye view of the MultiSpace unit with Operating Theatre, Recovery and sterilization.



Inside the sterilization room.

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## MULTISPACE TRAILER HOSPITALS

### The Operating Theatre



The Operating Theatre also contains a mobile x-ray and ultrasound machines.



The equipment in the sterilization is of high quality and high capacity.



One of the bedposts from the recovery-room..



The well-equipped operating theatre.



Ample storage space for surgical instruments.



Shelves and environment controlled storage facilities in the sterilization room.

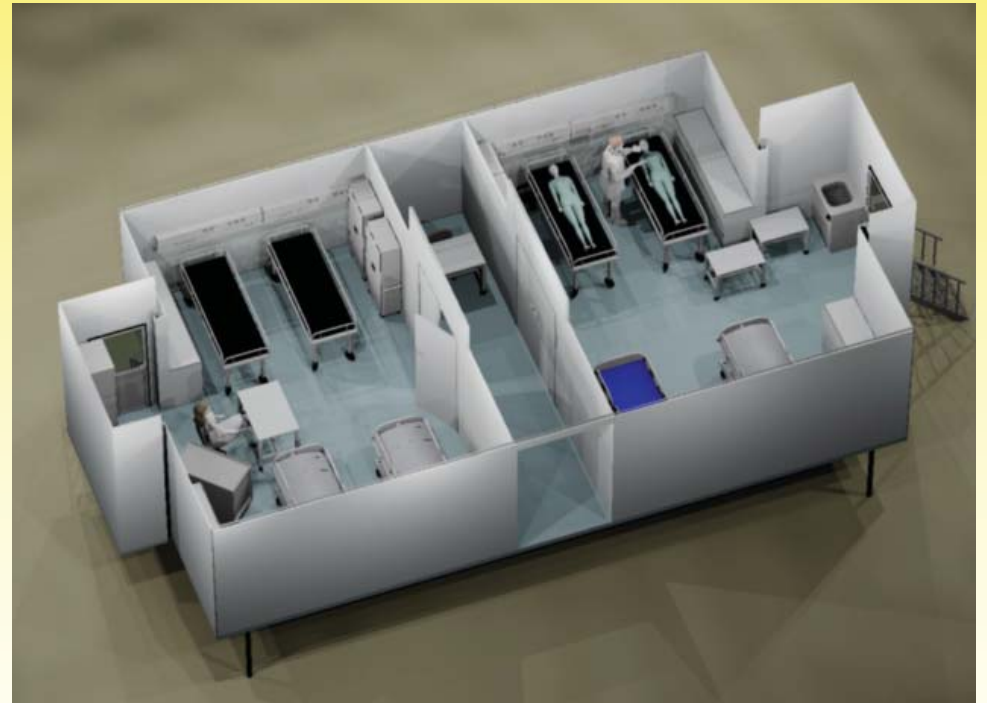
# Norwegian Mobile and Semi Permanent Hospitals

## MULTISPACE TRAILER HOSPITALS

### Intensive Care Unit

The ICU is equipped with a central patient monitoring alarm system, defibrillators, automatic respirators as well as a wide range of equipment for resuscitating unconscious patients and to provide timely treatment. As in the wards, the ICU is separated into male and female department, each accommodating four beds. Both departments are of the same design, identically equipped, and have their own dedicated emergency exit.

All ICU patients are vigilantly monitored, and in case of emergency, a drug trolley with a defibrillator is strategically located for easy access to emergency drugs.



A birds-eye view of the male and female ICU



Top-view drawing of the Intensive Care Unit.



The wide range of medical devices in the ICU makes it possible to watchfully monitor and treat all patients.



Emergency drugs and resuscitating equipment are always in close reach on a mobile trolley.



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## MULTISPACE TRAILER HOSPITALS

### Installation, training and shipment

Before the Mobile Hospital departed for Saudi Arabia, the whole hospital underwent a lengthy trial and all equipment was unpacked and checked by Normeca personnel in Norway. Technical medical equipment and devices were installed and tested, gas panels and A/C units mounted to the walls. The hospital was then repacked before shipment to Saudi Arabia. Training of technical personnel was given in Norway while the hospital was trialed and checked. The first hospital was transported from Norway to Saudi Arabia by road. The MultiSpace convoy left Oslo on Friday morning, November 7 2008, and arrived safely in Saudi Arabia on November 19, 2008, less than 2 weeks later, and 3 days before the delivery deadline.

The 5.000 km trip in 12 days included four ferry trips as the convoy passed through Germany, Italy, Greece, Turkey, Syria and Jordan en route to Jeddah, Saudi Arabia where the hospital was delivered.

The second hospital to be transported to Saudi Arabia was shipped entirely by ocean freight from Norway, and training and installation were arranged locally on Saudi Arabia in May 2009.



Saudi 1 - Ready before departure



Saudi 1 - The convoy lined up before departure



"Hospital on the road"



The large trailers are easily spotted on a normal ferry.

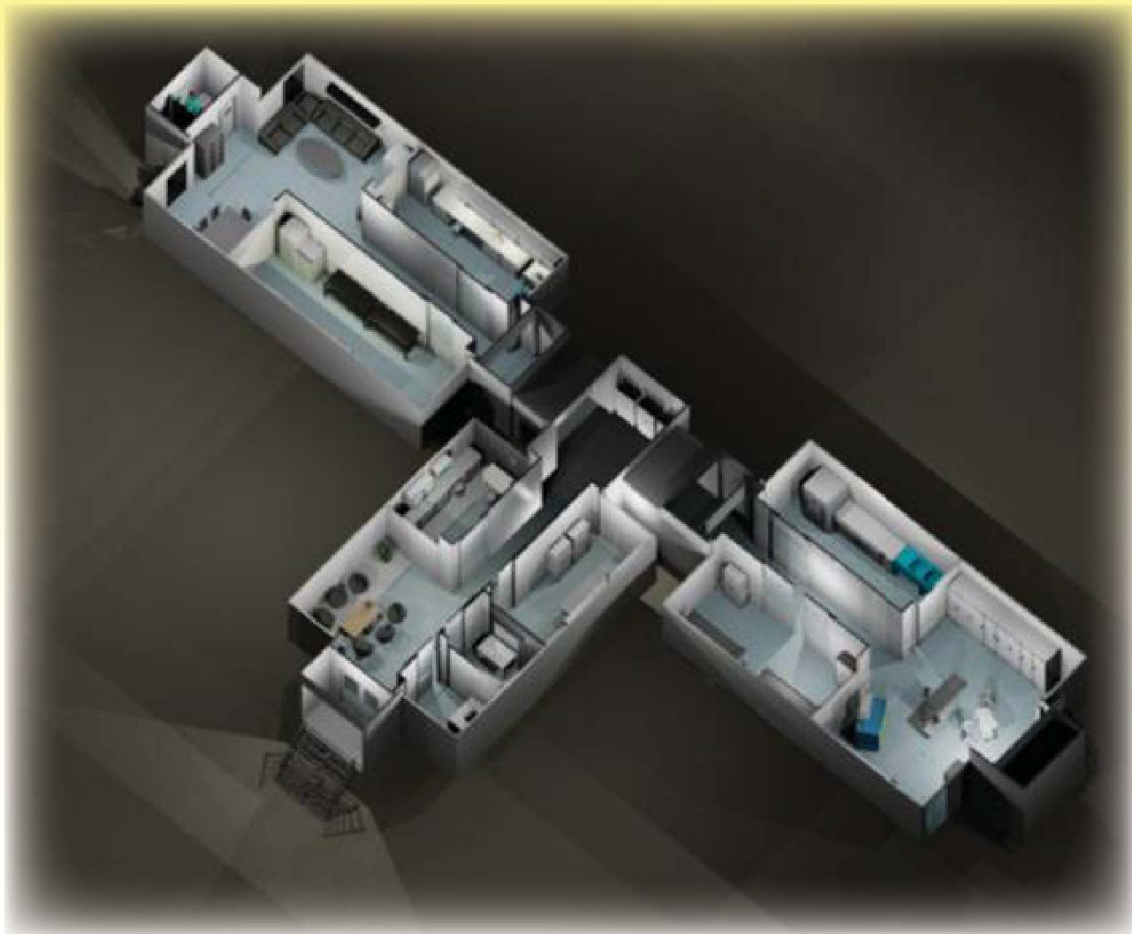


# Normeca AS

# Norwegian Mobile and Semi Permanent Hospitals

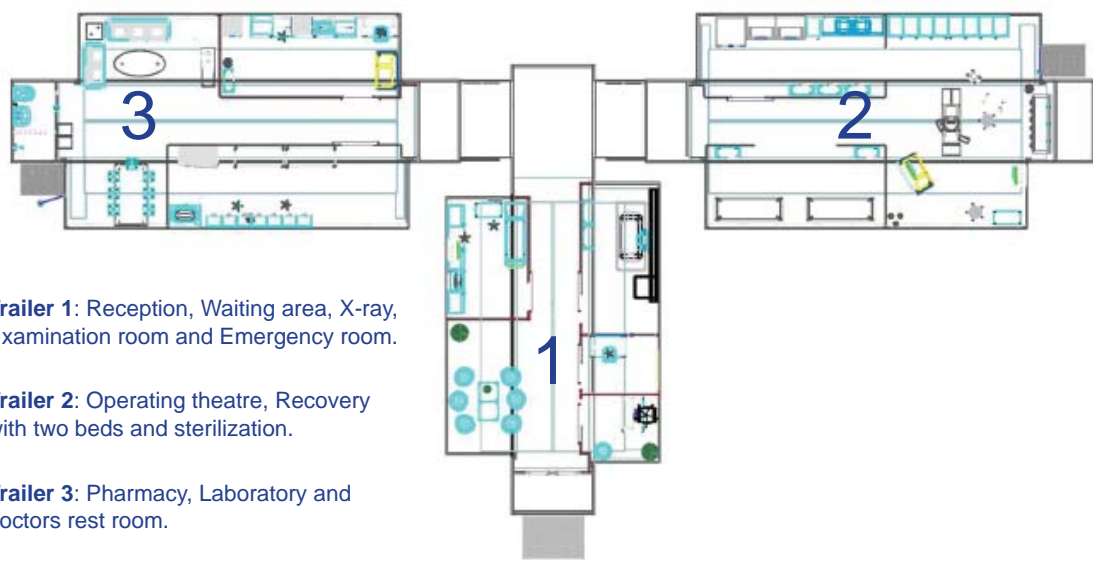
## MULTI SPACE

### AS MOBILE HOSPITAL OR CLINIC



The MultiSpace trailers are available in several sizes, with a floor area up to 130m<sup>2</sup>. The trailers are available with or without expandable sections, on one or both sides, (1 – 2 meters). It is possible to expand the MultiSpace even further by foldable sections on one or both sides. This flexibility in design makes the MultiSpace suitable for many different needs. With the interconnect option, it is possible to design expand an existing unit if necessary.

The trailers can operate as a standalone unit, or two or more can be interconnected.

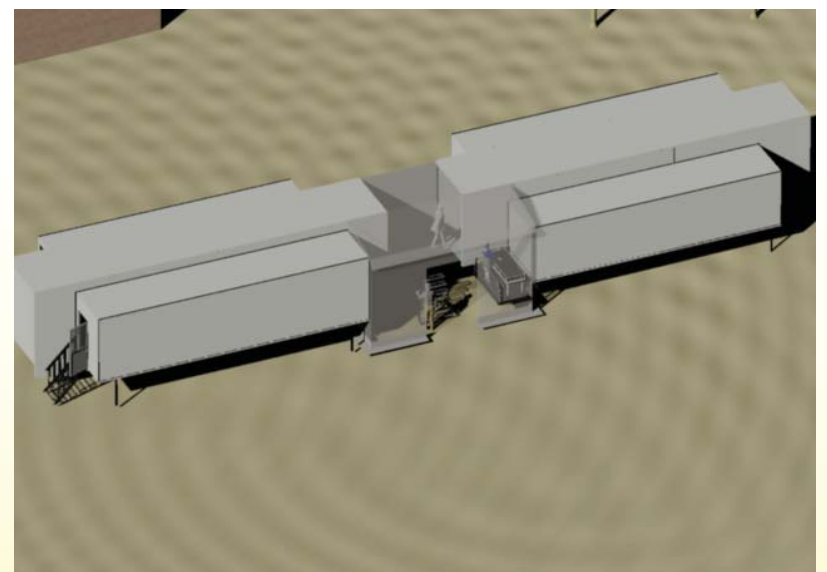


**Trailer 1:** Reception, Waiting area, X-ray, Examination room and Emergency room.

**Trailer 2:** Operating theatre, Recovery with two beds and sterilization.

**Trailer 3:** Pharmacy, Laboratory and doctors rest room.

Three units can be put together to a small hospital.



Two units can be connected together.

The design of the MultiSpace includes techniques for expanding the walls by hatches in the floor that can be lifted, or that will fold out as the walls are taken out from the trailer. Supporting legs are fastened to the extension parts, and these, together with support underneath the main body of the trailer will level the MultiSpace. The leveling is done automatically or manually. The many possibilities in layout of the trailers and the connection option between two or more trailers make the MultiSpace ideal to be fitted for any needs, for medical purposes or any other intended purpose.



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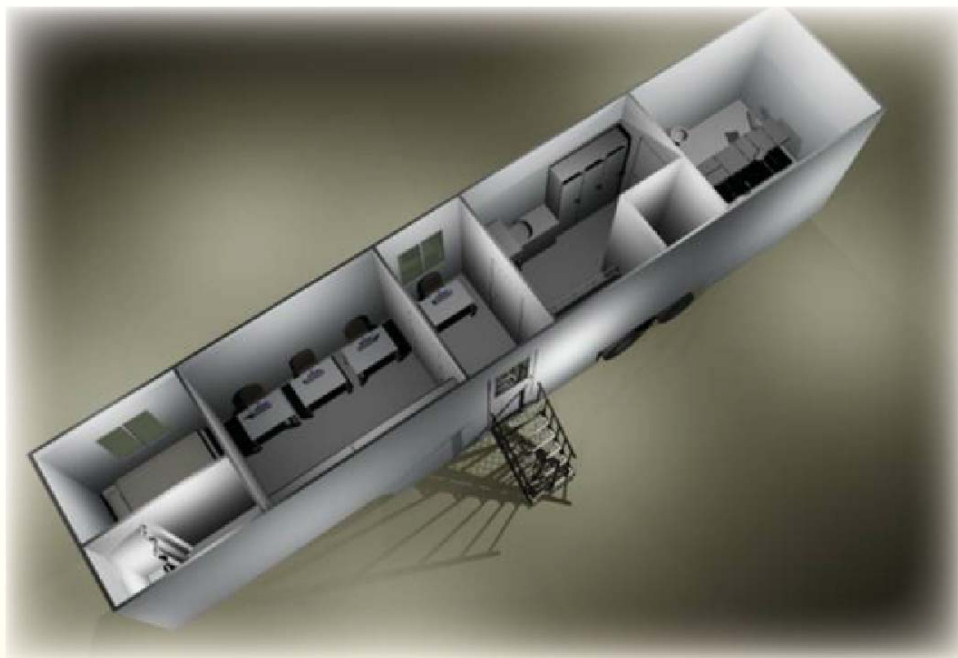
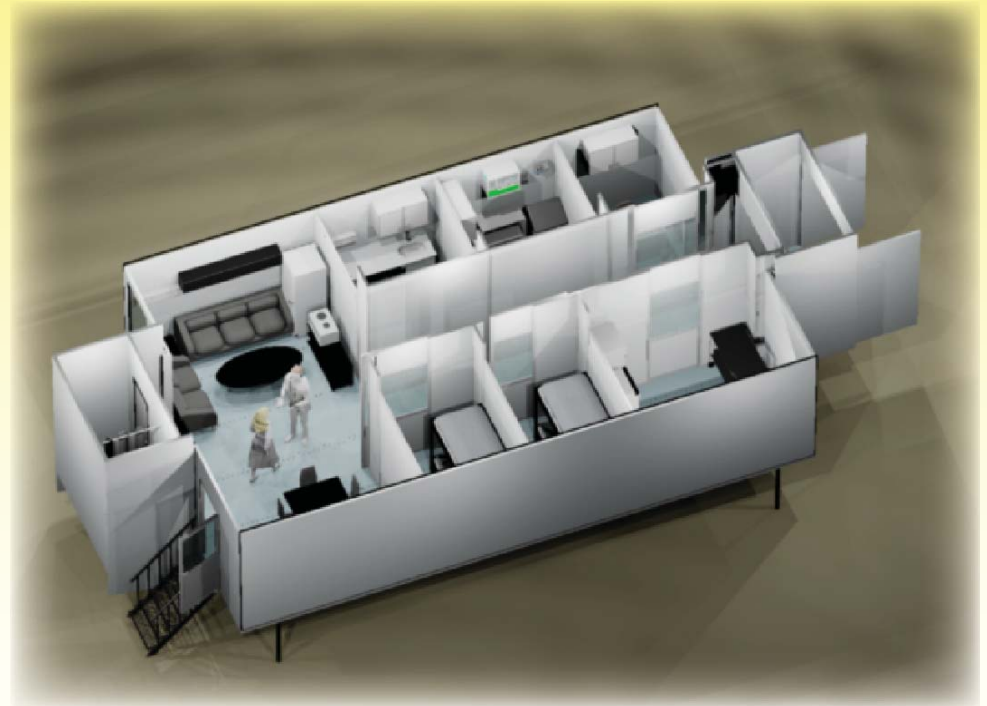
## MULTI SPACE AS MOBILE HOSPITAL OR CLINIC

The MultiSpace trailers are well suited for use in many different areas, such as:

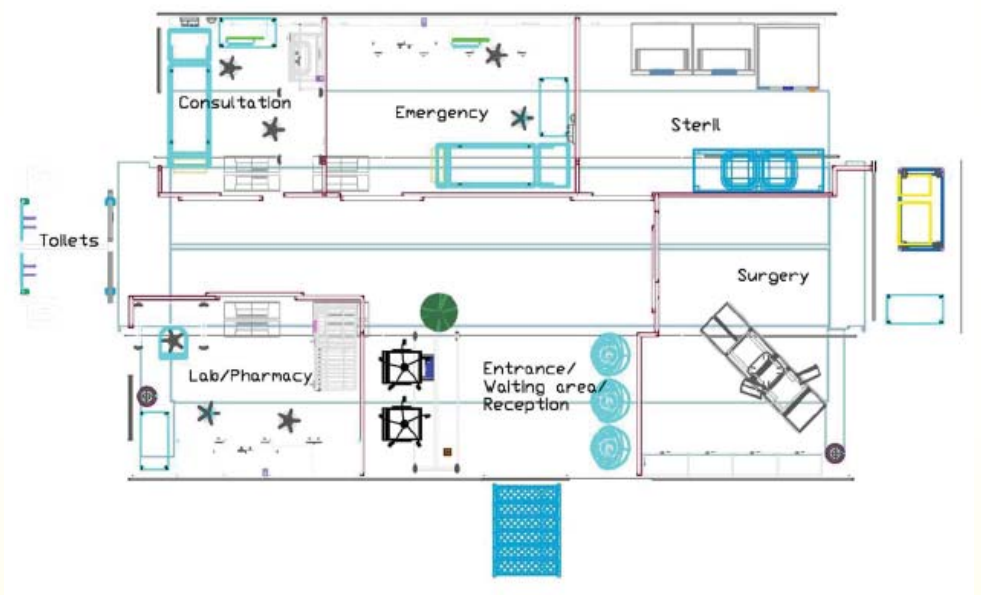
Health: Hospitals, clinics, dental clinics, isolation, mammography, MR, CT, triage unit, forensic medicine unit, DNA lab, etc.

Defence/Civil defence/Police: Surgical unit, field hospital, communication unit, catering, accommodation and more.

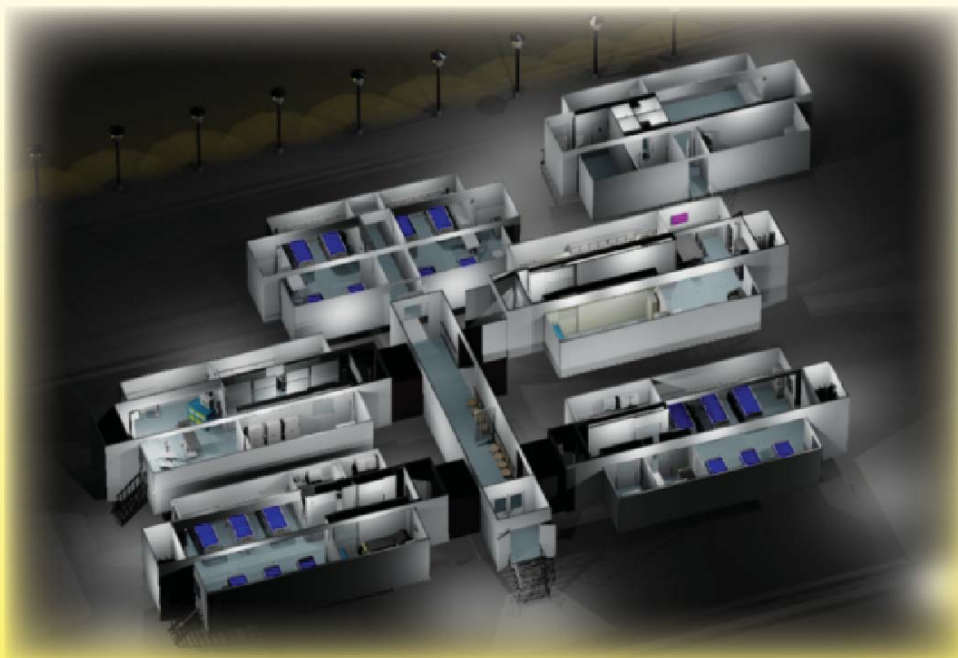
Other areas are: showroom/exhibition, salesstand, library, classroom, and more.



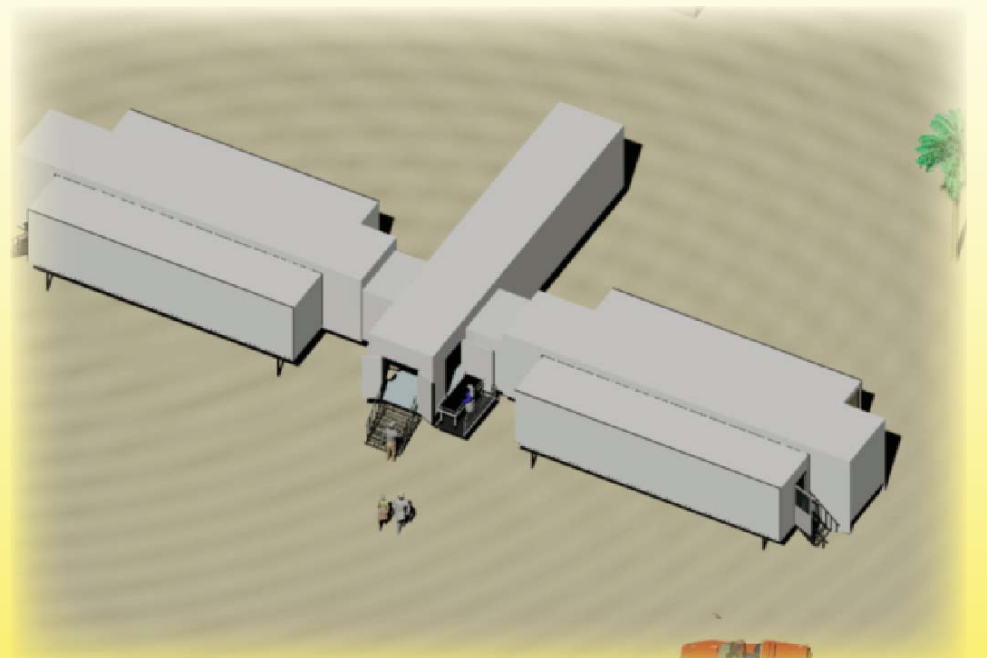
One stand-alone single trailer.



One trailer expandable on both sides.



Many trailers connected together (like Saudi Arabia)



One unit in three MultiSpace trailers



# Norwegian Mobile and Semi Permanent Hospitals

## HOSPITAL IN CONTAINERS AND TENTS TO RED CRESCENT IN SAUDI ARABIA, 2009

This field hospital which is designed as a combination of tents and containers was delivered by Normeca to the Red Crescent in Saudi Arabia in April 2009. This hospital of 6 tents and 7 containers houses a fully equipped hospital with 48 bedposts and 24 corresponding accommodations. In the hospital, there is also a surgical unit, a unit for lab and pharmacy as well as two examination units, all very well-equipped with top-modern instruments.

The hospital is self-served with water- and sanitation system, power supply and air condition system, everything delivered installed and ready for use. Training of technical and medical personnel were arranged by Normeca personnel at the site in Saudi Arabia.



The field hospital in Saudi Arabia, 2009.



# Global Disaster Management Team

## HOSPITAL IN CONTAINERS AND TENTS TO RED CRESCENT IN SAUDI ARABIA, 2009



The flysheets and AC system will lower the interior temperature in the tents.

The 6 tents are used as bedrooms for the wards and the accommodation-units. The tents are connected to sanitation containers with toilet and shower. In this way, the units achieves a large floor area as well as easy transport and fast deployment.

Due to the extreme weather conditions in Saudi Arabia where the temperature easily can reach 50-60 C, the tents are protected with flysheets, which will reduce the interior temperature with up to 10 C. The material has a high reflection of sun-radiation, which reduces the surface heat on the tent. The open weave of the fabric still allows wind and rain penetration, preventing wind catch and sagging of the flysheet.



The ward tents are connected to a sanitation container.



The connections between the tents and the container are totally tight.



Overview of the hospital area.



The containers includes toilet and shower. The entrances to the tents are on each side of the container.

# Norwegian Mobile and Semi Permanent Hospitals

## CONTAINERS AND TENTS CONNECTED TOGETHER



A combination where containers and tents are connected together similar to the solution in Saudi Arabia, will bring a lot of advantages to the structural solution. The container will cover the need for water and electrical system, also including a technical room for compressor, generator etc. easily accessible from the back of the container. Water and sanitation installations are fixed inside the container, and ready to be connected to the main system with one single fitting. This is a practical solution for any unit where you will need fixed interior and a large floor area.

During transportation, tents and all technical equipment, (i.e. lightning system, electrical equipment etc.) are stored in the container, securing easy transportation. Deployment of the system is also very fast and easy.



The picture on the left shows a container and tent solution for accommodations, similar to those seen in Saudi Arabia. A technical room with entrance from the back of the container contains generator, compressor and Air Condition, while toilet and shower is accessed from the main entrance. The tight connections between the tents and the container make it possible to access the toilet or the shower without having to leave the unit.

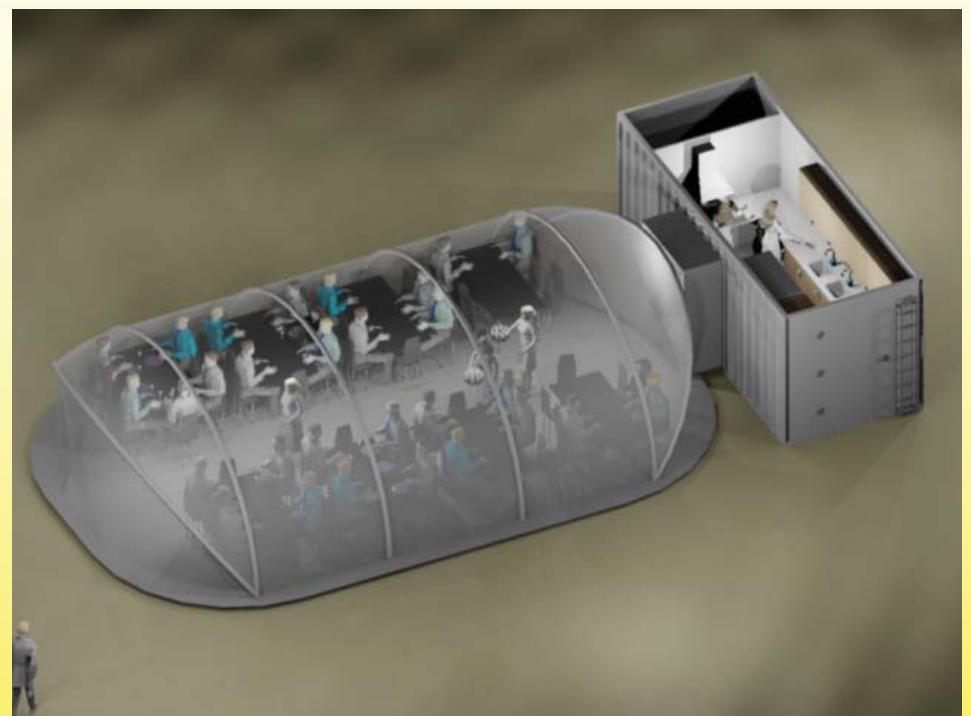
# Global Disaster Management Team

## CONTAINERS AND TENTS CONNECTED TOGETHER



The pictures above show the container- and tent solution in an emergency unit. The large floor-area provided by the tents, contains the emergency ward, while water and equipment is easily accessed by the staff inside the container.

In the same way as the examples mentioned above, will a dining area/cafeteria, (below), require a large floor area as only a small part of this needs any fixed installations. The dining area is situated in the tent as the kitchen is inside the container, creating access to water and other installations where they are needed while, at the same time, providing the necessary floor area for dining. The dining area from the example shown here can be further increased by adding another tent on the other side of the container or as an extension of the tent already included. Dining guests may enter the dining area directly, keeping the kitchen container accessible for staff only.



# GLOBAL DISASTER MANAGEMENT TEAM



Thai Tsunami Victim Identification Centre



KATI KO Referral Hospital, Southern Sudan



MSF Hospital, Hattian Bala, Pakistan



Inside OT in KATI KO Referral Hospital



**Normeeca<sup>AS</sup>**  
*Number One  
in  
the world  
within  
partly and turn key  
solutions  
incl.  
Transportation,  
Erection,  
Management,  
Training,  
Maintenance,  
Education,  
Administration,  
Storage,  
Out sourcing,  
Medevac,  
etc.*



Inside MSF Hospital in Hattian Bala



All kinds of clinics or hospitals in MultiSpace



Cuban Hospital, Muzaffarabad, Pakistan



NorCat Floating Hospitals



All kinds of Mobile Clinics

