



Modular Building

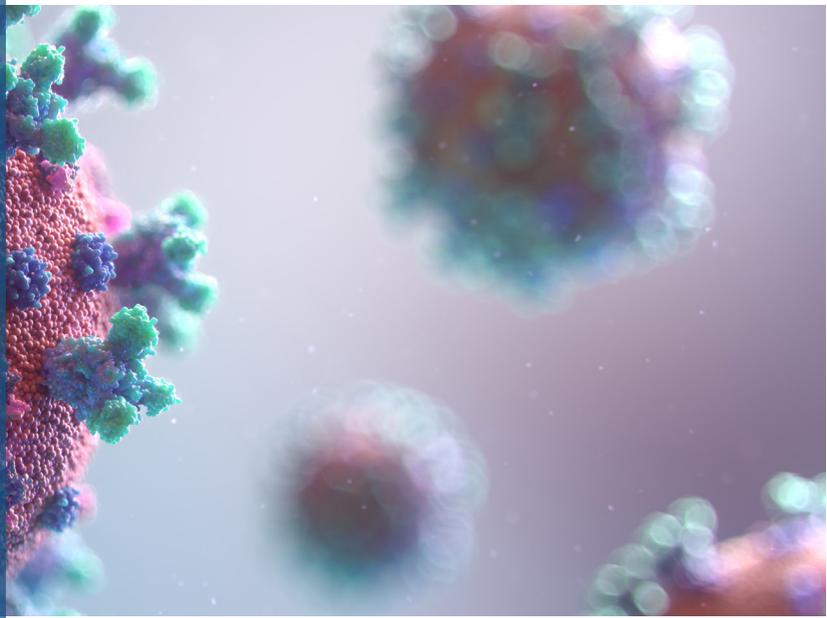
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**Mobile Intensive
Care Unit**
Health Care Solution

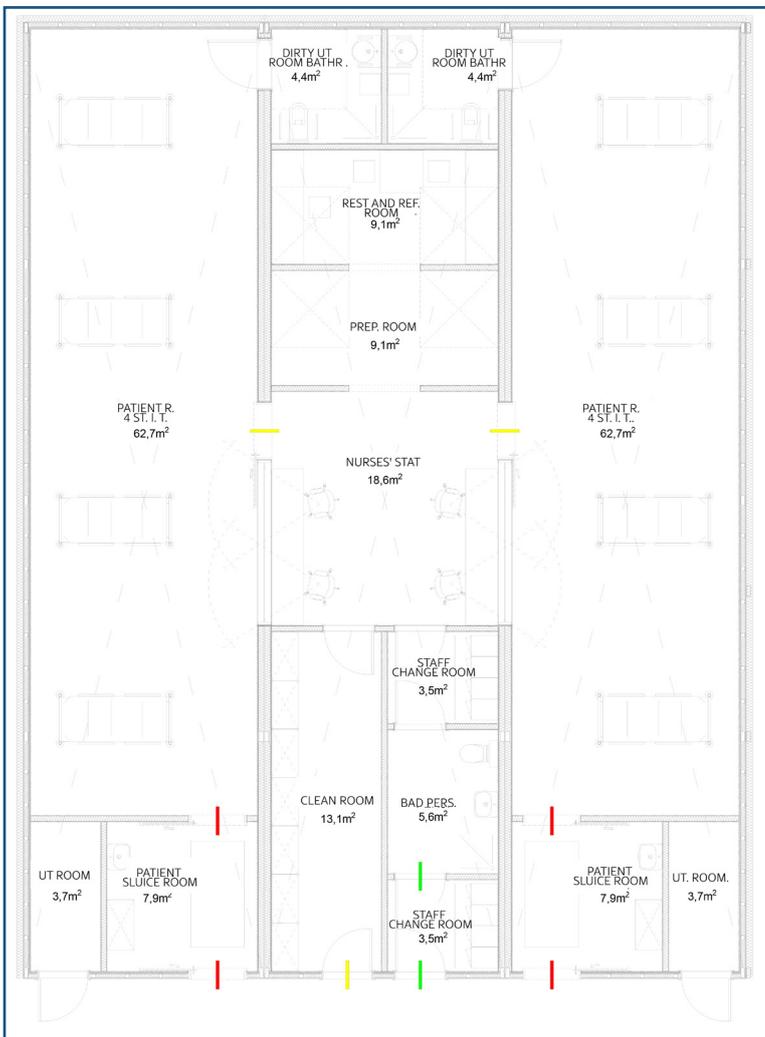
Covid-19 Threat

The effects of the coronavirus pandemic (COVID-19) are becoming more and more noticeable and now affect almost all areas of our lives. At this very difficult time, it is important to ensure that every potential patient has the opportunity to undergo tests that are crucial for their life and health, as well as to receive proper medical care. The prefabricated turnkey Climatic intensive care stations come to the rescue. Owing to the fact that we have been implementing projects for the health care sector encompassing hospital buildings (intensive care units, laboratories, etc.) for over a dozen or so years now, we have learned that a turnkey system with a robust modular design can save up to 70% of time.



+ MOBIOIT - Mobile Ward

Thanks to the modular implementation, the move to the new facility can take place just a few days after delivery. The role of technical services is limited to indicating the media outlet and the location of the facility. The modular structure has minimum impact on the operation of the hospital and ensures maximum protection of the staff and patients against risks typical of traditional structures (long-term noise and pollution caused by work, heavy traffic, supplies of construction materials, etc.) as well as noise and construction dirt. The basic MOBIOIT unit is a set of rooms designed to enable care for eight people in three construction modules. On the basis of this unit, larger intensive care structures can be freely duplicated and configured.



Characteristic parameters of the autonomous ICU unit

Total area	243 m ²
Unit dimensions	18m x 4,5m x 4,2m
Number of modules	3 sets
Height of ICU rooms	3 m
Number of beds	8 sets
Electricity demand	30 sqm





Medical Technology

The **MOBIOIT** has been designed as a sub-ward in a facility intended for the hospitalisation of particularly dangerous and highly contagious diseases. The sub-ward functions as a structure separated from the rest of the hospital by a sluice room enabling decontamination. The functioning of the isolation sub-ward with isolation stations for patients suffering from particularly dangerous and highly contagious diseases (including those requiring full respiratory isolation) is based on a comprehensive system of interconnected safeguards aimed at protecting medical personnel from secondary infections and, as a result, from transmitting the infection to the general population.

The sluice rooms should be equipped at least with disinfectant-resistant transport containers for the disposal of waste from the patient's rooms (previously packed in double bags) into the sluice room. The system features an audiovisual communication system, which reduces the need to enter the room and come into direct contact with the patient.

The patient room is divided into four fully equipped intensive care units. A double armed surgical pendant for the supply of medical gases (oxygen, vacuum and compressed air) and monitoring and life support equipment is provided for each bed. Diagnostic equipment (ultrasound machine, mobile X-ray machine) and other necessary apparatuses (ventilator, defibrillator) can be connected to each station at any time. The intensive care room is air-conditioned with negative pressure in relation to the adjacent rooms. HEPA filters have been included in the design of the room's air inlets and outlets.

Key Functions of the Sluice Room

01. Maintaining differential pressure

Istotne w przypadku patogenów przenoszonych drogą powietrzną (utrzymywana kaskada ciśnień 10Pa pomiędzy salą pacjenta a służbą oraz 5Pa pomiędzy służbą a komunikacją)

02. Decontamination

PPE (personal protective equipment) worn by medical personnel leaving the patient room (the sluice room should accommodate at least 2 people). Due to the need to decontaminate PPE, the sluice room features a running water tap and a drain in the floor.

03. Securing used protective equipment

The sluice room can be used to pack PPE in a double bag and an external biohazard bin and safe waste disposal. The sluice box is equipped with a separate ventilation system to maintain the pressure difference.



There is a bathroom available in the patient room, equipped with an additional macerator for the disposal of single-use bedpans. The design also incorporates a nurses' station with a preparation room. The room is hypertensive in relation to the patient room. The nurses' station is equipped with computers, a monitor for viewing the patient's vital signs and a camera image screen. The preparation room contains equipment necessary for basic analytical tests, a refrigerator for drugs and an incubator for heating infusion fluids.

In addition, there are lockers for storing PPE used by the personnel every time they come in contact with the patient. A rest and refreshment room is provided for the staff, to make sure that doctors and nurses have a place to eat and rest. The personnel enter the ward through the washing and changing rooms, while all materials and equipment are supplied through the clean room, also used for storage. Hospital kitchen staff provide meals to the patient sluice rooms in accordance with the procedure. The meals are served in disposable containers. Infected underwear of patients admitted to the ward is collected in properly labelled bags and placed in the dirty utility room. Depending on the degree of contamination, it should be sterilized or completely eliminated from use/burned. The hospital's sanitary services should be notified of each transfer of human waste and of the place of its delivery. Waste must be sorted and marked with codes.

Waste must be transported through the patient sluice room to the final storage location. The transport of waste from the place of origin to the place of storage or collection takes place in containers designed for this purpose in a way that guarantees the highest possible safety for personnel and patients. Transportation of deceased patients should be carried out with special precautions and according to the procedure developed for the hospital. Body detention time should be reduced to a minimum. The body must be placed in a double waterproof tear-resistant bag (thickness at least 150 µm) with adequate description (with an indication of the content of highly infectious material). This should be done at the place of death. It is forbidden to remove vascular accesses, catheters, tracheotomy tubes etc. The outer surfaces of the bags must be disinfected. The body should be transported to the morgue as soon as possible. The hospital's sanitary services should be notified of each transfer of a body and of the place of its delivery.



Building Foundation

Foundation on prefabricated point foundations recessed in the ground; method, depth of foundation, type and layout of foundations in line with geological surveys.

Corner and intermediate supports integrated into external or internal walls. Corrosion protection of steel structures in accordance with PN-EN ISO 12944. The structure (and, if needed, the substructure) is filled with mineral wool as required, and then clad from the outside and inside.

Modular Building Structure (R120 Fire Resistance)

The modular technology is based on steel modules. Dimensions of each segment: 18 m x 4.5 m x 4.2 m. The MOBIOT is an extensively prefabricated structure, with installations and finishing elements assembled in the prefabrication plant. The main supporting structure is a spatial steel frame system consisting of a floor frame and a roof with corner and intermediate supports. Floor structure: outer frame consisting of main frame beams and transverse beams, roof structure: outer frame and transverse steel beams;



Roof

The structure of the roof consists of a system of steel beams filled with mineral wool in the empty spaces. On the underside, the steel structure is protected by a system of Fermacell gypsum fibreboards or BZSPlus/BZSPlus+ cement particleboards and DR gypsum plasterboards. The spaces between the steel beams are filled with mineral wool. On the top, the beams are covered with a BZS cement fibreboard and thermal insulation. Roof covering – PROTAN SE 15 mm roofing membrane or equivalent.

Ceilings

Suspended ceilings in rooms that require increased asepsis ensure surface tightness and washability: coffered ceiling, demountable, 60 x 60 module, sound absorbing; tight surface designed for environments with the highest hygienic requirements, where regular cleaning and disinfection is needed.



Wall and Corner Protection

Protection of walls and railings in the corridor on one side / patient rooms – wall protection panels behind the beds, acrylic panels in a uniform colour with a thickness of 2 mm, with lightweight surface structure. Wall protection up to a height of 1,300 mm, all unused corners in the corridor and patient rooms fitted with steel 60x60x1,800 mm 90 degree protectors.

Painting and Wallpaper

Walls in bedrooms, utility rooms and the corridor covered with glass fibre wallpaper, medium structure, with scratch-resistant paint and disinfectants. Walls and ceilings in technical rooms: gypsum boards filled and painted with brush-resistant dispersion paint.

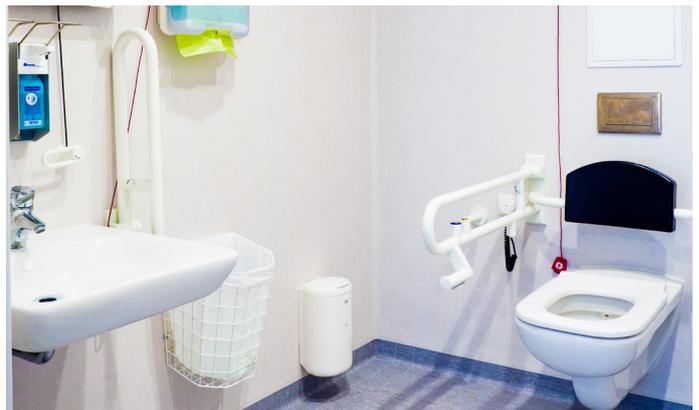
Sun Protection

Windows with sun protection: external blinds consisting of 60 mm wide powder-coated aluminium lamellas with rounded edges, hidden in the façade, guide rails with cover and stopper blocks, electric drive controlled individually and centrally with a sun and wind sensor.



Facade/Windows

Galvanised steel sheet façade with galvanised substructure arranged in a visible horizontal system. Substructure filled with mineral wool. All corners, skirting boards, and window, door and roof finishing elements included. Roof with an attic, material thickness in accordance with static requirements, insulation: black façade mineral wool with thickness in accordance with requirements for 2021, external surface: colour in accordance with the manufacturer's standard colour palette. 5 chamber 3-pane PVC profile windows, max. U-factor $U < 0.7 \text{ W/m}^2\text{K}$.



Sanitary Installations

All pipelines installed in the **MOBIOIT** are insulated in accordance with regulations. Wall-hung white porcelain toilet bowls, including complete toilet equipment, seat with steel hinges, paper holder, additional paper holder, toilet brush. A porcelain washbasin without overflow for a wall mixer with siphon, chrome-plated single lever table mixer, a 1x0.6 m wall mirror, nylon handles with a steel core at the toilet, wall-mounted washbasin handles. A non-slip shower levelled with the floor, with floor drip rails, a chrome-plat

ed wall-mounted mixer, a burn preventing lock, a shower set and a seat. Hygienic radiators including mounting brackets, thermostatic valves, screws, ventilation valves, etc. corresponding to the currently required standards.

Medical Gases

Supply of medical gases in accordance with DIN EN 110 7396, oxygen, vacuum and compressed air; the installation must be connected to the existing hospital network. A surgical pendant supplying 1 intensive care station – classified as class IIb medical device. Two articulated arms on a common tandem ceiling sling. A double-arm system consisting of articulated arms with suspended rotating vertical columns with panels fitted with gas and electric sockets, lighting panels, shelves and other accessories.



Basic and Night Lighting Installations

The basic and night lighting in the building is based on light fittings with LED light sources, the number and size of which have been calculated on the basis of applicable standards and regulations.

The sanitary rooms are equipped with fittings and airtight light fittings.

The rooms have the following illumination parameters:

rest and refreshment rooms	200lx
technical rooms	200lx
storage rooms	200lx
traffic routes	100lx
nurses' stations	300lx
recovery room	500lx
bathrooms, toilets, sluice rooms	200lx
intensive care	300lx



Ventilation

Air-conditioning in the intensive care rooms and staff rooms. In the remaining rooms, mechanical pressure and exhaust ventilation is used. Constantly operating mechanical exhaust ventilation in toilets and dirty utility rooms.

Electricity Supply

The **MOBIOIT** is powered from a cable and measuring connector equipped with an ATS system, enabling supply to the building from two independent lines. The cable connector facilitates supply from the power network as well as from a dedicated power generator or from two power generators. The cable and measuring connector is equipped with an automatic transfer switching (ATS) system triggered in emergency situations. The power supply lines are fed to each module from the cable and measuring connector to an RGX switchgear. A separate generator for the modular building turns on automatically within 15 seconds from a main voltage drop. Each patient room RGX switchgear is located in a separate technical room. Technical room also contains a switchgear of the separated IT network with a medical transformer and UPS with 1 hour backup.

Electric Shock Protection

To ensure protection against electric shocks, the TN-S system automatically switches off the power supply. All exposed conductive parts are connected to a neutral supply point by means of protective cables. Residual current circuit breakers with a sensitivity of 30 mA are used as a supplementary means of protection against direct contact.



Structured Cabling Installation

The structured cabling implemented in the facility is based on a category 6 shielded modular connection module. Both the number of workstations and their location are shown in the drawings. The transmission channel performance meets at least class E requirements and all components meet category 6 criteria. The IDF is a 19" 6U distribution cabinet located in each module. The vertical cabling system incorporates single-mode optical fibre cables.

All passive elements of the designed network come from one manufacturer to secure a comprehensive and consistent warranty for the entire system. The employed technical solutions are covered by a uniform and consistent manufacturer's system warranty for a period of 25 years encompassing all passive elements of the transmission track, as well as front panels of subscriber outlets, cable hangers and distribution cabinets. All subsystems, i.e. the logical (and telephone) cabling system, are developed (i.e. designed, manufactured and launched) by the manufacturer as complete solutions, in order to obtain maximum transmission inventory (margins of operation).



Electrical Installations in Group II Locations

In order to guarantee a high level of safety for patients and staff in selected rooms, called group 2 medical locations, medical isolation transformers are used, forming a system of IT networks, together with control devices with a high degree of reliability and safety. These devices comply with the requirements of PN-HD 60364-7-710, PN-EN 61557-8:2007, DIN VDE 0100-710 (VDE 0100 part 710). Therefore, group 2 medical locations are supplied with separated voltage, powered by two lines from ATS. The main power line is powered by a UPS, equipped with an external manual service bypass, with an interruption time of up to 0.5 s. Each patient room functional block is powered from a separate 230/230 V single-phase medical transformer matched to the receivers connected on the secondary side, in combination with a control and switching circuit, with an individual location of the grounded circuit and with signalling cassettes.

Nurse Call System

The modular building features a nurse call system for the patients and the hospital staff. The system guarantees digital information exchange between patients and staff. The nurse call system is installed at each bed and in the patient bathrooms. The hospital's call and communication system is based on devices using IP technology. The nurse call system is fully supplied with a 30 VDC safe voltage and is galvanically separated from other installations. The network switches dedicated for the call system have uplink sockets galvanically separated from the rest of the installation. The cabling of the call system is made of twisted pair cables. The nurse call system provides two-way communication between the patients and the nurses. The pear push-button is connected to a socket module. The socket module has a slot intended for connecting the patient button. Alerts from pear push-buttons installed in the patient rooms are transmitted to the ward terminal at the nurses' station. The pear push-button sockets have a mechanism which pulls the plug automatically when the cord is tugged strongly in any direction. Each alert or indication of presence activates a colour-coded signal light. A rhythmically repeated acoustic signal will sound in all areas in which the appropriate personnel may be found.

Scope of Manufacturer's Works

Scope of design works: production documentation, adaptation to the land development conditions, obtaining a building permit, construction of foundations, connections within 10 m from the constructed building, permanent equipment.



Instalacja CCTV

A CCTV system based on dome cameras is installed in the MOBIOIT in order to increase the security level in intensive care rooms. Video recordings will be captured using recording equipment located in the technical rooms of the patient modules. The image can be viewed with the use of 2 MPx vandal-resistant IP65 dome cameras featuring IP technology, arranged in accordance with the drawing attachment. Preview of the image from cameras is performed by a video recorder designed to record images from 4 cameras. The patient room image is displayed when access from any computer at the nurses' station has been appropriately granted. Image can be assigned to particular cameras using the CCTV DVR. The cameras transmit image via the structured network cabling.

Preliminary Implementation Schedule Without a Building Permit

