

方舱医院设计和改建的有关技术要求（修订版）

**Technical requirements for the Design and Conversion  
of Makeshift ( FangCang ) Hospitals  
(Revised Edition)**

湖北省住房和城乡建设厅

Department of Housing and Urban-Rural Development of Hubei Province

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## 编者按

在湖北武汉抗击新冠肺炎疫情最艰难的时刻，湖北省住房和城乡建设厅联合中南建筑设计院股份有限公司、中信建筑设计研究总院有限公司专家，夜以继日编写发布了《方舱医院设计和改建的有关技术要求》，希望为“应收尽收”做点贡献。武汉市从2月3日启动方舱医院建设至3月10日16家方舱医院全部休舱，累计收治1.2万余人。现在，新冠肺炎疫情在全球快速蔓延，我们再次组织专家团队，总结方舱医院设计、建设、运行管理的实践，修订《方舱医院设计和改建的有关技术要求》，现译成英文并予以发布，供国内外同行参考。希望携手抗疫、共克时艰，坚定信心赢得这场人类同重大传染疾病的斗争。

### From authors:

When Wuhan, Hubei was being hit the hardest by COVID-19, Department of Housing and Urban-Rural Development of Hubei Province collaborated with experts from Central South Architectural Design Institute Co., Ltd. and CITIC General Institute of Architectural Design and Research Co., Ltd, jointly to produce “Technical requirements for the Design and Conversion of Makeshift (FangCang) Hospitals”(short for MHs). Hopefully, this could be beneficial to the practice of “Leave No One Unattended”.

Up to 12,000 patients had been treated in 16 MHs from Feb 3<sup>rd</sup> 2020 (First MH put into operation) to March 10<sup>th</sup> 2020 (All MHs closed). Currently, with the COVID-19 Epidemic spreading quickly around the world, we pulled together professional team again to summarize practice of MH design, construction and operation and amended “Technical requirements for the Design and Conversion of Makeshift (FangCang) Hospitals”. Now, we have it translated into English and issued to public for peers both at home and around the world to refer to.

Hopefully, we join hands to combat this epidemic, overcome trials and tribulations, and solidify our confidence in conquering this major infectious disease endangering all human beings.

如需帮助或交流，请联系中南建筑设计院股份有限公司、中信建筑设计研究总院有限公司：

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方舱医院是为解决当前大量新型冠状病毒感染的肺炎确诊轻症患者的收治问题，充分利用既有建筑，在最短的时间内，以最小的成本建设和改造的临时收治场所，从而实现有效隔离传染源、最大限度救治患者的目标。方舱医院具有大空间、大容量的特点，设计和改建要遵循安全至上的原则，确保医护人员和患者的安全、建筑结构安全、设施设备运行安全、消防安全和环境安全。

Currently, Makeshift (FangCang) Hospitals (short for MHs) aim to receive large numbers of COVID-19 patients with mild symptom for joint treatment. With the shortest schedule and minimalist costs, MH takes full advantage of existent building, being reconstructed into temporary place for treatment to isolate source of infection and treat patients to the greatest extent. MH is of big space and large capacity. The design and reconstruction should follow the principle of safety to ensure the safety of medical staff and patients, building structure, facilities and equipment operation, firefighting as so as the environment.

## **1 选择被改造建筑的要求**

### **Requirement on building selection for reconstruction**

**1.1** 用于改造为方舱医院的建筑宜为单层或多层建筑，建筑结构、耐火等级、防火分区、安全疏散、消防设施和消防车道等满足现行规范相关要求。

Building to be reconstructed into MH shall be single storey or multi-storey, while building structure, fire-proof degree, fire prevention section, safe evacuation, fire-fighting facilities and traffic lanes shall be in accordance with current local rule and requirement.

**1.2** 选址应尽量远离居民区、幼儿园、小学校等城市人群密集活动区，远离易

燃易爆有毒有害气体生产储存场所。应在医院外围设置并设有危险标识，既有建筑与周边建筑物之间应有不小于20米的绿化隔离间距。当不具备绿化条件时，其隔离间距应不小于30米。

The site shall be remote from densely populated urban area such as residential area, kindergartens, schools and etc. Also, it shall be remote from storage site of inflammable, explosive, poisonous and harmful gases. Warning board shall be placed outside the MH, while isolated greening strips shall be at least 20 meters between existent building and its surroundings. At least 30 meters shall be remained if there are no greening strips.

**1.3** 被改建建筑入口处应有停车以及回车场地，能满足救护车辆的快速抵达以及快速撤离，做到对外交通便捷、内部联系顺畅、基本医疗保障设施齐备、无障碍设施齐全、并为临时停车和物资周转留出场地，用地周边宜有较为完备的安防设施。场地应有搭建临时房屋或帐篷、停放移动检验室、移动CT室等临时医疗设施，以及临时厕所、盥洗和相应的污水处理设施的空间。建筑内部空间便于迅速搭建隔断，可选择如会展中心、体育馆、大型厂房、仓库、宿舍等设施设备及消防基础条件较好的建筑。

Converted building shall have parking lots and turnarounds in the entrance to allow fast drop-off and pick-up for emergency vehicles. The existent building shall be accessible from the outside while connect well from inside, ensuring basic medical devices, accessible facilities, convenient passenger and materials drop off zones, fully geared security and protection appliances. Temporary houses, tents, mobile testing labs, mobile CT rooms, toilets, bathrooms, and relevant places for sewage treatment shall be available onsite. Buildings with proper equipment and good condition of fire protection such as exhibition center, stadium, big factory, warehouse, dormitory, where internal space can be easily partitioned is highly recommended.

**1.4** 建筑物的平面布置、结构形式、层高、通风空调、给排水、供配电、通讯信息、消防等市政配套及室内设施设备应能够或经改造后基本满足方舱医院的使

用要求。

Masterplan, structure form, height, HAVC, water supply and drainage, power supply and distribution, telecommunication, fire-fighting of the existent building, nearby municipal supporting conditions and indoor facilities should basically meet the requirements demand of MH or at least meet after renovation.

**1.5** 应选择结构状况良好的既有建筑，宜采用简便方法对房屋结构状况进行评估。宜为框架结构或大跨度结构，便于内部拆改。

Building to be converted shall be structurally safe, and can be easily tested for the structure condition. Frame or large span structure is recommended for its convenient indoor dismantle or conversion.

## **2 方舱医院改建内容要求**

### **Requirement on MH Conversion Details**

**2.1** 方舱医院的改造内容包括：室外市政设施、污水处理设施、建筑内部分隔、建筑内部设施设备、对外交通通道、人员物资进出运输通道、相邻环境防护与改善、卫生防疫、生物安全、安全防护等方面。原则上只进行建筑内部使用功能改造和场地设施改造。

Conversion details includes: outdoor municipal facilities, sewage treatment facilities, indoor partitions, indoor facilities and appliances, traffic lanes to outside, traffic lanes for people and materials, isolation and improvement of surrounding area, hygiene and pandemic prevention, biosafety, safe prevention and protection and etc. Theoretically speaking, indoor functions and site facilities shall be concerted only.

**2.2** 改造后至征用结束期间该建筑只能作为方舱医院使用，不得兼作他用。

Buildings shall be used as MH only from conversion to the completion of being taken

over.

**2.3** 改建后的方舱医院应满足当地卫健部门、疾控部门与驻场医护团队的要求。

The built MH shall meet the demand of local department of hygiene and health, department of disease control and onsite medical staff.

**2.4** 建筑物如不满足“1、选择被改造建筑的要求”中相关条款，应适当改建以适应需要。

If the existent building cannot accommodate clauses in “1. Requirement on building selection for conversion”, it shall be converted appropriately to meet the demand.

### **3 建筑平面布局及分区隔离的要求**

#### **Requirement on architectural plane layout and quarantine sections**

**3.1** 建筑平面布局需满足“三区两通道”（污染区、半污染区、清洁区；医务人员通道、患者通道）的要求，按医患分离、洁污分离的流线组织交通，采用负压通风系统，并预留适度的患者活动空间。

Architectural layout should in compliance of “THREE AREAS AND TWO PASSAGES” (contaminated area, semi- contaminated area, clean area; medical staff passage and patient passage). Medical staff passage shall be separated from patient passage, while clean area shall be separated from contaminated area, negative pressure ventilation system shall be adopted, enough places shall be allocated for plant facilities and patient active area.

**3.2** “三区两通道”具体要求如下：污染区包括轻症患者接收诊疗的区域，如病床区、观察救治室、处置室、污物间以及患者入院出院处理室。清洁区包括更衣室、配餐室、值班室及库房，半污染区指位于清洁区与污染区之间、有可能被

患者血液体液等污染病毒的区域，包括医务人员的办公室、治疗室、护士站、医疗器械等处理室、内走廊等。医务人员通道、患者通道完全分开。“污染区、半污染区和清洁区”可以用不同色彩标识区分。

Detailed requirement for “THREE AREAS AND TWO PASSAGES” are as follows, contaminated area includes treatment area for confirmed cases with mild symptoms, area for hospital beds, observation and treatment room, disposal room, medical material disposal room, contaminated material room and rooms for patients to proceed hospital discharge and admission. Clean area includes dressing room, food preparation room, duty room and warehouse. Semi-contaminated area refers to those between clean area and contaminated area, which includes places where could be potentially contaminated by patients’ blood or body fluid, such as medical staff office, treatment room, nurse station, medical device treatment room and internal walking passage and etc. Different colors shall be applied to differentiate contaminated, semi-contaminated and clean area.

**3.3** 合理设计诊疗卫生流程，清洁区进出污染区出入口处分别设置进入卫生通过室和返回卫生通过室。进入流程为：“一次更衣-二次更衣-缓冲间”以供医护人员穿戴防护装备后，从清洁区进入到污染区。返回流程为：“缓冲间-脱防护服-缓冲间-脱隔离服淋浴-更衣”后，从污染区返回清洁区，返回卫生间通过应男女分设。

Appropriately design diagnostic and treatment flow. Two rooms shall be placed between clean area and contaminated area, namely entrance and exit passage room. Entrance flow is dressing room I, dressing room II, buffer room, which allows medical staff to put on protective gears before entering contaminated area from clean area. Exit flow is buffer room, protective clothing undressing, buffer room, isolation clothing undressing, bathing, cloth changing, medical staff then enter clean area from contaminated area, but male and female for separate paths.

**3.4** 各区域应设置明显标识或隔离带，病床区应做好床位分区、男女分区，每

区床位不宜大于42床，每个分区应有2个疏散出口，分区内任一点至分区疏散出口的距离不大于30米，分区之间应形成消防疏散通道，高大空间内分区间消防疏散通道宽度不宜小于4米。分区内通道及疏散通道地面应粘贴地面疏散指示标志。分区隔断材料应选用难燃材料或不燃材料，表面耐擦洗，高度不宜小于1.8米。床位的排列应保持合适的距离，利于医生看护和治疗，平行的两床净距不宜小于1.2米，并设置床头柜。双排床位（床端）之间的通道净距不宜小于1.4米，单排床时床与对面墙体间通道净宽不宜小于1.1米。

Obvious signage or isolation strips shall be available in different areas. Area for hospital beds shall be divided into sections where each section no more than 42 beds. Also, female patients need to be separated from males. Two emergency exits shall be ready for each section, and no more than 30 meters from anywhere in the section to the emergency exit. Firefight evacuation passage shall be available between sections, with width of at least 4 meters in open and broad space. Indicating signage shall be available on the ground of internal passage between section and emergency evacuation passage. Partition materials shall be anti-inflammable with surface can easily cleaned, and height of at least 1.8 meters. Hospital beds equipped with bedside tables shall be parallel for the convenience of medical staff with at least 1.2 meters in between. In case of double-row beds, at least 1.4 meters shall be remained between ends of close beds. In case of single-row beds (very rare circumstance), at least 1.1 meters shall be remained between bed end and wall.

**3.5** 改建后各楼层或高大空间内容纳的人数应根据现有疏散楼梯及安全出口的疏散宽度确定，疏散楼梯间或高大空间安全出口净宽度按当地消防规范或按100人不小于1米计算。

The numbers of people accommodated by converted building of each floor or open and big space shall be determined by existent evacuation exit width. The net width of evacuation exit shall comply with local firefighting design rules, or base on at least 1 meter of 100 people.

**3.6** 病患和医护人员厕所须分开设置，病人厕所使用临时厕所，临时厕所区域



与病房区域之间设置专用通道；优先选用泡沫封堵型移动厕所，厕所数量按照男厕每20人/蹲位、女厕10人/蹲位配置，可依据病人实际需求适当增加，厕所位置应在建筑下风向并尽量远离餐饮区和供水点。临时厕所等的病人生活污水与洗浴废水必须经过消毒处理，严禁未经消毒处理或处理未达标的病区污水、医疗污水、病区污物直接排放。建筑原有厕所和沐浴区仅供身体健康的医务工作人员、后勤保障人员使用。

Toilets for patients and medical staff shall be separated. Patients use temporary toilets while special passage shall be allocated between toilets and area of hospital beds. The foam-sealed mobile toilets are preferred. The number of toilets shall be configured according to the standards of 20 people/squatting position for men's rooms and 10 people/squatting position for women's rooms, and additional more toilets may be allocated according to the actual requirements of patients. The toilets shall be located at the leeward of the buildings and as far away as possible from catering areas and water supply points. The domestic sewage from temporary toilets and other facilities for patients, and bathing wastewater must be disinfected. It is strictly prohibited to directly discharge untreated or substandard ward sewage, medical sewage and ward solid waste. The existing toilets and bathing areas of the buildings are allocated only for healthy medical staff and logistic support workers.

**3.7 无障碍设计：**主要出入口及内部医疗通道应有到达各医疗部门的无障碍通道。既有建筑内部通道有高差处宜采用坡道连通，坡度宜符合无障碍通道要求，并确保移动病床及陪护人员同时通过的必要宽度。

Accessibility design: The main entrances and exits and internal medical passages shall be equipped with the wheelchair-accessible ramps to all medical departments. The existing internal passages of buildings with a height difference shall be connected with ramps, and the ramps shall be designed according to the accessibility requirements, and in a width necessary for passage of both moving sickbeds and nursing staff.

**3.8 配套设施辅助用房：**病人入口要设置个人物品的寄存、消毒和安检用房，病人男女更衣室等。转院患者和康复患者的出口要有消毒和打包区域。此外还可在病区附近设置紧急抢救治疗室、处置室、备餐间、被服库、开水间、污洗间、生活垃圾暂存间（污洗间、暂存间宜靠外墙，并临近污物出口）等用房。可在医护清洁工作区设置配液（药）室、药品库房、无菌物品库、备餐间、休息值班室、办公室等用房。

Allocation of auxiliary rooms: The entrance for patients shall be equipped with rooms for storage of personal belongings, disinfection and security check, men's lock room and women's locker room, etc. The exit for patients to be transferred to another hospital and for recovered patients shall be equipped with a disinfection and packing area. In addition, the emergency treatment room, treatment room, pantry room, linen room, boiling water room, filth cleaning room and temporary storage room for domestic waste may be allocated near the ward zone (the filth cleaning room and temporary storage room should be close to the exterior wall and the sewage outlet). The medical and nursing clean area may be allocated with infusion preparation room (pharmacy), pharmaceutical warehouse, sterile warehouse, pantry room, rest room for duty staff, office and other rooms.

## **4 结构安全的要求**

### **Requirements for Structural Safety**

在方舱医院的改造和建设过程中，应对建筑物的安全进行评估，避免采用存在安全隐患的建筑进行改造。进行改造设计时，凡涉及到使用荷载可能超过原楼面设计活荷载时，结构设计人员应取得相关荷载资料据实进行复核，并根据复核结果采取相应措施。重点注意如下方面：

The buildings shall be evaluated in the aspect of safety before conversion into MHs, to avoid any potential safety hazards. In the design, under the circumstance that the service load may exceed the original design floor live load, the structural designer shall review the relevant load data and take corresponding measures according to

the review results. Focus shall be paid on the following items:

**4.1** 有较重的医疗设备时，应根据设备荷载信息及其平面布置图进行复核，并根据复核结果分别采取不处理（设备荷载小于设计活荷载）、加固或更换布置位置（设备荷载大于设计活荷载）。

If heavy medical equipment is allocated, the equipment load information and layout plan shall be reviewed, and corresponding measures shall be taken according to the review results, including no change (the equipment load is less than the design live load), reinforcement or position change (the equipment load is greater than the design live load).

**4.2** 在楼面上布置隔断时，应根据隔断的平面布置图和隔断材料的荷载信息进行复核，并根据复核结果分别采取不处理（隔断荷载小于设计活荷载）、加固或采用更轻质的隔断材料（隔断荷载大于设计活荷载）。

When partitions are arranged on the floor, the layout plan of partitions and the load information of partition materials shall be reviewed, and corresponding measures shall be taken according to the review results, including no change (the partition load is less than the design live load), reinforcement or replacement with lighter material (the partition load is greater than the design live load).

**4.3** 当有较重的移动设备时，应根据移动设备的重量和移动路线图进行复核，并根据复核结果，采取相应措施。

When heavy mobile equipment is allocated, the weight of the mobile equipment and movement route shall be reviewed, and corresponding measures shall be taken according to the review results.

**4.4** 改建新增隔断应安装稳固，连接紧密。

New partitions shall be installed firmly and connected securely.

## 5 消防设施要求

### Requirements for Fire-fighting Facilities

**5.1** 原有消防设施设备应能正常使用。确保应急疏散照明能正常使用。地面分区疏散指示标志设置清晰。原有安全出口满足要求，且保持畅通。

The existing fire-fighting facilities shall be in normal operating conditions. It is necessary to ensure emergency evacuation lighting is in normal operating conditions. Ground evacuation signs for zones shall be clearly visible. The existing emergency exits shall meet the requirements and shall be kept clear.

**5.2** 应按严重危险级场所配置相应数量灭火器，建筑灭火器配置按当地消防规范执行。

The corresponding number of fire extinguishers shall be allocated according to the standard for the place with critical hazard level, and the fire extinguishers shall be allocated for the buildings according to the local fire protection rules.

**5.3** 贵重设备用房、病案室和信息中心（网络）机房等应设置气体灭火装置。

The rooms for valuable equipment, medical record room and computer room of information center (network), etc. shall be allocated with gas extinguishers.

**5.4** 方舱医院内若无室内消火栓系统时，应增设消防软管卷盘或轻便消防水龙，其布置应满足同一平面至少有1股水柱能达到任何部位的要求。

If there is no indoor fire hydrant system in the buildings to be converted, fire hose reels or portable fire cocks shall be allocated additionally, and the layout shall meet the requirement that at least one jet of water can be delivered to any part on the same plan.

**5.5** 医护、医技工作区内的每名医护人员应配备一具过滤式消防自救呼吸器，

自救呼吸器应放置在方舱医院内醒目且便于取用的位置。

Each medical worker in the medical care and medical technology areas shall be allocated with a filtering respiratory protective device for self-rescue from fire, which shall be placed in an eye-catching and easily accessible position in MHs.

**5.6** 护士站宜配置微型消防站，移动式高压细水雾贮水量宜为 100L。

The nurse station should be allocated with a micro fire station, and the mobile high pressure water mist storage should be 100L.

**5.7** 条件许可的情况下，应确保改造后的火灾自动报警及消防联动控制系统可靠运行。

Where the conditions are available, it shall be ensured that the transformed automatic fire alarm and fire protection linkage control system can operate reliably.

## **6 给排水的要求**

### **Requirements for Water Supply and Drainage**

**6.1** 给水系统应采用断流水箱供水方式，且应配置消毒设备。供水系统应采用断流水箱加水泵的给水系统，当改建项目采用断流水箱供水确有困难时，应依据《建筑给水排水设计标准》GB50015的规定，分析供水系统产生回流污染的危险等级，并符合下列规定：

Water supply systems should be equipped with break tanks and disinfecting equipment. Water supply systems should consist of break tanks and pumps. When it is practically difficult to adopt break tanks, analyses of backflow pollution grades of the water supply system should be carried out. Following regulations should be observed.

**6.1.1** 当产生回流污染的风险较低，且供水压力满足要求时，供水系统应采用减压型倒流防止器防止回流污染；

When the risk of backflow pollution is relatively low and the supply pressure meets the requirements, water supply systems should adopt reduced-pressure type backflow preventers to prevent backflow pollution.

**6.1.2** 当风险较高时，应采用断流水箱供水方式。

When the risk is relatively high, break tanks should be adopted.

**6.2** 卫生间和洗浴区给水管与卫生器具及设备的连接应有空气隔断或倒流防止器，不应直接相连。生活给水应设有防止管道内产生虹吸回流、背压回流等污染的措施。

Water supply pipes and sanitary ware in toilets and bathing areas should not be connected directly, instead there should be air isolation or backflow preventer equipment between them. Certain measures should be adopted in the water supply system to prevent pollution which can be induced by siphon backflow and back-pressure backflow in pipes.

**6.3** 洗浴区生活热水系统宜采用集中供应系统，宜采用空气源热泵，当采用电热水器时，必须带有保证使用安全的装置。

It is advisable that centralized supply systems with air source heat pumps be adopted for domestic hot water supply in bathing areas. When electric water heaters are adopted, safety devices should be provided.

**6.4** 每个病区应单独设置饮用水供水点，供水点应能足额提供常温直饮水、开水。生活用水水质应符合《生活饮用水卫生标准》GB5749。开水系统也可采用瓶装水饮水机供应。

Each ward should have its own drinking water supply point which could provide sufficient room temperature direct drinking water and boiled water. Water quality of

domestic water should comply with **Sanitary Standard for Domestic Drinking Water** (GB5749). Bottled water dispensers are acceptable for the supply of boiled water.

**6.5 污水、污物处理。**临时移动厕所等部位的生活污水与洗浴区生活排水必须经过消毒处理。污水处理参考《疫源地消毒总则》(GB19193-2015)、《医院污水处理技术指南》等相关要求，达到《医疗机构水污染物排放标准》GB18466或生态环境部《新型冠状病毒污染的医疗污水应急处理技术方案》(环办水体函[2020]52号)的水质要求后排放。

Sewage Treatment. Sewage from temporary portable toilets and wastewater from bathing areas should be disinfected according to **General Guidelines of Disinfection in Epidemic Foci** (GB19193-2015) and **Technical Guidelines for Hospital Wastewater Treatment**. Sewage treatment should meet requirements in **Standards for Discharge of Wastewater in Medical Institutions**. (GB18466) or those in **Technical Scheme for Emergency Treatment of Novel Coronavirus-infected Medical Wastewater** issued by Ministry of Ecology and Environment before discharge.

病区对外弃置的粪便、呕吐物和污、废水必须进行杀菌消毒。不得将固体传染性废物、各种化学废液弃置和倾倒入下水道。严禁未经消毒处理或处理未达标的病区污水、医疗污水、病区污物直接排放。

Faeces, vomit and wastewater from wards should be disinfected before discharge. Solid infected waste and various chemical wastes should not be disposed of and discharged into the sewer. Direct discharge of ward wastewater, medical sewage and ward waste without adequate disinfection which meets certain standards is strictly prohibited.

**6.6 室外临时搭建供病患使用洗浴区排水应密闭管道系统收集，应经消毒后排入污水系统。**

Wastewater from temporary outdoor bathing areas should be collected with air-tight piping system and get disinfected before being discharged into the sewage system.

**6.7** 医院空调冷凝水应分区集中收集，间接排水，随各区污废水集中处理。

Condensed water should be collected, discharged indirectly and treated together with wastewater within each zone.

**6.8** 在急救车辆停放处，应设冲洗和消毒设施。冲洗和消毒废水应排入污水系统，排水口应采取水封措施。

Washing and disinfecting facilities should be equipped for ambulance parking spots. Washing and disinfecting wastewater should be discharged into the sewage system and the outlets should be treated with water seals.

**6.9** 排水系统中的每个用水器具都应该自带水封或外置水封，水封深度不得小于50mm。且应采取防止水封破坏的技术措施。严禁采用活动机械活瓣替代水封。

All water appliances within the drainage system should either have water seals or be equipped with external water seals. The depth of water seals should not be smaller than 50mm. Safety measures should be adopted to protect water seals from damage. It is strictly prohibited to replace water seals with movable mechanical valves.

**6.10** 临时移动厕所管道排水宜与洗浴区排水分开收集，排水通气系统均应独立设置。

Temporary portable toilets and bathing areas should have respective sewage systems with independent vent pipes.

**6.11** 室外临时搭建供病患使用的卫生间、洗浴区等雨棚的排水宜经消毒处理后排入污水系统。

It is advisable that rainwater from canopies of temporary outdoor toilets and bathing areas for patients be disinfected before being discharged into the sewage system.



**6.12** 洗手盆不得采用盆塞。

Plugs should not be used in wash basins.

**6.13** 排水管应采用不收缩、不燃烧、不起尘材料密封；排水管上的通气管口必须设置高效过滤器或其他可靠的消毒设备，通气口四周的通风条件应良好。排水管上的通气管口不得接入空调通风系统的排风管道内。

Drainpipes should be sealed with unshrinkable, incombustible and non-dusty material. Outlets of vent pipes on drainpipes should be equipped with high efficiency particulate air filters or other reliable disinfection equipment. Draft condition around vent pipe outlets should be good. Outlets of vent pipes on drainpipes should not be connected into exhaust pipes in the HVAC system.

## **7 通风空调的要求**

### **Requirements for Ventilation and Air Conditioning**

**7.1** 应根据设定的清洁区、半污染区和污染区分别设置送、排风系统，严格控制气流流向按不同压力梯度从清洁区→半污染区→污染区。清洁区宜以自然通风为主，不具备自然通风条件时，应设置机械通风。半污染区和污染区宜以机械通风方式为主。

The air inlet and exhaust systems should be set according to the set clean area, semi-polluted area and polluted area. The airflow direction should be from the clean area → semi-polluted area → polluted area according to different pressure gradients. The clean area should be dominated by natural ventilation. When natural ventilation is not available, mechanical ventilation should be provided. Semi-polluted and polluted areas should be dominated by mechanical ventilation.

**7.2** 采用自然通风时，每人的通风量应不小于226立方米/小时（60升/秒）。

When natural ventilation is adopted, the ventilation rate per person should be not less than 226 cubic meters per hour (60 liters per second).

**7.3** 利用宿舍、酒店等独立房间设置隔离病房时，每个房间的换气次数应不小于6次/小时。利用会展中心、体育馆、厂房等高大空间设置隔离病房时，每人的通风量应不小于150立方米/小时（40升/秒）。

When using separate rooms such as dormitories and hotels to set up isolation wards, the number of air changes in each room should not be less than 6 times / hour. When using isolated spaces in convention and exhibition centers, gyms, and factories to set up isolation wards, the ventilation volume per person should not be less than 150 cubic meters per hour (40 liters per second).

**7.4** 原有空调和排风系统可以利用时，应设置为直流式送、排风系统，空调机组关闭回风阀，封堵回风口，新风阀全部开启，全新风送入，排风量应大于送风量（排风机风量不够时，可开启排烟风机或增加排风风机），排风机入口处均加装初中高效过滤器。原有空调和排风系统无法利用或未设置通风系统的，应增设机械通风系统。需临时加装机械排风系统时，宜选择风量、风压合适的风机箱，排风口设置高度距地不高于2米，并设置安全防护措施。通风系统要求24h不间断运行。

When the original air-conditioning and exhaust system is available, it should be set as a DC-type air supply and exhaust system. The air-conditioning unit closes the return air damper and blocks return air inlet. The outdoor air damper is fully opened, and the outdoor air is sent in. The exhaust air volume should be greater than the supply air volume (if the exhaust fan volume is not enough, you can turn on the smoke extraction fan or increase the exhaust fan), and the junior high efficiency filter is installed at the inlet of the exhaust fan. If the original air-conditioning and exhaust system cannot be used or there is no ventilation system, a mechanical ventilating system should be added. When temporarily installing a mechanical exhaust system, it is advisable to select an air casing with an appropriate air volume and air pressure,

set the exhaust outlet to a height not higher than 2 meters, and set up safety protection measures. The ventilation system requires 24 hours uninterrupted operation throughout.

**7.5** 送、排风机（口）的设置位置应形成合理的气流通道，气流流程宜短捷并覆盖全部病房区域，以利于污染空气的快速排放。

The setting position of the intake and exhaust air fans (ports) should form a reasonable airflow channel. The airflow process should be short and cover all the ward area to facilitate the rapid discharge of polluted air.

**7.6** 医护人员从清洁区进入到污染区的“一次更衣室”设置不小于 30 次/小时的送风，各相邻隔间设置 D300 的通风短管。医护人员从污染区返回清洁区，在“脱隔离服间”设置不小于 30 次/小时的排风或系统服务区域不小于 6 次/小时的排风，各相邻隔间设置 D300（或计算确定）通风短管。

After the medical staff went from the clean area to the contaminated area, while setting the supply air or system service area no less than 30 times / hour in the "one dressing". D300 short ventilation ducts are set in each adjacent compartment. After the medical staff returned from the contaminated area to the clean area, while setting up the exhaust air which is not less than 30 times / hour or system service area which is not less than 6 times / hour, in the "de-isolated service room". Each adjacent compartment is provided with a D300 short duct.

**7.7** 每个隔离病房区域，设置若干台具有杀菌消毒功能的空气净化器，需要设置升温设施的宜每个床位设置电热毯和若干台电热油汀。

In each isolation ward area, set several air purifiers with sterilization and disinfection functions. Electric heating blankets and several electric oil heaters should be installed in each bed where heating facilities are required.

**7.8** 隔离病房应设置卫生间、盥洗间，排风应满足换气次数不小于 12 次/时，并应经高效过滤后排放。

Isolation wards shall be provided with toilets and restrooms, and the exhaust air shall meet the ventilation rate of not less than 12 times / hour, and shall be discharged after high-efficiency filtering.

**7.9** 应根据实际情况设置送、排风机的安装位置，应确保新风取自室外，新风取风口及其周围环境必须清洁，保证新风不被污染。室外排风宜高空排放，且与任何进风口水平距离不得小于 20 米或垂直距离不得小于 6 米。

The installation location of the blower and exhaust fan should be set according to the actual situation. It should be ensured that the fresh air is taken from the outside. The fresh air outlet and the surrounding environment must be clean to ensure that the fresh air is not polluted. The outdoor exhaust should be discharged at a high altitude, and the horizontal distance from any air inlet should not be less than 20 meters, or the vertical distance should not be less than 6 meters.

**7.10** 污染区空调的冷凝水应集中收集，并应采用间接排水的方式排入医院污水排水系统统一处理。

The condensate water of the air conditioner in the contaminated area should be collected centrally and discharged into the hospital's sewage drainage system for unified treatment by indirect drainage.

**7.11** 宜随时监测送、排风机故障报警信号，保证风机正常运行；随时监测送排、风系统的各级空气过滤器的压差报警，及时更换堵塞的空气过滤器，保证送、排风风量。

It is advisable to monitor the alarm signal of the air supply fan and exhaust fan at any time to ensure the normal operation, to monitor the pressure difference alarm of the air filters at various levels of the air supply and exhaust system at any time, and to replace the blocked air filter in time to ensure the air volume of the fan.

**7.12** 排风高效空气过滤器更换操作人员须做好自我防护，拆除的排风高效过滤器应当由专业人员进行原位消毒后，装入安全容器内进行消毒灭菌，随医疗废弃物一起处理。

Exhaust high efficiency air filter replacement operators must be self-protected. Dismantled exhaust high efficiency air filters should be disinfected in-situ by professionals, put into safe containers for disinfection, and dispose of them with medical waste.

**7.13** 高大空间设置的方舱医院，气流组织明显不利的区域，如增设排风口困难，应集中设置具有杀菌消毒功能的空气净化器，并优先设置工业用空气净化器。

In the MH with a large space, where the airflow organization is obviously unfavorable, if it is difficult to add an exhaust outlet, an air purifier with sterilization and disinfection functions should be concentrated set, and an industrial air purifier should be given priority.

**7.14** 仅能通过外门负压补风的方舱医院，如外门处风速过大，应采取增设挡板等措施减少风速对病人的影响。

For MHs that can only supply air through the negative pressure of the external door, if the wind speed at the external door is too high, measures such as adding baffles should be adopted to reduce the impact of the wind speed on the patients.

**7.15** 应根据需要配置一定数量的移动式氧气瓶，以满足病人吸氧需要。

A certain number of mobile oxygen cylinders should be configured according to the needs to meet the oxygen demand of patients.

## **8 电气及智能管理的要求**

### **Requirements for Electric and Intelligent Management**

**8.1** 改建场所的供电能力应满足改建后负荷的用电需求，改建增设的配电线路应满足保护灵敏度的要求。

The power supply capacity of the converted building should meet the demand of power load for the new function after conversion. The addition of distribution power lines should meet the requirements of protection sensitivity.

**8.2** 改建区域的配电箱、控制箱宜设置在污染区外，有条件时宜置于专用房间内。

It is advisable to keep distribution boxes and the controllers of the site away from the contaminated areas and to place them in a special room, if possible.

**8.3** 通风设备控制箱宜采用成套定型产品，并由护士站（值班室）集中控制。

It is advisable that standard product packages be used for controllers of ventilation equipment which could be put under the centralized control of nurse stations (duty offices).

**8.4** 有条件时，每个床位应设置 1-2个220V、10A单相插座并配置台灯；条件欠缺的场所，可在大开间周边分区域设置多组单相电源插座箱，方便患者手机充电使用。有条件设置电热毯时，电热毯供电宜配置单独供电回路，集中、分时控制，以减少火灾隐患。

When conditions permit, each bed should be provided with 1-2 220V, 10A single-phase sockets and table lamps; in places with insufficient conditions, multiple groups of single-phase power socket boxes can be set in the surrounding area of the large open room, which is convenient for patients to charge their mobile phones. When required to install electric blankets, they should be equipped with a separate power supply circuit, with a centralized and time-sharing control to reduce fire hazards.

**8.5** 有条件时可在大开间周边墙上增设一些照明灯具，或地面增设一些立杆灯，增设的灯具宜带不透明罩或采用间接照明，以减少原建筑顶部照明灯具的眩光影响。

In order to reduce the glare effect of luminaires on the top of existing building, it is advisable to add some luminaires and pole lights with opaque lamp shade or indirect illumination on the peripheral walls of large-bay areas or on the ground, if circumstances permit.

**8.6** 改建增设的照明、插座回路，应采用30mA剩余电流动作保护器。

Additional luminaires and socket circuits should be equipped with residual current operated protective devices of 30mA.

**8.7** 应提供无线网络接入条件，保证4G或5G网络全覆盖。有条件的场所，应增设无线AP实现WIFI全覆盖。

Accesses to wireless networks should be provided for the complete coverage of 4G/5G networks. If circumstances permit, a wireless AP should be added to achieve the complete coverage of WIFI.

**8.8** 地面增设的照明、插座电源线路及弱电线路应采用金属管（槽）敷设，管（槽）的敷设宜避开人员通行及货物运输通道，无法避开时应采取必要措施。

Additional ground luminaries, power socket circuits and weak-current circuits should be installed with metal conduits (slots). It is advisable that layout of conduits (slots) should avoid personnel and logistics passageways. Necessary measures should be taken when it's impossible to avoid them.

**8.9** 在医疗场所及其他需要灭菌消毒的场所需设置紫外杀菌灯或空气灭菌器插座。紫外杀菌灯应采用专用开关，不得与普通灯开关并列，并有专用标识。平时有人滞留的场所若采用紫外杀菌灯，宜采用间接式灯具或照射角度可调节的灯具。

The places which provide medical treatment and necessitate disinfection need to be equipped with sockets for ultraviolet lamps or air sterilizers. Ultraviolet lamps should have identifiable specific switches which could not be parallel to those of ordinary lamps. If ultraviolet lamps are used in places with human presence, it is advisable to use indirect-type lamps or those which have adjustable angles.

**8.10** 医疗设备间、淋浴间或有洗浴功能的卫生间等处，应设置辅助（局部）等电位联结。

Medical equipment rooms, bathrooms toilets with shower areas should be equipped with auxiliary (local) equipotential bondings.

**8.11** 在护士站（值班室）设置一键报警按钮，接入医院安防系统。护士站应考虑大功率设备用电，宜由两个插座回路供电。

Nurse stations (duty offices) should be equipped with one-button alarm system which links with the security and safeguard system. Nurse stations should allow for the power supply of high-power appliances and it is advisable to have two sockets circuits for power supply.

**8.12** 病患休息区、护士站宜实现视频监控覆盖。

It is advisable to apply video surveillance systems to patient rest areas and nurse stations.

**8.13** 改建的弱电及智能化系统当有线布线无条件实施时可采用无线方案替代。

When conditions for the wiring of new weak-current and intelligent system do not exist, wireless solutions could be adopted.

**8.14** 改建后的信息化管理系统应按管理部门要求共享相应信息。

Information management systems should share corresponding information as



required by administrative departments.

**8.15** 广播和信息发布系统需设置公共广播系统，可利用原有场所的公共广播系统改造，并将前端接入护士站；或设置临时广播系统，临时广播系统宜采取分散式无线联网方案。

Broadcasting and information-distribution systems need to be equipped with public broadcasting systems. It is acceptable to make use of old ones in the original sites and to connect the wiring port into nurse stations. Temporary broadcasting systems which adopt the scheme of distributed networks are also acceptable.

**8.16** 宜配置多参数生命体征检测仪，实现病患生命体征自动采集，并自动上传保存记录。

It is advisable that module hospitals be equipped with multi-parameter vital signs detectors which collect patients' vital signs and upload records automatically.

**8.17** 宜配置基于会议视屏的可移动式集成远程会诊终端。

It is advisable that module hospitals be equipped with mobile integrated remote consultation terminals based on conference video.

**8.18** 人员进出通道宜设置无接触式快速体温测量设备。

It is advisable that accesses for personnel be equipped with non-contact rapid body temperature measurement equipment.

**8.19** 宜配置消毒机器人、物流机器人等提供无接触服务。

It is advisable that module hospitals be equipped with disinfection robots and logistics robots which enable various non-contact services.

## **9 现场施工要求**

### **Requirements for Site Construction**

**9.1** 采取设计、采购、施工、验收一体化建设模式，设计、采购、施工高度融合，设计、施工等单位在施工现场密切配合，同步进行。

Adopt the integrated construction mode of design, procurement, construction and acceptance by integrating the design, procurement and construction when units of design and construction cooperate closely and proceed simultaneously at the construction site.

**9.2** 分区、分段、分作业班组按照模块化、标准化、装配式的要求进行施工，避免班组之间交叉作业，工序之间留出合理时间间隔。

The zone division, operation segmentation, and work teams detachment should be carried out during the construction in accordance with the requirements of modularization, standardization and assembly, to avoid cross-work between teams and set reasonable aside time intervals between procedures.

**9.3** 按建筑平面及分区隔离布局的设计要求组织隔断墙施工，隔断墙体采用轻质防火材料。以分隔单元为检验批，对隔断墙刚度、强度和稳定性及连接处密封性进行检查验收。

The partition wall construction shall be organized according to the design requirements of the building plane and quarantine partition layout. The partition wall shall be made of the lightweight fireproof materials. Take the partition unit as the inspection batch, check and inspect the rigidity, strength and stability of the partition wall and the tightness of the joint.

**9.4** 应对穿隔断墙管道和附于隔断墙内的设备采取局部加强措施，轻质隔断墙

与顶棚或与其它墙体的交接处应采取防开裂措施。

Special partial strengthening measures shall be taken at such places where pipelines passing through the partition wall and the equipment attached to the partition wall, and the crack prevention measures shall be taken at the junctions of the light partition wall with the ceiling or with other walls.

**9.5** 对通风空调、建筑电气等相关指标进行检测，确保满足设计和相关标准规范要求。

Check and test all the relevant indicators of ventilation, air conditioning, and building electricity to ensure that they meet the requirements of design and relevant standards and specifications.

**9.6** 加强现场作业人员的防疫安全管理。在各出入口设置固定的测温点，并且设置流动测温人员，每四小时随机进行流动测温，工作人员均应正确戴口罩，避免人员交叉感染。对施工场地采取通风措施，保持空气通畅。对施工期间的卫生间和办公场所每6个小时进行一次消毒。

Strengthen the epidemic prevention and safety management of all on-site operators. Fixed temperature measuring points shall be set at each entrance and exit, and set the mobile temperature measuring personnel to conduct a mobile temperature measurement randomly every four hours. The staff should wear masks correctly to avoid cross-infection. Ventilate the construction site to keep the air flowing. Disinfect the toilets and offices every 6 hours during construction.

**9.7** 施工现场严禁吸烟。加强施工场地的消防安全，减少明火作业，并按消防要求设置灭火器或微型消防站。

Smoking is strictly prohibited at the construction site. Strengthen the fire safety at construction sites, reduce the open flame operations, and set up fire extinguishers or mini fire stations in accordance with the fire protection requirements.

**9.8** 设置双回路备用电源，分区设置漏电保护器，做好施工用电和运营阶段的用电安全。

The dual-circuit backup power supply should be set up, and the leakage protector should be installed in different zones to ensure the safety of power consumption during construction and operation.

## **10 其他要求**

### **Other Requirements**

**10.1** 垃圾处理：各病区单元设置套有医疗废弃物垃圾袋并加盖的专用垃圾桶。生活垃圾放置在专用垃圾桶内，每日清理或随时清理。清理前用含有效氯500mg/L~1000mg/L的含氯消毒液喷洒或浇洒垃圾至完全湿润，作用30分钟后送往专门储存医疗废物的房间集中存放。医疗废弃物垃圾和病患生活垃圾（视同医疗废弃物）应由医院管理部门统一收集、交由相关职能部门确定的有资质的单位运送到指定的地点进行无害化处理。

Refuse disposal: Each unit of the ward is equipped with clinical capped garbage bins covered with medical waste garbage bags . Non-medical waste placed in dictated trash bins, and shall be cleaned up daily or instantly. Before dump trash bins, use chlorine-containing disinfectant which contained 500mg/L-1000mg/L available chlorine to spray or pour on the trash until completely wet. After 30 minutes, send the waste to the dedicated clinical waste storage room for centralized storage. Clinical waste and domestic waste produced by patients (regarded as clinical waste) will be unified collected by the hospital administration, then transport to appointed place for harmless treatment by qualified institutions certificated by relevant functional departments.

**10.2** 方舱医院临时厕所的卫生状况需要及时巡查、清洁卫生，巡查人员需穿着防护服。

The sanitary condition of contemporary toilets in MHs need to be inspected and cleaned up instantly, inspection staff should wear protective suits.

**10.3** 应在显著位置张贴建筑平面及洁污分区布局图，并指示安全出口位置、应急逃生路线，日常管理需保证消防通道畅通。建立与辖区消防队站的联动机制，制定灭火和应急疏散预案，院外配置1辆消防车辆。

Layouts of building plans and clean-dirt partition should be prominently displayed, indicated with emergency exit locations and escape routes. Daily management shall ensure that the fire passages are unblocked. Establish linkage mechanism with district fire station, formulate pre-proposal on fire fighting and emergency evacuation. One fire engine is equipped outside the hospital.

**10.4** 病媒消杀：以鼠类、蟑螂和蝇类为重点防控对象进行病媒消杀。重点区域为储物库、垃圾堆放点、污染物处理场所、杂物间及厕所等。

Disinfection: Disinfection focuses on the prevention and control of rats, cockroach and flies. Key areas are storage rooms, garbage dump points, pollutant disposal sites, utility rooms and toilets.

**10.5** 方舱医院运行过程中要加强安全巡查，如发现隐患须及时整改到位。

Strengthen the safety inspection during the process of operation of MHs, any detected risk or hidden dangers must be promptly and properly solved.