Operation and Management Guidelines for Nationally-Designated Inpatient Beds

February 2017

The Ministry of Health and Welfare

The Korea Centers for Disease Control and Prevention

< Table of Contents >

Part 1. Introduction and Features of Nationally-Designated Inpatient Beds Responding to Emerging Infectious Diseases

** Translator's note: Part 2 and Part 3 have not been translated yet.*

PART I

Introduction and Features of Nationally-Designated Inpatient Beds Responding to Emerging Infectious Diseases

Chapter 1. Overview

I. Background

1. Purpose of the Installation and Operation of Nationally-Designated Inpatient Beds

- Responding in case of patients with Severe Acute Respiratory Syndrome(SARS), Animal Influenza in humans, Pandemic Influenza(PI), Middle East Respiratory Syndrome(MERS), Emerging Infectious Disease Syndrome, and Infectious Diseases spread through Bioterrorism.
- An Infectious Disease Control Institutions equipped with Infectious Disease Control Facilities for preventing infection, such as negative pressure facilities and proper decontamination spaces, to curb secondary infections in hospitals, secure the safety of healthcare providers, and prevent spread to local communities

2. Legal Basis

- *Infectious Disease Control and Prevention Act of Republic of Korea* Article 36[1] and 37
- *Regulations on the Operation of Nationally-Designated Inpatient Beds* (Korea Centers for Disease Control and Prevention (KCDC) Rules, Subparagraph 299)

3. Definition of Terminologies

- “Nationally-designated inpatient beds” (hereafter “inpatient beds”) is an infectious disease management facility established and operated with the support of the Director of the KCDC to isolate and provide inpatient care for patients with emerging infectious disease and the likes,” under “ordinary times” or “national public health emergency”
- According to the crisis alert levels defined by the standard manual for the infectious diseases crisis management, the “ordinary times” refers to the level blue; the “national public health emergency” refers to all levels of yellow, orange, and red
- “Patients with infectious diseases and the likes” refers to those that the head of the KCDC determines as requiring inpatient treatment among confirmed and suspected cases, carriers, and any persons who have been in contact with them.
- The “Healthcare facility that operates nationally-designated inpatient beds” (hereafter “healthcare facility”) refers to the Infectious Disease Control Institutions that establish and operate nationally-designated inpatient beds

[1] *Infectious Disease Control and Prevention Act of Republic of Korea* Article 36, (Designation of the Infectious Disease Control Institutions, etc.) ① The Governor of a municipality or the head of city/county/district can designate a Healthcare facility under the *Medical Service Act* as an Infectious Disease Control Institution, as prescribed by the Ordinance of the Ministry of Health and Welfare. ② The head of a Healthcare facility designated pursuant to paragraph 1 (Referred to as "Infectious Disease Control Institutions") has to establish facilities for preventing infectious diseases and screening infectious disease patients (Referred to as "Infectious Disease Control Facilities") as prescribed by the Ordinance of the Ministry of Health and Welfare. ③~⑤ omitted

- A “negative pressure isolation area” refers to an area engineered to maintain lower air pressure compared to other areas of the building for the purpose of treating high-risk infectious disease cases; it includes patient rooms, auxiliary rooms, and other essential support facilities
- A “non-negative pressure area” refers to an area adjacent to the negative pressure area; equipped with facilities like a nursing station to prepare the treatment of infectious disease patients and monitor the patients’ condition
- A “negative pressure isolation room” refers to a room where a patient with infectious disease can be hospitalized:
  - The room is constantly maintained with negative pressure; it includes shower facility and lavatory directly accessible from the patient room. The pressure in the lavatory with a toilet is set the lowest so that the air flows from the patient room to the lavatory
- A “general isolation patient room” refers to the patient room, which was prepared with the support of the nationally-designated inpatient beds project prior to 2015 that lacks negative pressure facility
- An “anteroom” refers to an area reserved for preparing basic infection control and for preventing airborne infection; it helps to maintain a stable air pressure in the negative pressure area; it includes “patient room anteroom” and “corridor anteroom”
  - “Patient room anteroom” refers to an area between the negative pressure isolation room and the internal corridor; it is reserved for the preparation of infection control; it prevents the leakage of air into the internal corridor when entering and exiting the room
  - “Corridor anteroom” refers to an area between the non-negative pressure area and the internal corridor; usually set to a negative pressure in order to maintain the negative pressure in the internal corridor
- “Internal corridor” refers to a corridor inside the negative pressure isolation area; it connects the patient room anteroom, corridor anteroom, PPE doffing room, waste disposal room, and equipment storage room
- “Required support facility” refers to the “PPE doffing room,” “waste disposal room,” “equipment storage room,” etc.
- “PPE doffing room (hereafter doffing room)” refers to a space connected to the internal corridor where healthcare providers who completed patient care take off personal protective equipment (PPE) before entering the general area
  - It includes shower room, dressing room reserved for after shower, etc. and may include additional decontamination spaces to prevent respiratory and contact transmission.
  - The PPE donning room may be built outside the negative pressure area; in the case of space constraints, nursing station and PPE storage area can be used
- “Waste disposal room” refers to a space healthcare wastes generated during the treatment are sterilized or stored before disposal; it is connected to the internal corridor; it is set to a negative pressure lower than the internal corridor. A sterilizer may be installed if necessary
- “Equipment storage room” refers to a space reserved for storing or disinfecting mobile equipment used for the treatment of the patients with infectious diseases and the likes; it is connected to the internal corridor
- “HEPA filter or filter equivalent or higher” refers to a filter with a decontamination function equivalent or higher than that of HEPA filter (which can remove 99.97% or more of the 0.3μm particles)

4. Operation Status and Planning

- As of 2006, 566 rooms (194 negative pressure and 372 general) are under construction in 29 hospitals nationwide, starting with the National Medical Center and the Armed Force Capital Hospital
  - In 2015, the government expanded the construction of negative pressure isolation rooms with increased budget (in 10 existing locations and 10 new locations)

Table 1: Nationally-designated inpatient beds and negative pressure room expansion before and after comparison table

Number	City province	Hospital name	Before expansion		After expansion		Remark
			Single patient room	Shared room (# beds x # rooms)	Single patient room	Shared room (# beds x # rooms)	
1	Seoul	National Medical Center	2	5 x 3	4	5 x 3	Existing
2		Seoul National University Hospital	2	2 x 2	7	0	Existing
3		Seoul Medical Center	5	-	10	-	Existing
4		Chung Ang University Hospital			4	-	New
5		Hanil General Hospital			3	-	New
6	Gyeonggi	Armed Forces Capital Hospital	3	-	3	-	
7		Myongji Hospital	2	2 x 2	7	2 x 2	Existing
8		Seoul National University Bundang Hospital			9		New
9	Incheon	Incheon Medical Center	1	2 x 2	7	0	Existing
10		Inha University Hospital			4		New
11		Gachon University Gil Hospital			5		New
12	Gangwon	Gangneung Medical Center	1	2 x 2	1	2 x 2	
13		Kangwon National University Hospital			3		New
14	Daejeon	Chungnam National University Hospital	1	2 x 2	8	0	Existing
15	Chungbuk	Chungbuk National University Hospital	2	2 x 1 3 x 2	2	3 x 2 2 x 1	
16	Chungnam	Dankook University Hospital	1	2 x 2	7	0	Existing
17	Jeonbuk	Chonbuk National University Hospital	1	4 x 1	4	4 x 1	Existing
18		Wonkwang University			3		New

		Hospital					
19	Gwangju	Chonnam National University Hospital	1	2 x 2	7	0	Existing
20		Chosun University Hospital			5		New
21	Jeonnam	Mokpo National Tuberculosis Hospital	2	4 x 2	2	4 x 2	
22	Gyeongbuk	Dongguk University Gyeongju Hospital	1	2 x 2	1	2 x 2	
23	Daegu	Daegu Medical Center	1	2 x 2	1	2 x 2	
24		Kyungpook National University Hospital			5		New
25	Ulsan	Ulsan University Hospital	5	-	5	-	
26	Gyeongnam	Gyeongsang National University Hospital	1	2 x 3	1	2 x 3	
27	Busan	Pusan National University Hospital	5	-	5	-	
28		Busan Medical Center			5		New
29	Jeju	Jeju National University Hospital	2	2 x 1	7	2 x 1	Existing
Total			39	31(79)	135	21(59)	
			70(118)		156(194)		

II. Applicable Standards

1. Applicable Facilities

- Infectious disease management facilities under Article 36 and Article 37 of the *Infectious Disease Control and Prevention Act of Republic of Korea* (hereinafter referred to as the "Act") and the first clause of Article 2[2] of the *Regulations on the Operation of Nationally-Designated Inpatient Beds*

2. Applicable Infectious Diseases

- Among the infectious diseases proclaimed by the Ministry of Health and Welfare as per the Article 41 of the Act, those with extremely high risk of transmission; they include Severe Acute Respiratory Syndrome (SARS), Animal influenza virus, Influenza A(H1N1)pdm09 virus, Middle East Respiratory Syndrome (MERS), emerging infectious disease syndrome, infectious diseases spread through bioterrorism, etc. that require isolation
- Other infectious diseases that the director of the Korea Centers for Disease Control and Prevention decide as requiring isolation and inpatient treatment at nationally-designated inpatient bed

3. Individuals Subject to Inpatient Treatment

- Infectious disease patients corresponding to diagnosis criteria for infectious diseases listed above (Table 2 related to the fourth clause of Article 6 of the Enforcement Rules)

[2] *Regulations on the Operation of Nationally-Designated Inpatient Beds*. Article 2 (definition). Terminologies used in this law are defined as follows.

① “Nationally-designated inpatient bed (“inpatient bed” hereafter)” refers to infectious disease management facilities in which special facilities and equipments are installed in a separate compartment in order to prevent the infection of patients and healthcare providers as well as the spread of microorganisms in the process of treating patients with emerging infectious diseases and etc. under ordinary times and under “national public health emergency” (“emergency” hereafter).

②~④ omitted

Chapter 2. Definition of Isolation Inpatient Treatment

I. Purpose and Basic Principles

- To prevent the infection of other patients and healthcare providers in the process of treating patients with infectious diseases; to suppress the transmission of causative pathogens to the community
- Isolation methods are applied depending on the mode of transmission of each pathogen and the condition of each patient
- The methods and procedures for isolation inpatient isolation treatment accord with Table 2[3] of Article 23 of the Enforcement Rules of the Infectious Disease Prevention

[3] Table 2 of the *Enforcement rules of the Infectious Disease Control and Prevention Act of Republic of Korea*. Methods and Procedures for Home Treatment and Inpatient Treatment (Relating to Article 23); 1~2 omitted

3. Inpatient Treatment Methods

A. During the period of inpatient treatment for infectious diseases, except for infectious diseases which may spread via the respiratory tract (hereinafter "respiratory infectious diseases"), patients must be hospitalized in a single-person room equipped with a sink and a toilet in a healthcare facility designated by the infectious disease management facility, governor of a municipality, or head of city/county/district. In case the treatment in a single patient room is not possible, patients may be placed together in a room with another patient with the same disease or a patient with low risk of reinfection.

B. In the case of respiratory infectious diseases, the patient must be treated in a single patient room in a healthcare facility designated by the infectious disease management facility, governor of a municipality, or head of city/county/district. This single-person room must have a negative pressure facility once the door has been closed and independent air circulation. If a negative pressure facility is unavailable, the patient must be treated in a separate, freestanding facility. In case the treatment in a separate facility is not possible, the patient may be isolated together with another patient as long as measures are taken to protect the other patient from infection via the respiratory tract.

C. Patients under inpatient treatment must be prohibited from leaving their room and moving around during the treatment period.

D. All discharge, secretions, excrement, etc. from a patient under inpatient treatment must be strictly controlled; contaminated items should be disinfected.

E. Visitors, including healthcare providers, should be restricted to the minimum. All visitors must wear PPE such as disposable gloves, etc., wash hands, and take other measures to prevent the spread of infectious disease.

F. Medical devices used for the treatment of these patients must be disposable; they need to be disposed of immediately after each use. Devices inadequate for single use such as thermometers, etc., should be allowed exclusive use on a single patient.

4. Inpatient Treatment Procedures, etc.

A. Once a patient is admitted for inpatient treatment, the healthcare provider, the head of the infectious disease management facility, or the head of the healthcare facility who examined and/or diagnosed the patient should immediately report to the director of the Local Public Health Center.

B. Upon receiving the report, the director of the Local Public Health Center must immediately confirm inpatient treatment.

C. The duration of inpatient treatment shall last from the time the patient is found to have an infectious disease until all symptoms disappear and the patient is determined as no longer infectious.

D. The head of the healthcare facility and healthcare providers at the facility shall release any patient who, through treatment, has become eligible for release. They must report the release immediately to the director of the Local Public Health Center, who shall immediately confirm the release.

E. Carriers who show no symptoms but are still infectious shall receive ongoing treatment under the purview of the director of the Local Public Health Facility; until they are determined as no longer infectious, they shall receive inpatient treatment in a healthcare facility or be treated at home.

II. Function of Isolation Inpatient Beds

- Treatment
  - Because healthcare providers in PPE are conducting multiple types of tests and treatments, the isolation inpatient beds require special equipment and more space compared to a general ward.

- Prevent the spread of infection
  - Patients with infectious diseases and the likes are examined and treated in patient rooms in which negative pressure is maintained by the air circulation systems so as to prevent secondary infections within the hospital and the transmission of infectious pathogens through contacts

- Secure Safety for Healthcare Providers
  - The safety of healthcare providers is secured through routine facility and equipment check-ups and training and education of infectious disease control

Chapter 3. Facility Standards of Inpatient (Isolation) Beds

I. General Information

- Inpatient treatment beds are affiliated facilities within a hospital, functionally connected to existing hospital facilities for easy access

- Secure an independent route so that patients with infectious diseases and the likes are able to move from the outside to negative-pressure isolation areas without going through other departments
  - When considering sites and other conditions, if infectious disease wards are placed on the second floor or above, patients and medical staff should either have a separate elevator or a separate route secured through which they can access these wards
    * Facilities created before 2015 that are unable to separate routes for patients and healthcare providers should design and implement Standard Operating Procedures (hereafter, SOPs) to prevent the spread of infection when transporting disease patients

- Physically separate the inpatient beds from the general area of the hospital and divided into negative pressure isolation areas and non-negative pressure areas

- Negative pressure isolation areas should include hallways, doffing rooms, anteroom, patient rooms and restrooms, waste disposal facilities, equipment storage areas, and so on. A nursing station should also be designed for easy observation of negative pressure isolation areas.
  * Facilities created before 2015 that do not include all of the necessary supporting facilities (doffing rooms, waste disposal facilities, equipment storage areas) should use the space within the negative pressure isolation area for such facilities; if there is not enough space to do so, facilities should design and implement SOPs for disinfecting doffing rooms, waste disposal facilities, and equipment storage areas

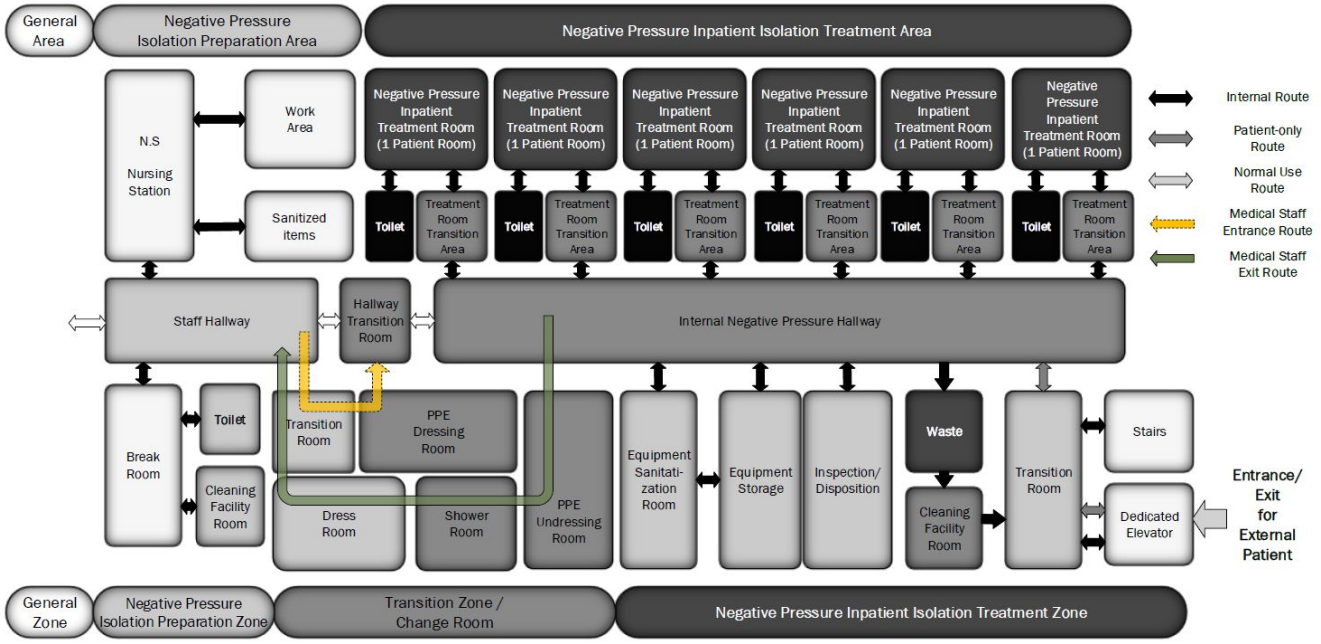


Figure 1. Example of mid-corridor negative pressure isolation inpatient treatment beds (darker color indicates stronger negative pressure)

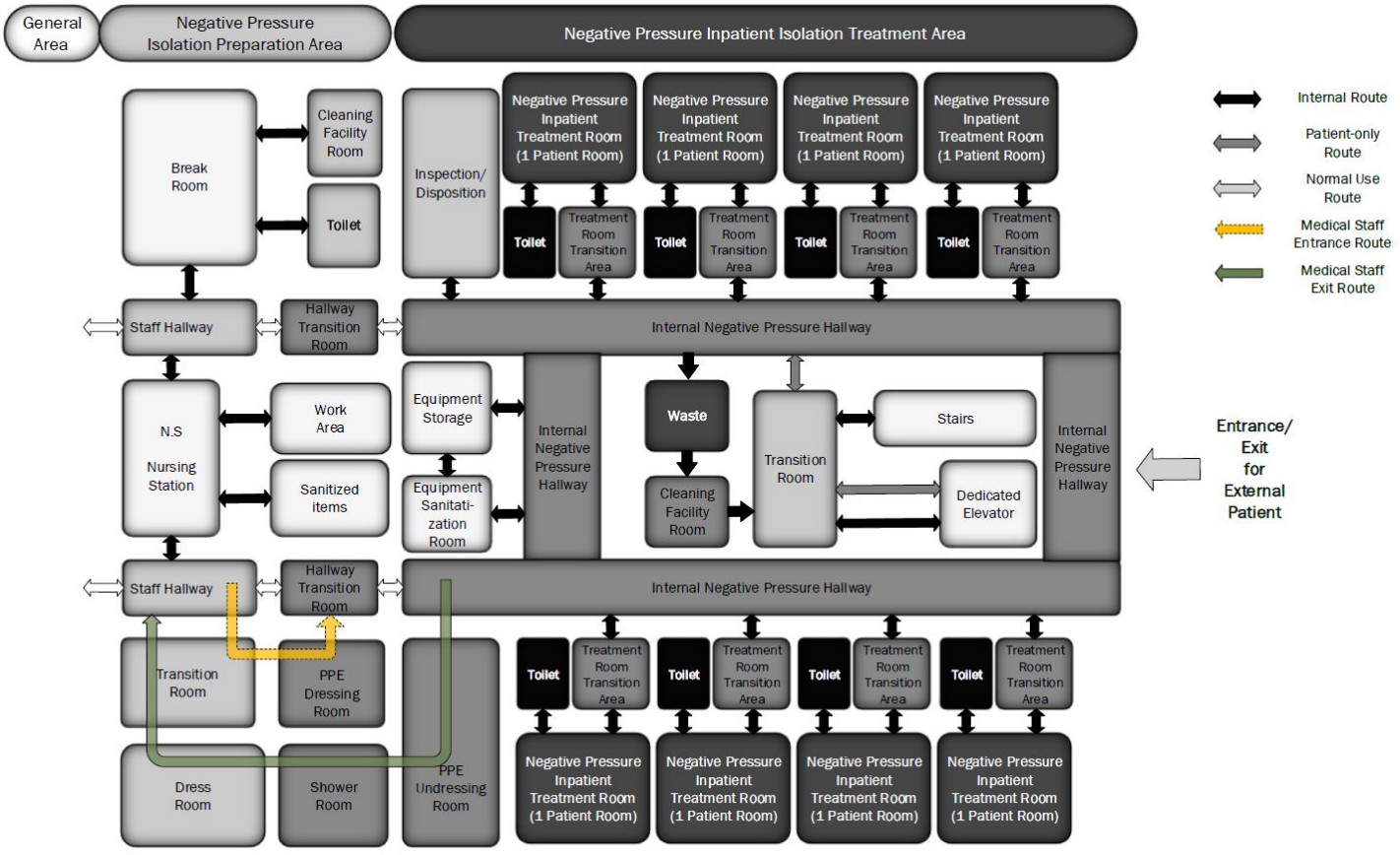


Figure 2. Example of double-corridor negative pressure isolation inpatient treatment beds (darker color indicates stronger negative pressure)

II. Facility Standards of Negative Pressure Inpatient (Isolation) Beds

1. Architectural Planning

1) Common Requirements

A. Composition of negative pressure isolation area

- Physically separate non-negative and general areas from negative pressure isolation areas
- In principle, a negative pressure isolation room should be a single room
- Secure proper dimensions of ceilings and entrances.
  - The ceiling height of hallway and isolation rooms is more than 2.4m to relieve pressure from isolation.
  - The width of major entrances of isolation rooms and anterooms is more than 1.2m to facilitate transportation of patient transport beds

B. Airtight structure

- Protect all walls, floors, and ceilings in the negative pressure isolation area from air circulation and humidity, and seal the joints of the walls
- Secure air tightness across all windows in the negative pressure isolation
- Seal attachments, such as sockets and power switches and various HVAC, sanitary, and electrical pipes, to maintain air tightness and prevent from becoming air pathways

C. Materials

- In order to maintain negative pressure, use interior materials with good sealing performance
- Use durable, water-resistant, and chemical-resistant finishing materials for ceilings, floors, and walls to prevent chemical reactions during sterilization, and use easy-to-clean methods and materials
- Round off all corners to avoid dust gathering and for easy clean up
- If curtains or blinds are required, make them easy to clean and minimize surface irregularities (Built-in blinds are recommended)
- Use antimicrobial silicone for sealing

D. Doors and windows

- In order to maintain negative pressure in the room, use airtight windows that should only be allowed to open in emergencies
- Doors on either side of adjacent rooms in negative pressure areas, such as those between patient room anteroom, corridor anteroom and donning/doffing room, should not open simultaneously (use an interlocking door system). However, the interlocking system should be manually or automatically released in case of emergencies including fires.

    - ∗ When drafting the operational plan for each hospital, prepare a patient evacuation plan (SOP) in case of emergencies including fires
  - Install automatic doors for patient room, patient room anteroom, and corridor anteroom
  - In principle, doors of patient rooms, patient room anterooms, and corridor anterooms should allow for opening and closing in a non-contact manner, and should be kept closed unless necessary
  - Installation of reinforced glass doors (at least 12mm) or observation windows (at least 0.72m^2) is recommended at the entrance of patient rooms and anterooms in the negative pressure isolation area to allow monitoring of the interior.
  - Install pass boxes to move goods between negative and non-negative pressure areas when necessary

2) Architectural Planning by Room

A. Negative pressure isolation room

- Patient room
  - To account for activities of healthcare providers, use of medical devices, and arrangement of patient furnitures and fixtures, secure at least 15m^2 of effective area (net floor area) for a single patient room, excluding anteroom, bathroom, wall, etc.
  - Secure a proper outside view from the patient's room
  - It is recommended that furniture in the patient room be hung on the wall as much as possible to prevent the spread of contamination on the floor.
  - Use built-in furniture if fixed-type is used but allow for floor cleaning
  - Seal joints of walls, ceilings, and floors airtight
- Accessory bathroom
  - In patient room, install a separate private bathroom to allow direct access to room without having to go through anteroom
  - Install shower facility but not bathtub
  - Install a sink with non-contact faucet in bathroom; wall piping is recommended for sink and facility piping
  - The floor should not accumulate water and should be non-slip
  - The floor gradient should be placed so that water from the bathroom or the shower does not flow to the hospital room
- Patient room anteroom
  - Considering transportation of patient bed, recommended area for patient room anteroom is at least 4m^2 and at least 2.4m in depth
  - Locate patient room anteroom between internal corridor and patient room in negative pressure area
  - It is recommended to install sinks with automatic faucets and wall piping
  - Do not allow patients to enter or leave at any time

B. Internal corridor

- Corridor
  - Separate the route between healthcare providers and patients entering the internal corridor

    - ∗ If the facility was built before 2015 and healthcare providers and patients cannot be separated, an SOP should be prepared to prevent infection while patients move
- Corridor anteroom
  - When moving patient beds, an area of 4m^2 and depth of at least 2.4m are recommended to maintain the door interlock on both sides of the corridor

C. Waste treatment room

- Prepare sufficient space for the temporary storage of waste from inpatient treatment, in a location from which contaminants can be safely removed
  ∗ If a facility was built before 2015 and does not have a waste treatment room, utilize a space in the negative pressure area; if this is impossible, arrange another way to safely store and handle waste in case of a public health crisis according to Article 10 of the *Regulations on the Operation of Nationally-Designated Inpatient Beds*
- Autoclave sterilization installation is recommended
- Separation of healthcare providers' route and waste removal routes is recommended

D. Doffing room

- Install a doffing room, shower room, and a post-shower dressing room at the exit of the negative pressure (isolation) area
  * If a facility does not have a doffing room because it was built before 2015, utilize a space in the negative pressure area; if this is impossible, arrange another way of installing a doffing room for PPE in case of a public health crisis under Article 10 of the *Regulations on the Operation of Nationally-Designated Inpatient Beds*
- Install a full-length mirror in the doffing room to check the process of doffing PPE, and to check if PPE is donned correctly before entering the hospital room
- Since it is used to remove contaminated PPE, make doffing room a negative pressure area, with sufficient space to properly doff PPE
- Install a dedicated waste container for the disposal of PPE in doffing room
- If necessary, use a separate decontamination room with sufficient area or an existing doffing room to decontaminate PPE before doffing

E. Equipment storage room

- Provide an equipment storage room for storage and disinfection of equipment for isolated patients within the negative pressure isolation area
  ∗ If a facility does not have an equipment storage room because it was built before 2015, utilize a space in the negative pressure area; if this is impossible, arrange another way to safely store and disinfect equipment exclusively for isolated patients in case of a public health crisis according to Article 10 of the *Regulations on the Operation of Nationally-Designated Inpatient Beds*

F. Nursing station

- Place nursing stations in non-negative pressure that is physically separated from the negative pressure area; nursing stations should be equipped to monitor pressure differences,

temperature, and humidity for all rooms in the negative pressure isolation area, and to activate alarms in case of emergency
- Nursing stations should be equipped to monitor patient status such as blood pressure, pulse, and oxygen saturation, and to communicate with patients and healthcare providers in inpatient rooms

3) Others

- If necessary, arrange proper space and facilities for the autopsy of human remains in the hospital
- If necessary, arrange a separate laboratory space to test specimens
- Designate areas to store, don and doff PPE
  - Install a full-length mirror in PPE donning/doffing room to check whether the equipment is properly donned

2. Mechanical Facilities

1) HVAC System

A. HVAC system method

- Construct HVAC systems in negative pressure isolation areas as dedicated ventilation facilities separate from ventilation facilities in other areas of the hospital
- Equip the system to prevent the spread of infection and cross-contamination caused by the backflow of air, and/or when the HVAC system stops due to power failure, mechanical failure, etc.
- Place exhaust vents near the patient, preferably on the wall near patient's head
- Install ports that can be decontaminated when replacing filters, which should be HEPA equivalent or higher
- Equip to maintain proper temperature and humidity without opening windows, but do not install fan-coil units, system air-conditioners, etc. that can cause summer seasonal bacteria (eg, Legionella)
  * If the system has established before 2011, and the fan coil for air-conditioning and heating is already installed, clean pipelines with chemicals or clean and disinfect air circulation filter regularly to prevent growth of bacteria
- A room noise level below 50dB(A) is recommended

B. Supply system

- Have a dedicated supply and exhaust system, with all-outdoor air supply
- Ventilation should occur at least 6 times per hour; 12 times or more is recommended
  - Do not recirculate emitted air from patient room and anteroom to another space even if filtered with HEPA filter equivalent or higher
- To prevent backflow of contaminated air from patient room in case of HVAC system shutdown, install HEPA filter equivalent or higher in air supply vent, or install airtight back-draft damper in air supply system in each room

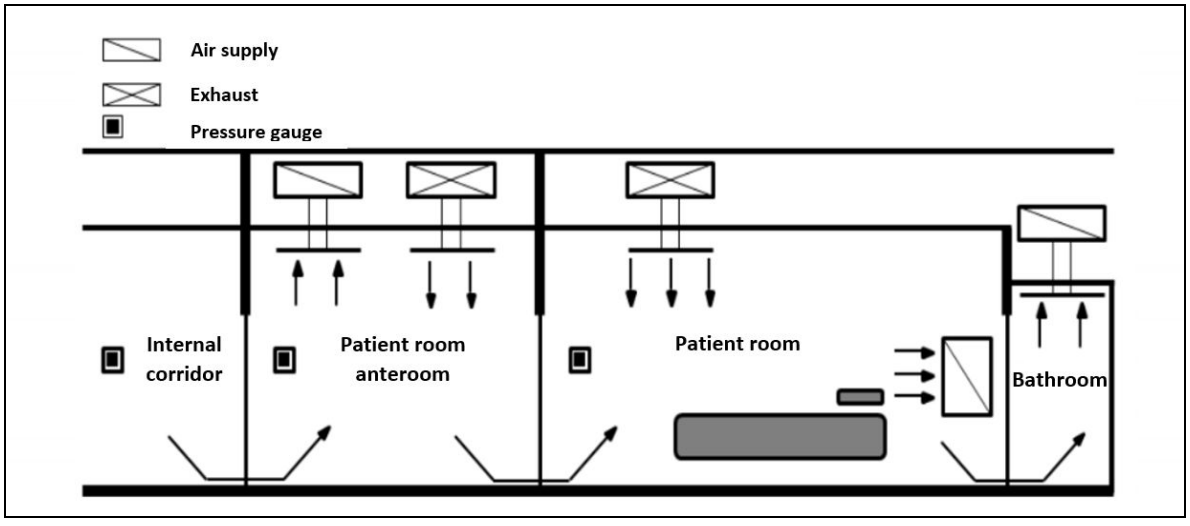
- Establish a supply-and-exhaust interlocking system to prevent leakage of contaminated air in case of malfunction; if unable to establish such a system, set air supply to start automatically after exhaust system

C. Exhaust system

- Discharge all exhaust air outdoors through a HEPA filter or a filter of the same level or higher
- Place the vent near the patient, preferably on the wall near the patient's head
- Exhaust the ducts from each room independently, and install exhaust fans at the ends. However, if each exhaust contains a filter or a back-flow prevention damper (Airtight Back Draft Damper), the ducts can be integrated from the rear end of the filter or damper.
- Install a spare exhaust fan in the negative pressure isolation areas to prepare for failures
- Install exhaust vents outside the buildings at a height of 2m or above from the ground to prevent direct venting towards pedestrian traffic, and at least 2m clear of any inlet systems.
- The system should have a larger capacity than the airflow volume needed for maintaining negative pressure
- Connect exhaust fans in the negative pressure isolation area to the UPS and the emergency back-up generator to ensure its operation during power outages

D. Negative pressure control

- Set the air pressure in the room to ensure air flows from low-polluted area to the high-polluted area: 1) non-negative isolation area 2) corridor anteroom (doffing room) 3) negative pressure corridor (internal corridor) 4) patient room anteroom 5) patient room 6) bathroom
  - Differential pressure devices are unnecessary between the bathroom and the patient room as pressure difference between the bathroom and the patient room is to prevent the flow of unpleasant odors.



- Install air supply and exhaust vents in negative pressure isolation rooms and patient room anterooms to maintain stable air pressure; however, only exhaust vents are needed in the bathrooms.
- Maintain a pressure difference of at least -2.5Pa between rooms such as the bathroom, patient room, patient room anteroom, and the internal corridor

- At exit points in negative pressure isolation areas, install pressure gauges that display air pressure to the first decimal place (0.1Pa)
- To maintain stable pressure control, install pressure controllers in a central control room
  - Only approved personnel should have access to controls
  - In the event of an emergency, the manager and healthcare providers should be able to take immediate action, and any malfunction should be automatically recorded

E. HEPA filter or equivalent filter units

- HEPA filters (or equivalent filter units) must allow scans such as PAO* tests during normal operation; they must also be sealable and sterilizable when replacing.
  (**Translator's note: Poly Alpha Olefin*)
- Keep particle transmittance rate under 0.01% upon scanning
  - When performing scans with a tube (Probe scan), the scan should include the gasket (filter mounting frame) and keep a leakage rate under 0.005%

2) Sanitary Facilities

A. Sanitary equipment

- Hand-washing facilities should allow for face-washing, and should be designed to prevent water splashing while big enough to contain hands up to the wrists
- Faucets of sanitary equipment should enable usage without touch (e.g. touchless sensor faucets)
- Wall piping recommended when installing washbasins
- Wall-mounted storage units for paper towels, detergents, and disinfectants may be installed near the hand-washing facility
- Flush-valve-type toilets are recommended for toilets in negative pressure patient rooms
- Wall-mounted toilets are recommended

B. Water and hot water supply

- Install backflow prevention valves before the terminal plumbing fixture to prevent contamination due to backflow
- Hot water should be supplied through a separate hot water supply system that prevents cross-contamination
  - However, if an effective backflow prevention valve is installed in each room, hot water supply can be recirculated
- Ensure there is no backflow through water supply pipes when connecting with toilets
- When using detergents or disinfectants, install the containers above the hand-washing facility to prevent contamination of washbasin countertops, walls, etc.

C. Drainage

- Install drain pipes and vent pipes connected to the hand-washing sink, toilets, etc. to prevent drain backflow

- Recommend that the drainpipe in the negative pressure isolation area be independently connected to a dedicated wastewater storage tank

3) Wastewater (Drainage) Treatment Facility

- Place a dedicated wastewater storage tank and include the tank into the general wastewater treatment facility after disinfecting or sterilizing
- Ensure that wastewater treatment equipment materials are suitable for chemical or thermal treatment
- Install a vent pipe in the wastewater storage tank to prevent wastewater backflow and connect a sterilization filter to the bottom of the vent pipe
- Set up equipment (e.g. mineral tanks or ozone facilities) for biological inactivation of microorganism and verification ports
- If a dedicated sterilizer is installed in the negative pressure isolation area, discharge condensate water from the sterilizer into the dedicated wastewater storage tank

4) Fire-Fighting Equipment

- Install watering devices like a fire hydrant (outside the negative pressure isolation room) in case of fire
- A fire sprinkler system should be designed to prevent malfunction
- Keep all doors in the negative pressure isolation area open automatically or manually in case of fire
- Place fire extinguishers in each room

5) Medical Gas Facility

- Oxygen and compressed air can be supplied through the general system
  - However, designated areas should be controllable through automatic shut-off valves
  - Transportable medical gas equipment can also be used
- If wall-mounted medical gas outlets are installed on the patient room wall, do not allow air to escape from the patient room
- Prevent spread of the infection to other patient through suction equipment
- In the negative pressure isolation area, set up suction equipment in each designated area as a separate system or use a mobile aspirator, and install HEPA filters (or equivalent) in the vacuum pump exhaust
- Suction tank in the machine room should be set up to enable cleaning and disinfection. Disinfect the drain used to clean the suction tank, or connect to an independent drainage system.

3. Telecommunication Facilities

1) Lighting

- All lighting should be designed to create a pleasant environment, with easily cleanable materials and structure
- Use light fixtures with airtight structures

- Localized illumination of at least 500 Lux is recommended
- To prevent contamination, install lighting with replaceable parts from the ceiling (upper parts) and/or from the interior (lower parts)

2) Back-Up Generator

- Operate back-up generator to maintain stable pressure in the negative pressure isolation areas
- Ensure exhaust fans in negative pressure isolation areas are connected to UPS* and back-up generator to maintain exhaust system function even under power outage situations (**Translator's note: Uninterruptible Power Supply*)

3) Automated Control System

- Operate HVAC system automatically (computer control)
- Install a monitoring system to display temperature and humidity, pressure differences and door sensors of each room
- Set off an alarm system to alert emergencies such as an error in pressure differences, etc.
- Record a malfunction history automatically when an emergency alarm sounds

4) Communication Systems

- Install equipment to allow video medical service and patient visits, as well as easy access to the nursing station (video calls, closed-circuit television (CCTV) cameras or wireless devices, etc.)
- Enable checking of visitors and patient status by installing CCTV cameras for monitoring patient rooms and hospital wards

III. Management of General Isolation Beds

- Keep general isolation beds prioritized for isolating close contacts of confirmed cases in case of crises
  - Make sure air flows from the corridor to the patient room and use portable negative pressure equipment when needed in general isolation rooms
  - Maintain isolation facilities to house asymptomatic close contacts with underlying medical conditions during a crisis(e.g. cohort isolation) and to serve as supporting facilities required for treating patients in negative pressure isolation rooms

Disclaimer

The original document was developed by the South Korean government and has been translated from Korean to English by a group of volunteers listed below.

This is an unofficial translation of the original in Korean for information purposes. While reasonable efforts are made to provide accurate translations, portions may be incorrect. Some files or items may not be translated including but not limited to download guides, technical articles, graphic features, photos, and certain information highly specific to one geographic region (e.g., commercial names of all clinics in South Korea, specific billing information only pertinent to South Korea). In addition, some applications and/or services may not work as expected when translated due to language restrictions. In case of discrepancy, the original Korean document will prevail.

Any person or entity that relies on translated content does so at their own risk. If you would like to report a translation error or discrepancy, please contact us (covidtranslate@gmail.com).

Contributors

Alexander Bae
Anisa Khalifa
Doyeun Kim
Elaine Minae Park
Hyewon Kim
Irene Nayoung Ye
Jennifer Ryu
Jihyun Kim
Jiseon Gwon
Jooahn Park
Jungmin Hwang
Minseo Yun
Natalie Grant
Nam Choi
Sang Woo Park
Sehyo Yune
Sohl Lee
Vivian Lee
Yoojin Chung
Younsun Kim