ESCO™ ASTER

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Esco Aster Turnkey Treatment Center for Pandemic Readiness and Response to Emerging Healthcare Needs

The Need For Esco Aster Turnkey Treatment Center (TTC)

Based on the dynamics of the COVID-19 pandemic, response interventions should be done to effectively control and mitigate the disease. As countries are experiencing different severity levels of the said disease, corresponding resource requirements (isolation, oxygen therapy, mechanical ventilation) should be tailored to address the pandemic immediately. During the first three phases of case severity, a patient's journey can be represented in Figure 1.

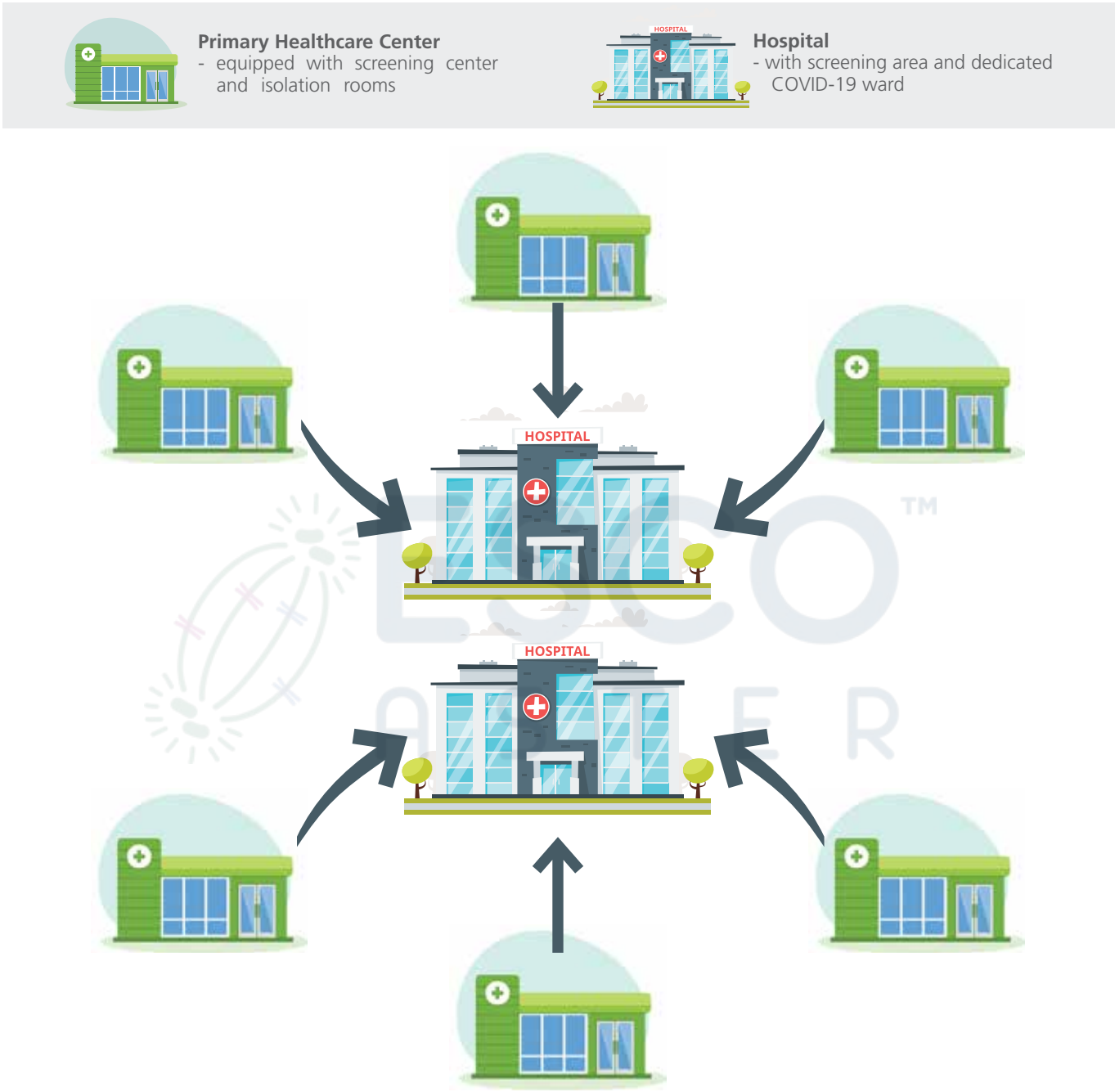

Figure 1. A primary healthcare center monitors and investigates people of having the infection, who will then be referred to the hospital for testing or treatment.

Primary Healthcare Center
- equipped with screening center and isolation rooms

Hospital
- with screening area and dedicated COVID-19 ward

Esco Aster TTC
- served as a repurposed area or tent-type screening and treatment center

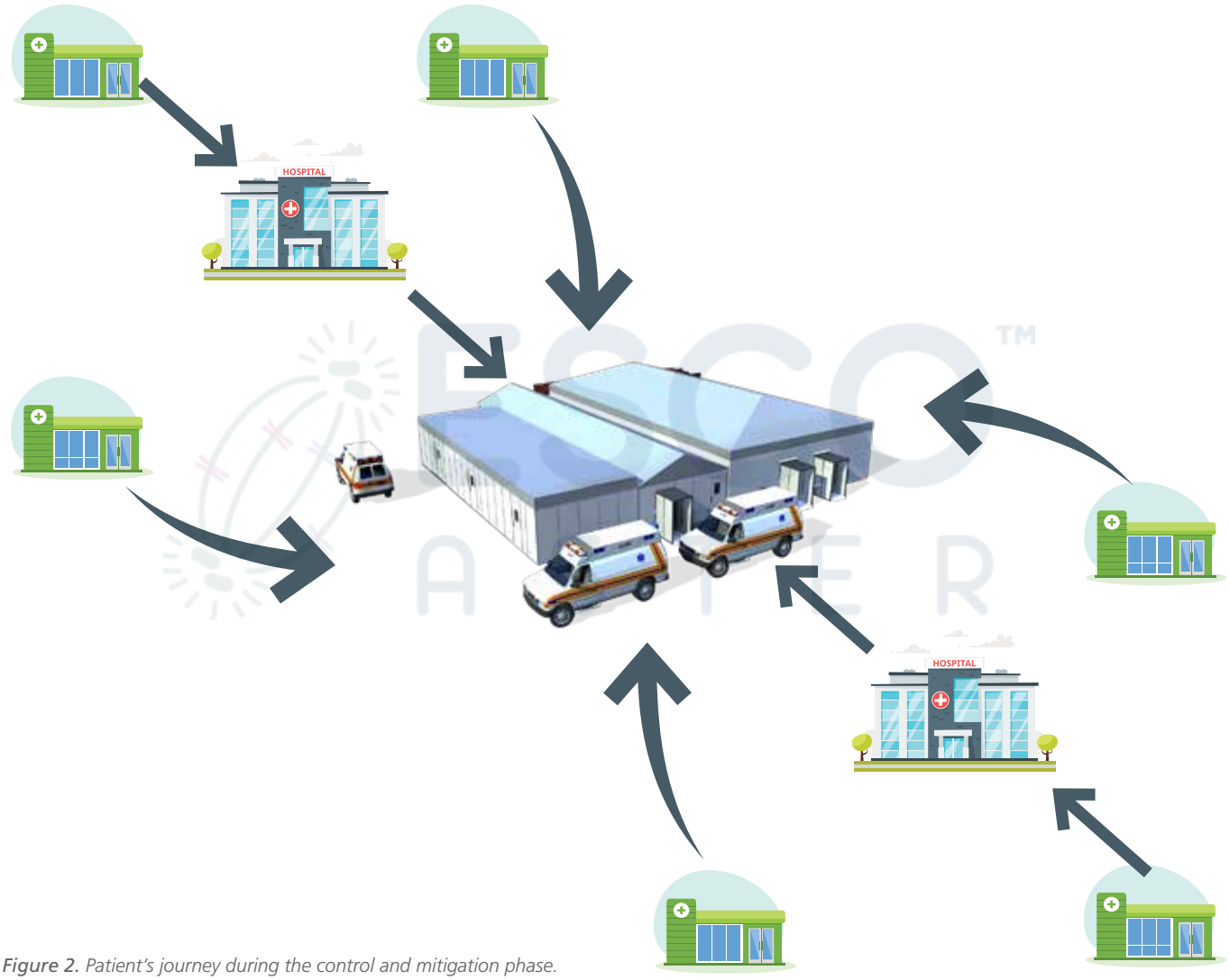

Figure 2. Patient's journey during the control and mitigation phase.

In the phase of a pandemic, the goal is to mitigate its impact and reduce its incidence, morbidity, mortality, and disruption. However, the evolution of this pandemic caused an alarming exhaustion of the public health system and biomedical supplies in some countries. In order to protect this from further expanding, it is a must to centralize specific case management to simplify referrals across hospitals, primary healthcare centers, and severe acute respiratory infection (SARI) treatment centers (Figure 2).

SARI treatment centers are needed especially in low- and middle-income countries and limited-resource settings, including those existing buildings that can be and will repurposed into a SARI treatment center. This means that no new facilities have to be built, there is a greater reduction of exposure risk to healthcare workers, patients, and communities, and acceleration in testing.

Note: *Specifications and configurations are subject to change depending on application, number of beds, site and local regulations.*
Esco Aster only provides facilities as turnkey EPC Vendor.

Key Features:

- Simple to deploy for temporary testing operations
- Exposure risk elimination for provider-patient through labelled distinctive zones
- Uninterrupted testing cycles for diagnosis and treatment acceleration
- Modular partition system with advanced ventilation as recommended by WHO
- Available in tent, drive through, or containerized (for rapid deployment) configuration

Many lock down cities, refugee camps, outbreak clusters, or states may not have nearby hospital or diagnostics.

Esco Aster TTC adapted from WHO Severe Acute Respiratory Infection (SARI) guidelines provides a modular easy to assemble and disassemble treatment center for immediate relocation to next cluster turnkey solution.

Our integrated approach brings our complete solutions to point-of-need rather than point-of-care in a decentralized manner to supplement and provide fast response to countries.

Esco Aster TTC total containment is provided to protect healthcare workers and to greatly reduce health system exhaustion.

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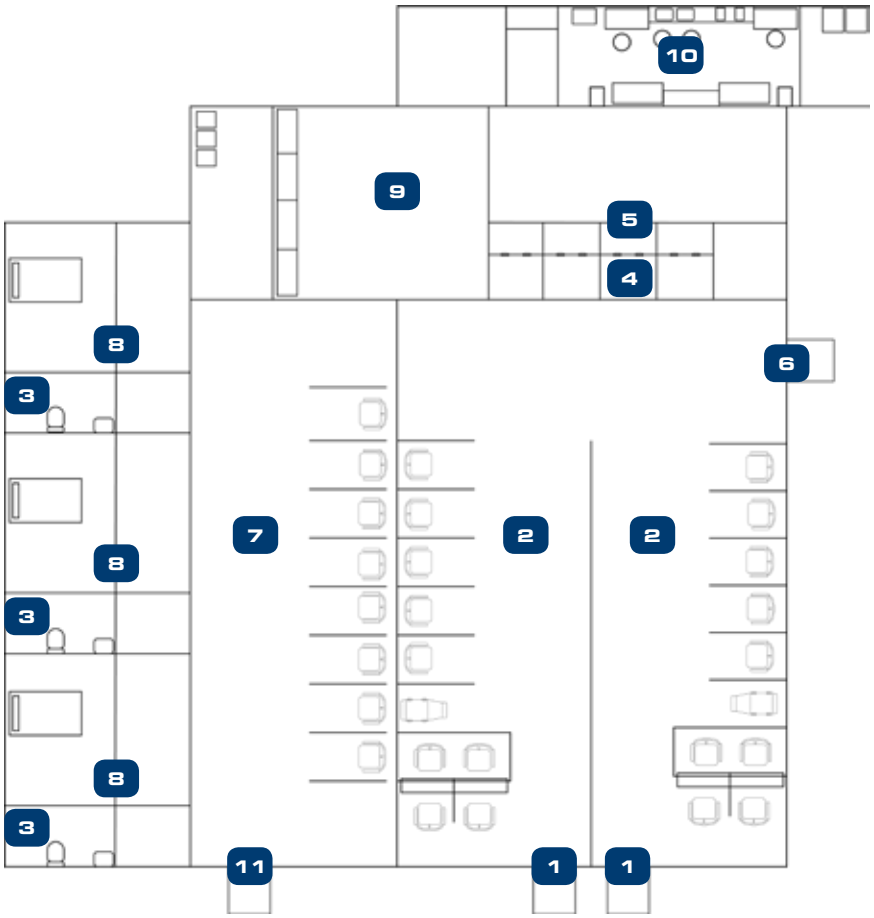
Esco Aster Treatment Center Schematics One pass only –no re-circulating air, unidirectional air flow



1. Patient Entry

All patients at this area should

- receive a mask from reception
- handwash in the dedicated area and entry to disinfection booth
- go to the dedicated booth in the waiting room as addressed by the reception

2. Waiting Room

The waiting room is composed of clearly identified and labelled individual booths partitioned with a polycarbonate material.

The room is ventilated through HEPA machines.

3. Dedicated Toilets

4. Patient Screening

Patient shall enter in the swab booth for disease screening.
Note: Screening area depends on the chosen option for swab booths

5. Staff Side Screening

Staff shall conduct screening through contained swab booths for worker protection.

6. Exit for transport to Health Facility

7. Waiting Room

This waiting room is intended for those under severe cases cohort.

8. Isolation Room (AIIR Technology)

9. Donning and Doffing Area

10. Mobile Dx Lab

11. To Treatment Center

Patient Flow in EA-TTC

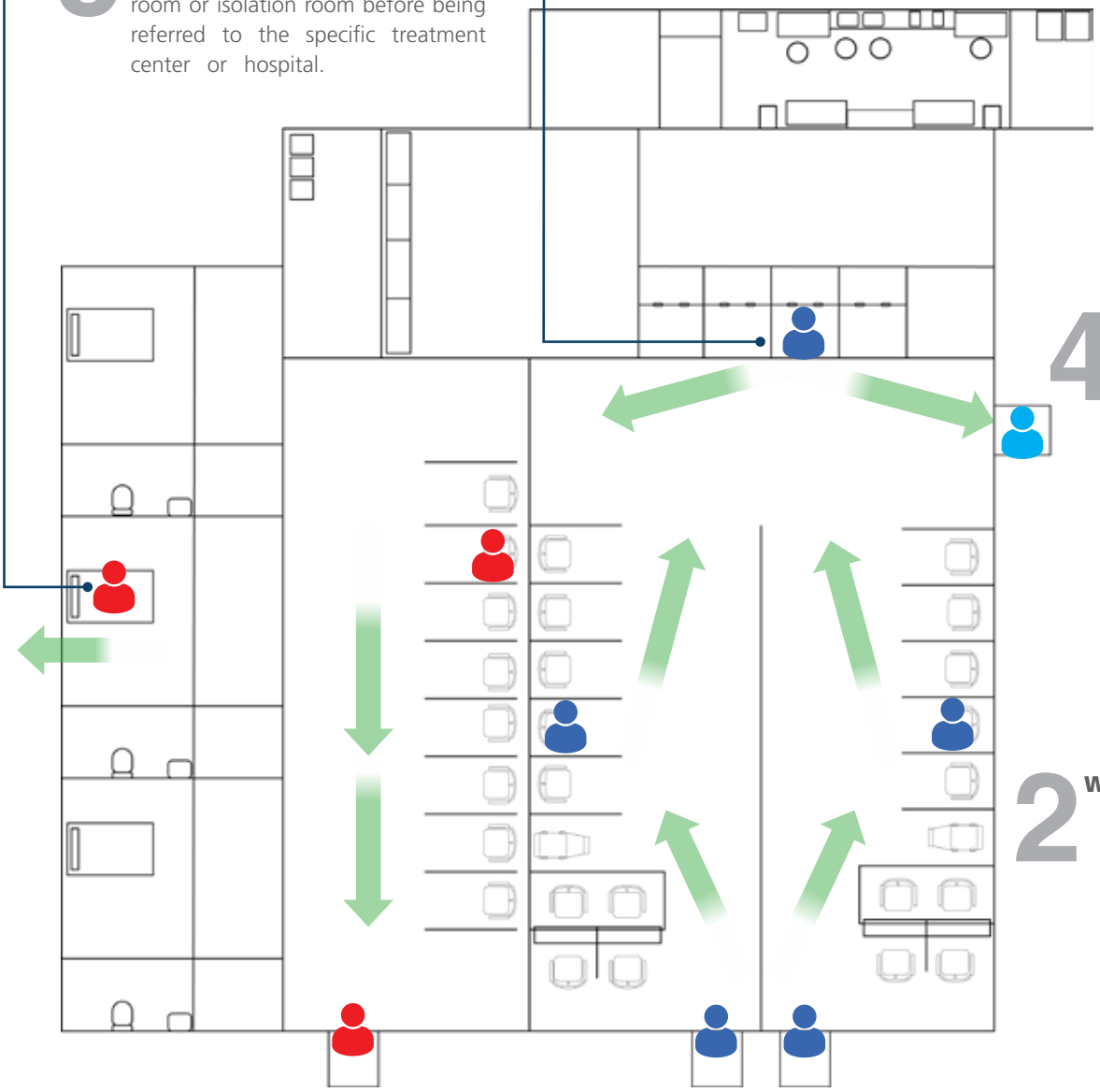
3 SCREENING

Patients are investigated and will be taken samples on the dedicated swab booths (may differ depending on client's preference). These booths completely separates and provides containment between the healthcare worker and the patient.

The facility ventilation will depend on the preferred TTC configuration.

5 SUSPECTED CASE

Patient moves into the waiting room or isolation room before being referred to the specific treatment center or hospital.



4 NON-CASE

2 WAITING ROOM

6 EXIT FOR SUSPECTED CASE

Patient will be transferred to the specific treatment center either in contained stretcher for eliminating exposure risk.

1 PATIENT ENTRY

After the triage area, the patient at this point will enter through the disinfection booth and is addressed to a dedicated waiting booth.

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Screening Area of the Esco Aster Turnkey Treatment Center (EA-TTC)

EA-TTC COVID-19 TENT LAYOUT

Makeshift Recovery and Treatment Isolation Room™ (MRTIR™)

Donning / Doffing Area

Exit Point from MRTIR™

Dedicated for transporting from isolation room to the nearest hospital, especially for sever cases

Isolation Rooms

Exit for Suspected Cases (straight to isolation rooms)

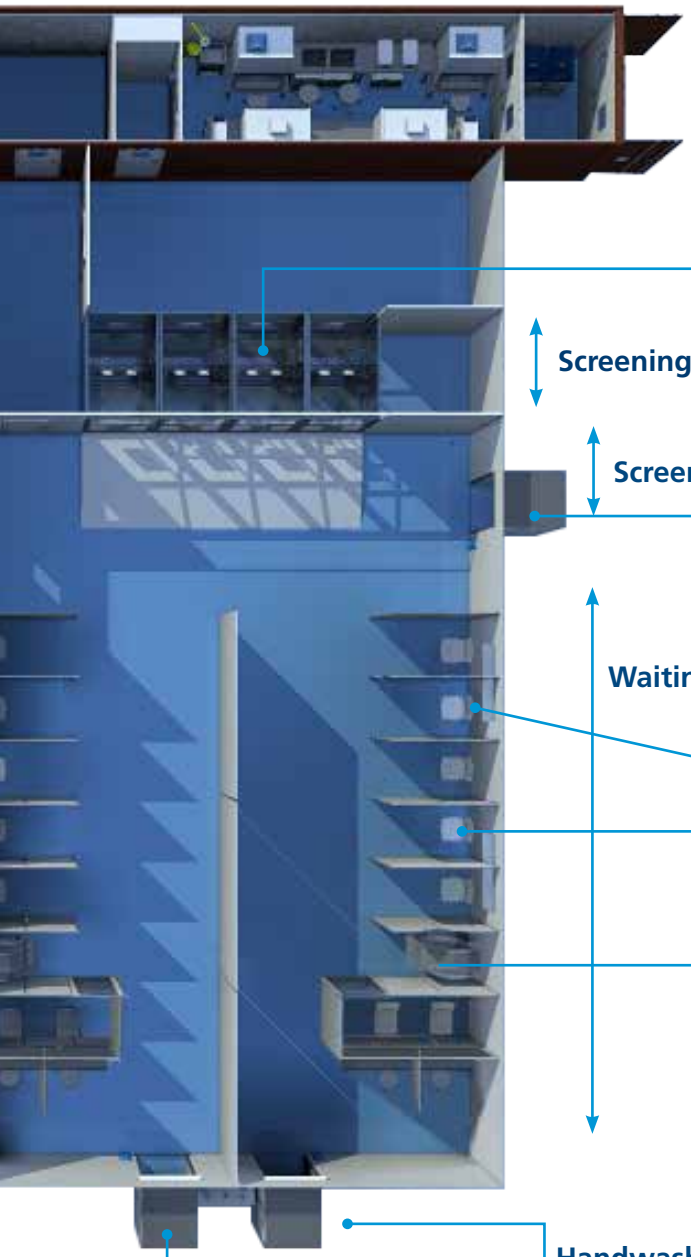
Dedicated Toilets

Exit Toward Hospital

Transport Vehicles

Dedicated transport system for referral to hospital (client's own / ambulance)

Esco Mobile Diagnostic Laboratory



SWAB BOOTHS:

- Mass Testing Swab Booth™ (MSSB™) in 20ft container
- Infectious Diseases Diagnostic Swab Booth (IDDSB™)

Screening (Staff Side)

Screening (Patient Side)

Exit for Mild Cases

Waiting Room

Individual Booths

Esco Wheelchair™

For person with disability or severe symptoms

Handwash Point

Dedicated handwashing area before entering the waiting room

Patient Entrance - Disinfection Booth

Note: *Specifications and configurations are subject to change depending on application, number of beds, site and local regulations.*

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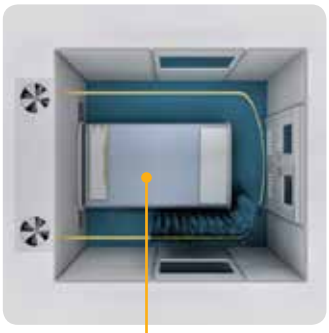
Makeshift Recovery and Treatment Isolation Room™ (MRTIR™)

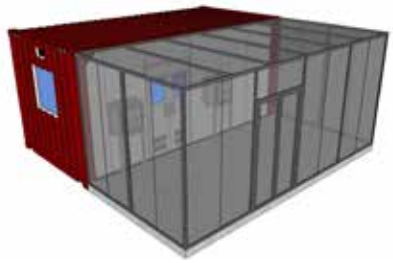
MRTIR™ utilizes the AIIR technology for a controlled negatively-pressurized room. It is designed to be used as an isolation room for COVID-19 positive individuals that fall under mild to moderate cases; hence, with less viral shedding often characterized by occasional coughing and sneezing.



Key Features

- Single HEPA filter air supply
- Double HEPA filter exhaust with UV-C kill box single pass
- Room exhaust with UV-C lighting technology
- 1200 x 2000 mm patient bed
- Medical curtain
- Modular Partitioning System
- Aluminum column and connector beams
- PVC door with vision panels
- Clear fixed windows for visibility
- LED lighting
- Pressure gauge for differential pressure monitoring
- Customizable dimensions to suit client-specific requirements

Several options are available for the AIIR Technology:



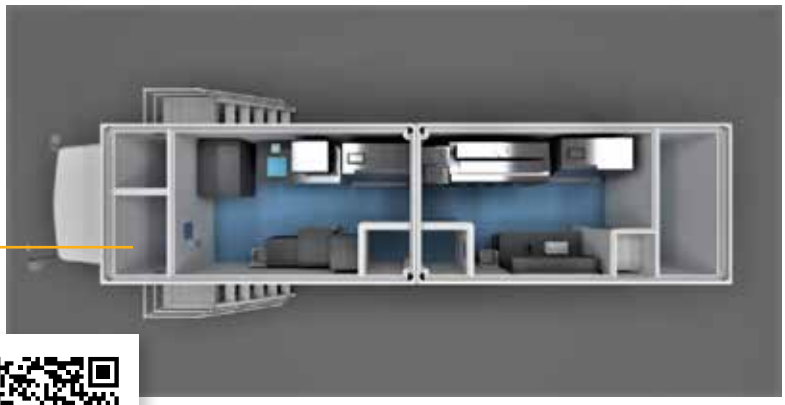
Modular 20' and 40' Container™

An isolation room built with a personal en suite bathroom and anteroom; designed for individuals with no other severe symptoms that require admission to intensive care wards.

For non-ICU-requiring admission patients who prefer private space, the **Single 40' Container Premium™** isolation room is available. This is inclusive of living room set, bathroom, and anteroom.

Esco Aster Mobile Diagnostic Laboratory

Esco mobile diagnostic test laboratory and research solutions are designed for virus infected areas where specialized laboratory mechanical contractors are not present.



This turnkey services makes the diagnostic unit easy to deploy in situations where the medical provider desires to cover large areas and in situations where mobility of health services is desirable (through shifting demand). The Mobile Dx Lab is a Biosafety Level 2 (BSL-2) laboratory, making it suitable for conducting diagnostics for viruses like SARS-CoV-2.

Laboratory Equipment List

- Airstream Class II Biosafety Cabinet
- Airstream PCR Cabinet
- HP Series Laboratory Refrigerator, +2 °C to 15 °C
- HP Series Laboratory Freezer, -10°C to -20 °C
- Versati™ High Speed Micro Centrifuge Refrigerated
- Swift™ ProGene Real Time PCR Thermal Cycler

Designated Individual Waiting Booths

The booths are partitioned with a polycarbonate material or patients can wait through their designated contained wheelchair.

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Swab Booths of the TTC's Screening Area

The swab booths in the TTC's screening area can either be the mass screening swab booth (MSSB™) or the infectious disease diagnostic sampling booth (IDDSB™). The selected swab booth highly depends on the client's preference.

Note: Schemes on installation on swab booths are discussed on the following pages.

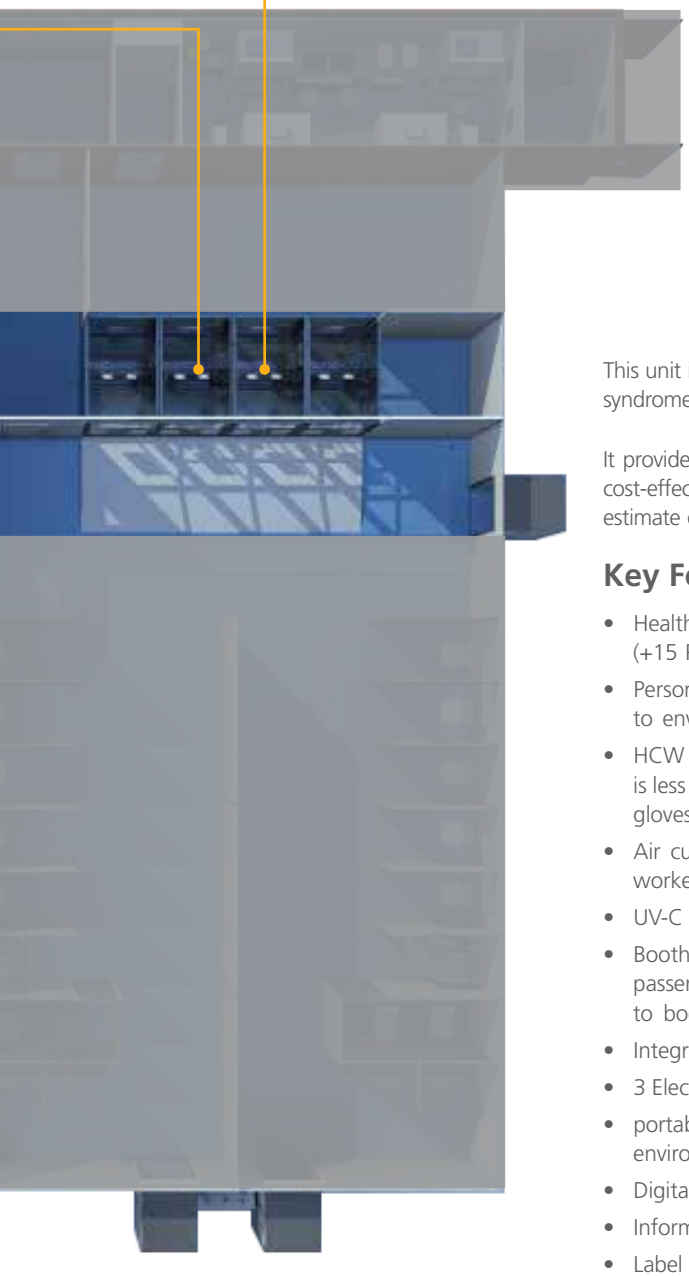
Infectious Disease Diagnostic Sampling Booth™ (IDDSB™)

The IDDSB™ controls exposure risk to harmful aerosols/airborne diseases by providing containment using airflow to capture and exhaust out aerosols from sputum expectoration, handling, sampling, or swabbing of asymptomatic carriers, patients under investigation that have some form of COVID-19 symptoms which are borderline to other infectious diseases, COVID-19 positive patients. The booth is pressure-tested (can be configured to Class II Leak Tight containment as per ISO 10648-2) and operates under negative pressure, providing both operator/patient and environmental protection.

Key Features

- Inflatable Sealed doors
  - » with on-board compressor
- Negative pressure keeps aerosol contained in booth with options for:
  - » Single Pass booth
- Pressure-tested
- Manual glove leak tester (GLT)
- CCTV Mount
- Shelves:
  - » Inside the booth
  - » Outside the booth
- Closed Bag-out port for collecting Diagnostic samples
- Intercom
- LED lighting
- UV Lamp for overnight internal environment disinfection
  - » operators may choose to validate as well if UV-C lighting can provide a way to disinfect PPE for reusage; operators to develop own protocols.
- Sound and Light alarms
- Optional Esco Mobile BioVap™ or Esco BioAtom Disinfection Gun
- Optional Esco Misting Personnel Disinfectant Booth
- Optional handheld heat sealer for sealing diagnostic samples
- Ergonomic glove port system for swabbing test

Mass Screening Swab Booth™ (MSSB™)



This unit is designed for the mass swabbing of potential carriers of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus or other possible severe infections.

It provides enhanced protection for PUIs with some level of COVID-19 symptoms. MSSB™ is cost-effective and easy to deploy. This booth increases the number of diagnosed patients with an estimate of **12-15 swabs per hour**, with consideration to consultation time during each test.

Key Features

- Healthcare worker (HCW) booth operates under positive pressure for worker protection (+15 Pa) to environment.
- Person under investigation (PUI) booth operates under negative pressure (-10 to -20 Pa) to environment.
- HCW can use their preferred glove size, and as there is no gauntlet or glove sleeve, there is less worry on validation glove leak testing to identify pinhole leaks in gloves or ensuring gloves are completely disinfected.
- Air curtain directly above glove ports provides maximum barrier to protect healthcare workers from droplet nuclei.
- UV-C lighting for over-night sterilization of the internal booths.
- Booths are of polycarbonate which absorbs UV-C such that they are not harmful to passersby. However, it is not recommended to constantly stare or intentionally get close to booth.
- Integrated hand disinfection stations for individual booths of the HCW and the PUI.
- 3 Electrical outlets in the booth are provided during outdoor usage for:
- portable air-cooler or heater (client to procure and provide own) to ensure HCW environment is suitable for the climate
- Digital device with Electronic Medical Record/Hospital
- Information System
- Label printer
- Scanner
- Portable cooler for storage of VTM and swabs
- Dimensions fixed at 1.2m x 1m for both PUI and HCW Booth with total footprint of 1.2 x 2m
- Material of construction stainless steel 304 frames with plastic polycarbonate panels.

Note: *Specifications and configurations are subject to change depending on application, number of beds, site and local regulations.*
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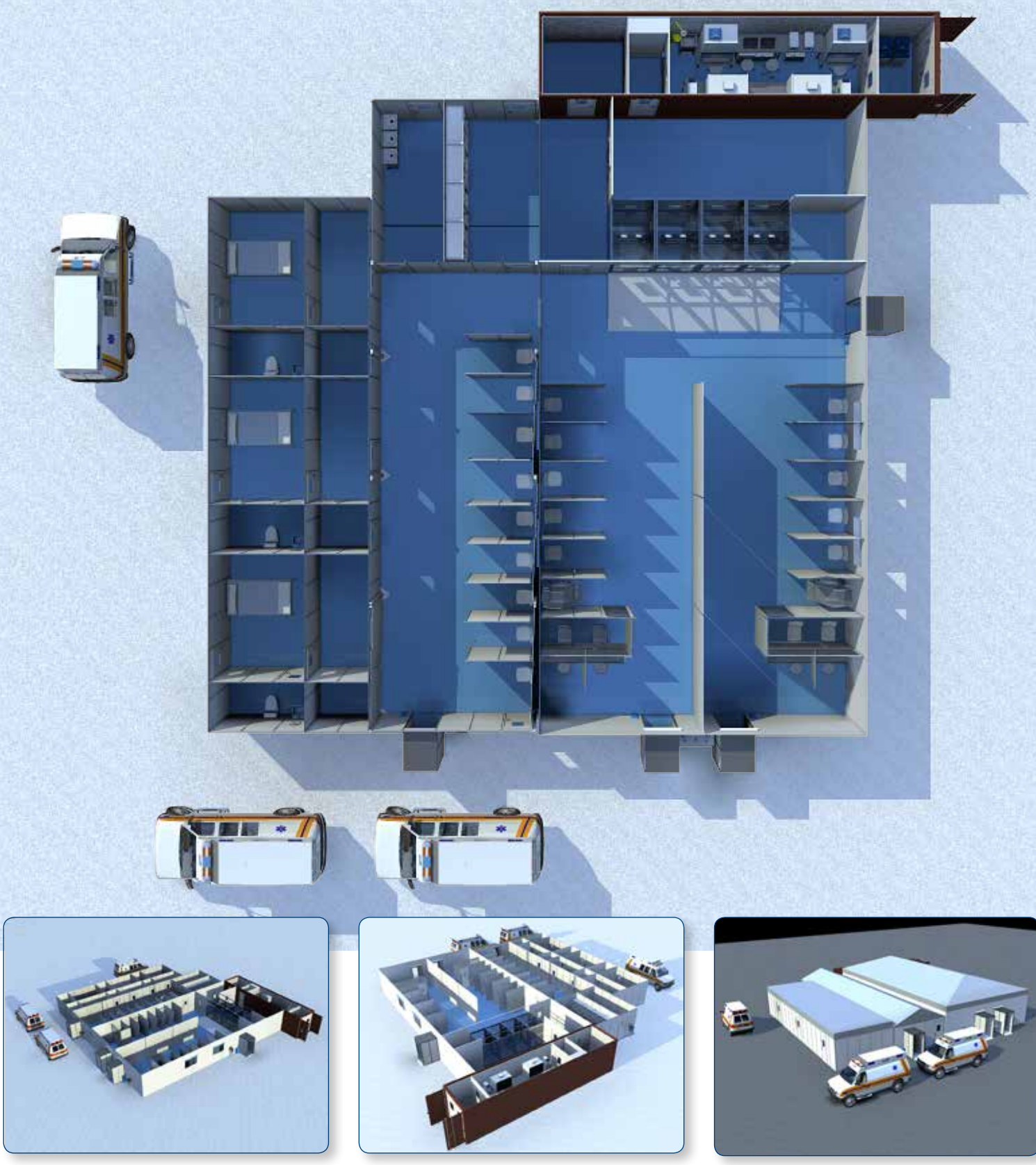


ESCO ASTER TTC – SCREENING AREA CONFIGURATION 1

MSSB Non-container Form Assembled at Site with Background Partition Room + Container Dx (10', 20' or 40')

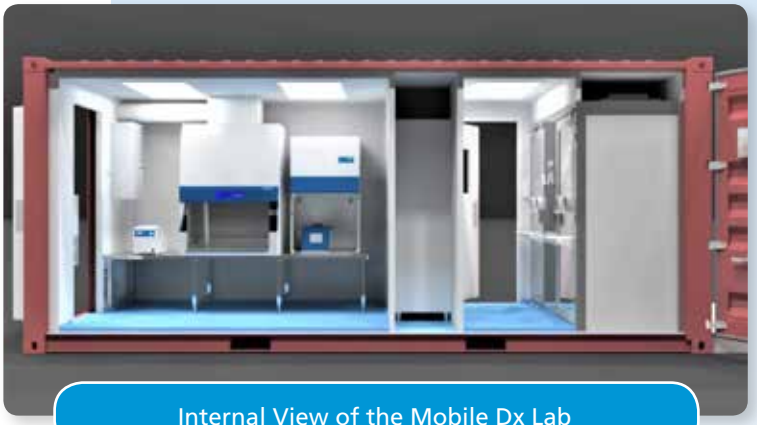
A Mass Screening Swab Booth™ Assembled at Site. The non-containerized MSSB™ will be assembled on site by the engineers to make sure of the contained environment in order to operate. It is equipped with a background partition room to allow separation of the waiting area and the screening area.

MSSB™ Facing Waiting Area

A Clean Corridor. This is dedicated to the healthcare workers to allow space to move that is positively pressured, thus reducing risk of community transmission. There will be dedicated donning/doffing area as well as handwashing area before and after the whole testing process.

Located at the Back of the MSSB™ Screening Area

A Mobile Diagnostic Laboratory in 10 ft, 20 ft, or 40 ft container. This helps aid in continuous rapid testing for COVID-19 after swabbing. This laboratory is vertically integrated with the necessary equipment and tools to conduct testing under biosafety level 2.



Internal View of the Mobile Dx Lab

Note: *Specifications and configurations are subject to change depending on application, number of beds, site and local regulations.*

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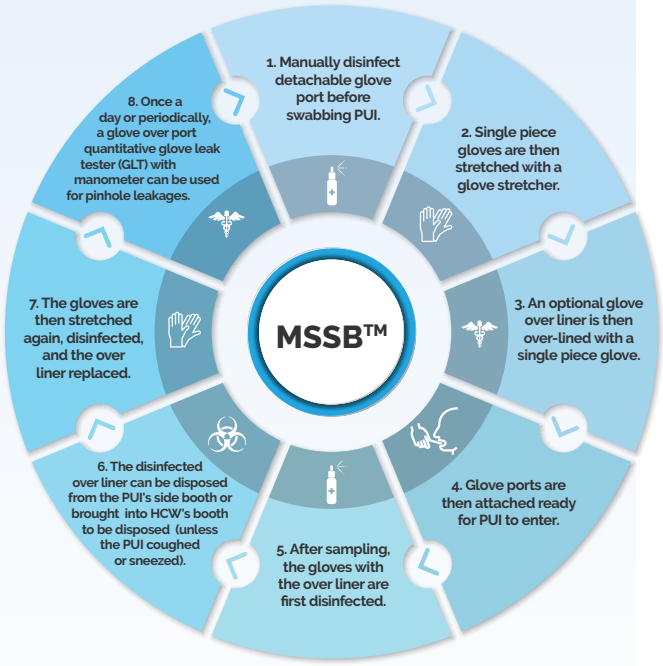
MSSB™ Non-container Form Assembled at Site with Background Partition Room + Container Dx (10', 20' or 40')

HCW Point of Entry for MSSB™ Booth

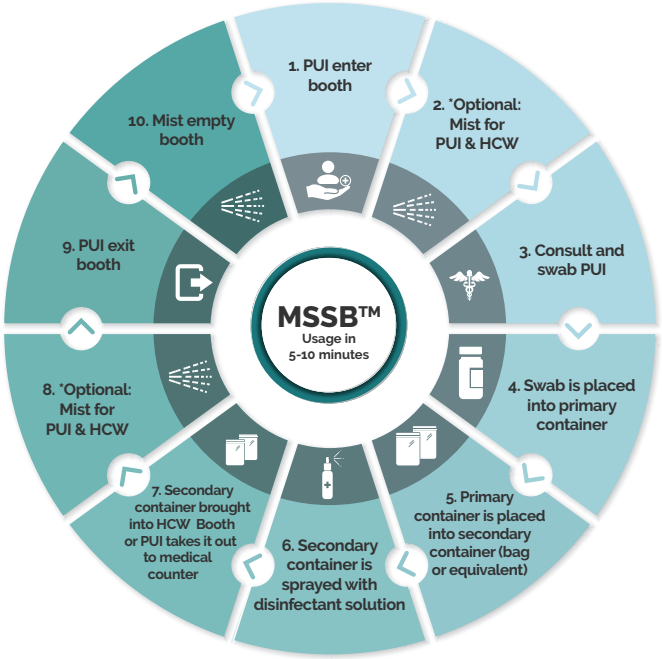
A Containerized Mass Screening Swab Booth™. Compared to TTC- Configuration 1, this scheme uses a containerized MSSB™, which is a plug and play kind of swab booth. The environment inside the container itself is already rendered as BSL-2 and becomes highly modular when assembling and disassembling.

SOP for MSSB™ with Detachable Gloveports



SOP for MSSB™ without Detachable Gloveports

(with air curtain for additional protection)
Steps 1-6 within 5-10mins.



***Disclaimer**: In some countries (point 2 & 8) personnel are not recommended to be misted, please check with local Ministry of Health (MOH) guidelines.*

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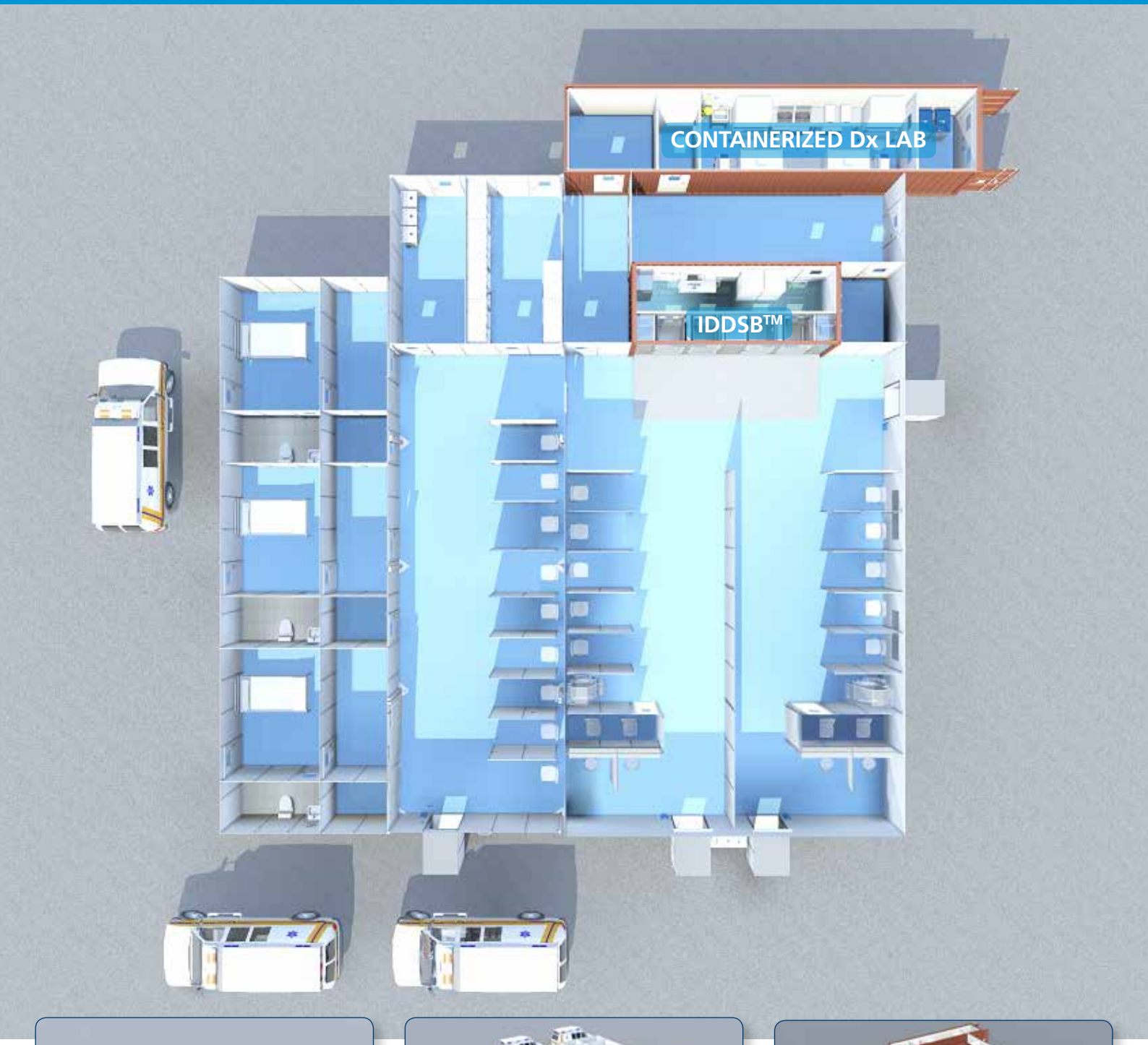
CONTAINERIZED Dx LAB
IDDSB™

ESCO ASTER TTC – SCREENING AREA CONFIGURATION 3

IDDSB 20 ft Container + Container Dx (10', 20' or 40')

An Infectious Disease Diagnostics Sampling Booth™ (IDDSB™) 20 ft Container. The IDDSB™ integrated inside a 20 ft container is placed on the TTC for faster installation with reduced time for validation. Seven (7) units of IDDSB™ can be installed in the 20 ft container for faster and efficient mass testing. It is also equipped with an additional working space and storage like refrigerators, for the samples.

IDDSB™ HCW Side

A Mobile Diagnostic Laboratory in 10 ft, 20 ft, or 40 ft container. This helps aid in continuous rapid testing for COVID-19 after swabbing. This laboratory is vertically integrated with the necessary equipment and tools to conduct testing under biosafety level 2.

Internal View of the Mobile Dx Lab

A Clean Corridor. This is dedicated to the healthcare workers to allow space to move towards the donning/doffing area, that is positively pressured, thus reducing risk of community transmission. There will be dedicated donning/doffing area as well as handwashing area before and after the whole testing process.

Donning/Doffing Area

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ESCO ASTER TTC – SCREENING AREA CONFIGURATION 4

20 ft or 40 ft Containerized IDDSB with Integrated Mobile Dx

IDDSB™ Patient Side

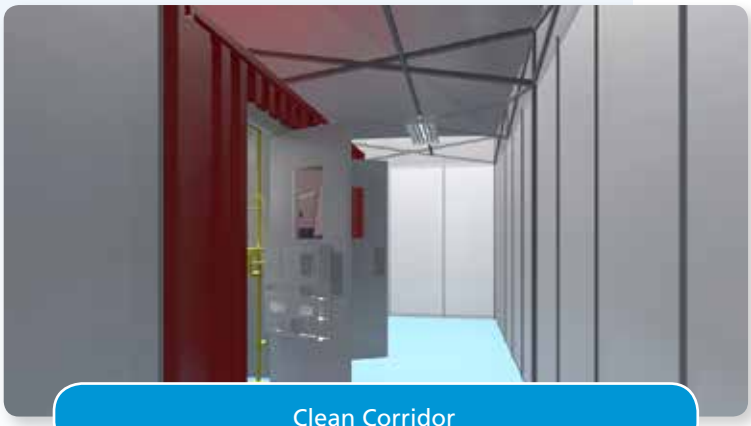
A 20 ft or 40 ft Containerized IDDSB™. Unlike configuration 3, this scheme is available in two sizes: 20 ft or 40 ft. The environment inside the container itself is already rendered as BSL-2 and becomes highly modular when assembling and disassembling.

Internal View of Integrated Mobile Dx

Integrated Mobile Dx. The Mobile Dx, which is usually a separated area as compared to other TTC schemes, is integrated within the same container of the IDDSB™ units. This is dedicated to conduct diagnostic testing right after swabbing of the patient. The whole Biosafety Level 2 (BSL-2) laboratory is equipped with the necessary equipment and tools to conduct testing.

- Container Module BSL-2 that is negatively pressured for x4 units of IDDSB,

  (x1 for wheelchair/children or x3 average Asian height of 1.65m)
- Equipped with the following equipment:
  - » x2 Medical Refrigerators
  - » x1 Stainless steel PPE Cabinet
  - » x1 Auto-hand disinfection
  - » x1 Misting corner
  - » x1 Stainless steel table
  - » x2 Laboratory chairs
  - » x1 Main control panel with electrical isolator
  - » x2 UPS for medical refrigerators
- BioVap™ with cat convertor
- Onsite commissioning and training



Clean Corridor

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ESCO ASTER TTC – SCREENING AREA CONFIGURATION 5

Mobile Viral Transport Medium (VTM) Production

Containerized Mobile Viral Transport Medium (VTM) Production. A dedicated working space for VTM will be installed situated at the back of the swab booth screening area. A suitable VTM may be produced in this part of the facility which will be ready for use after collecting throat and nasal swabs from human patients in the swab booths.

List of equipment in Mobile VTM Container:

- x2 Biosafety Cabinet
- x1 Provocell
- x2 Refrigerators
- x1 CO2 Incubator
- x1 Auto-hand disinfection
- x1 Emergency shower and eyewash area
- x1 Sink
- x1 Stainless steel table
- x2 Laboratory chairs
- x2 Laptops
- x1 Thermometer

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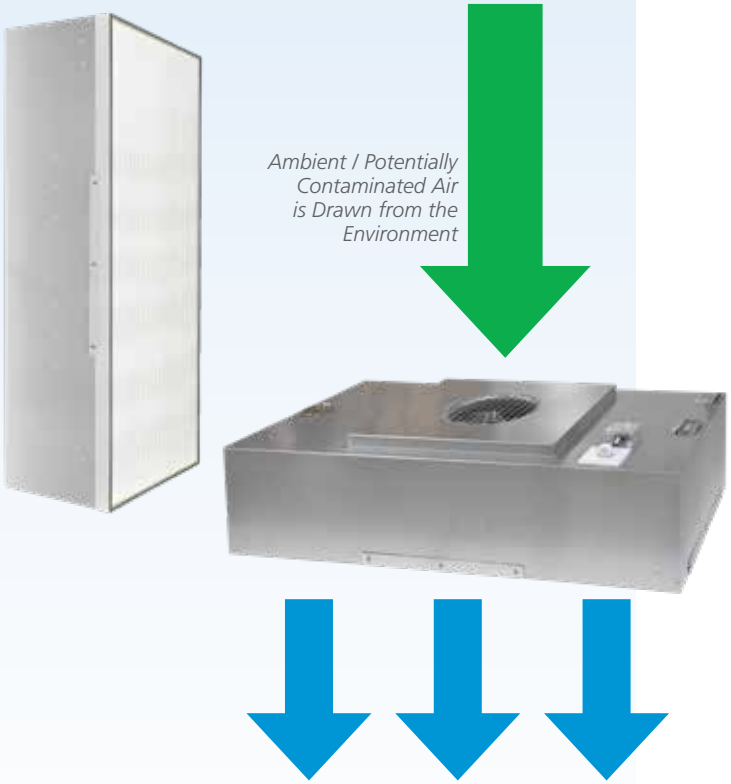
Mobile Office

Mobile Office. A separated option wherein there is a dedicated space where healthcare professionals can work under a contained room. The Mobile Office, like other schemes, are integrated with Fan-Filter Units (FFUs), to provide HEPA/ULPA-filtered laminar airflow over a specific area.



Esco Airstream® Fan Filter Units (FFUs). All TTC Schemes can be integrated with FFUs. It is designed to draw in ambient air from the top of the module, and supply clean filtered air vertically in a unidirectional (laminar) air stream toward a dedicated area or space.

Common applications for these units include:

- Construction of conventional cleanrooms
- Conversion of normal wards into isolation rooms

Integration and installation in areas, equipment, and devices such as the following:

- Modular hard and soft wall cleanrooms
- Makeshift medical centres and hospitals
- Isolation testing mobile tents and retrofit isolation rooms
- Registration, reception, cashier, and checkout counters
- Laminar flow cabinets, containment carts, and other clean air devices
- Pharmacies, grocery stalls, and other areas which call for controlled room environment

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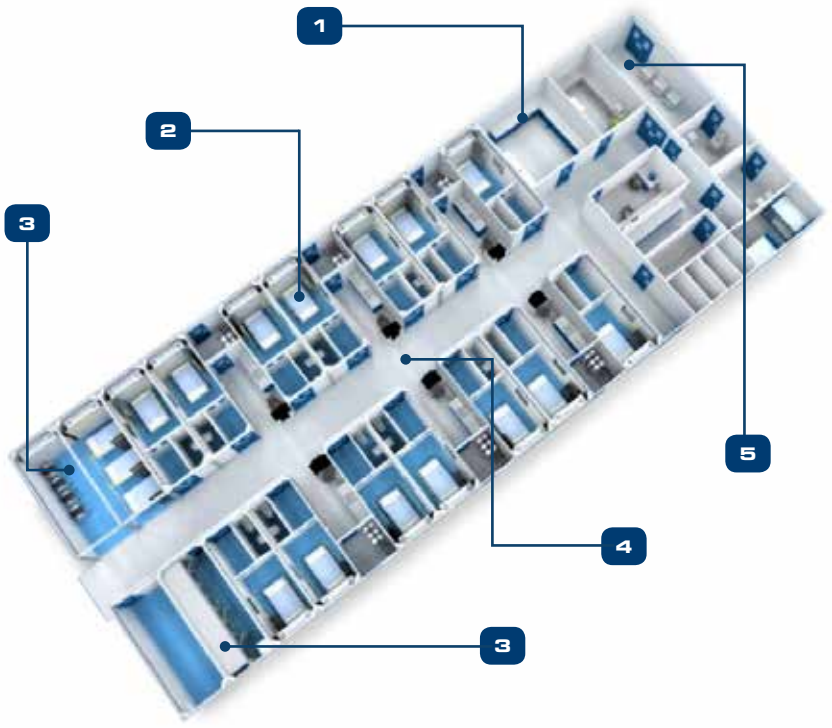
Isometric View of Turnkey Medical Center



1. DIRTY CORRIDOR

2. ISOLATION TREATMENT ROOMS

3. WAITING AREA

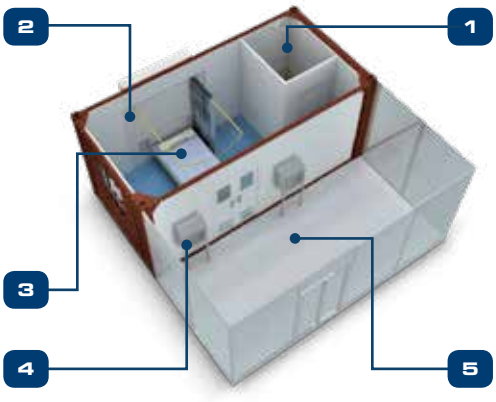
- Equipped with Isolated wheelchairs and Contained stretchers

4. CLEAN CORRIDOR

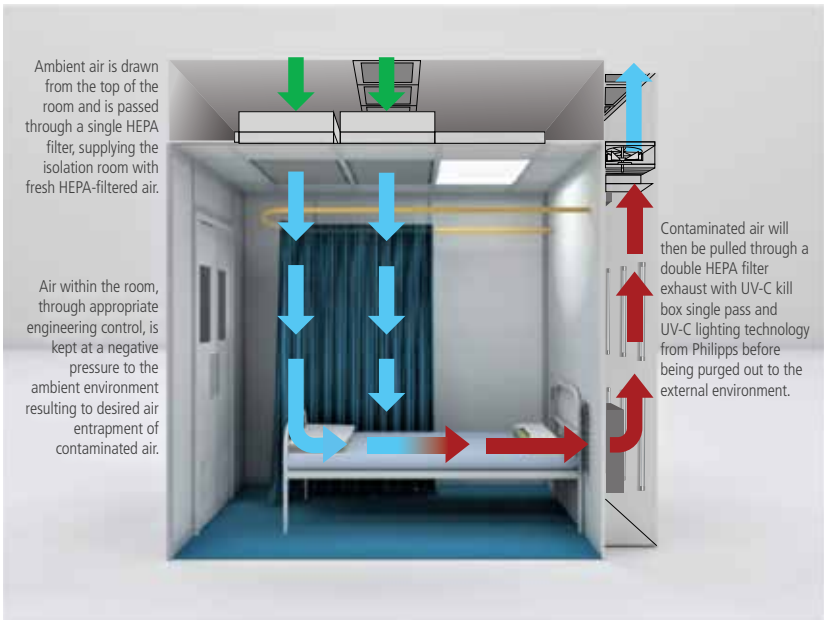
5. SUPPLY AND LINEN ROOM

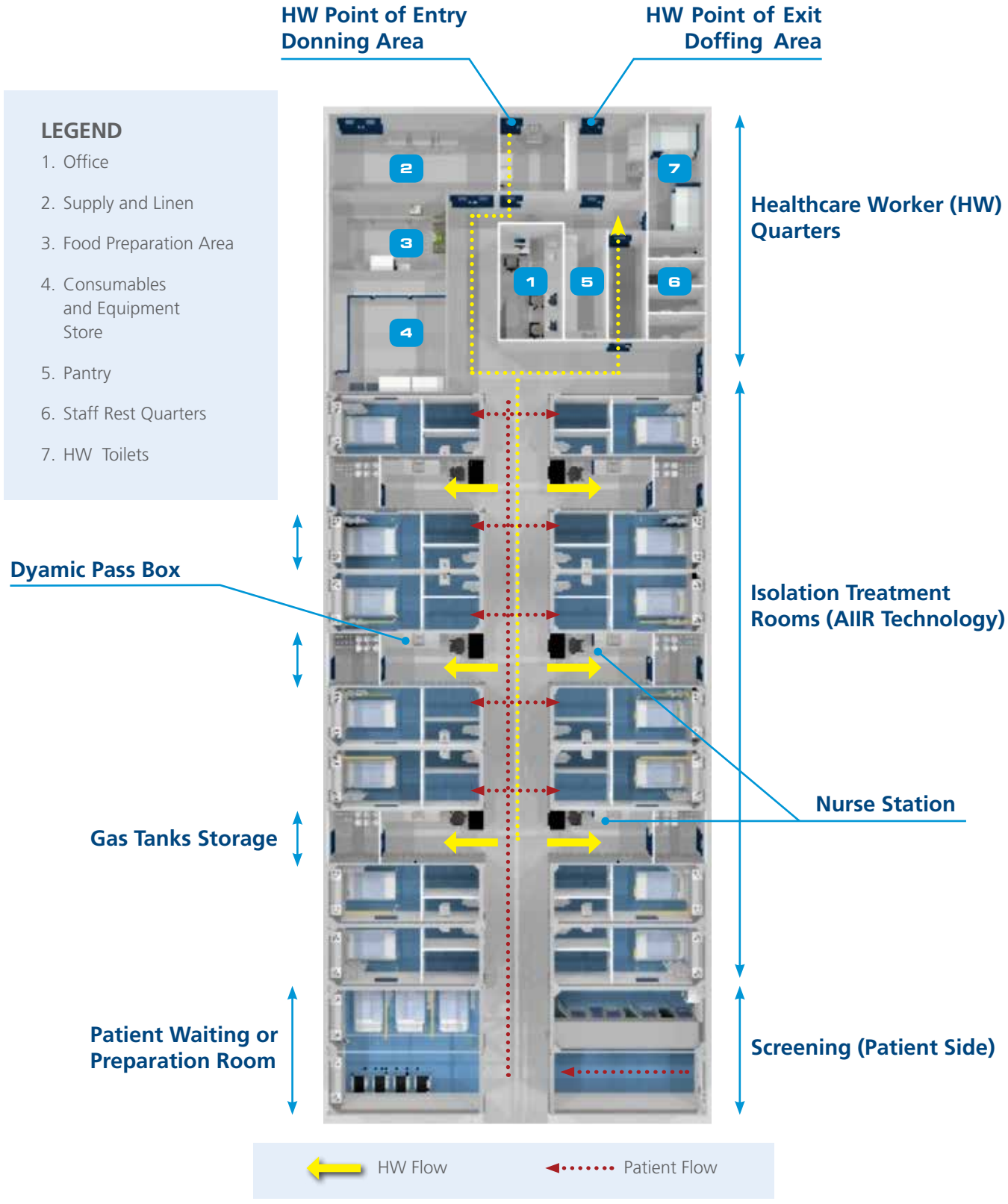
- Room designated for storage of PPEs and other supplies needed for treatment

Isolation Treatment Rooms



1. BATHROOM
2. BED BAY
3. BED HEAD TRUNK AND POWER OUTLETS
4. ANTEROOM BASIN (HANDWASH POINTS)
5. CLEAN CORRIDOR





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Esco is committed to flatten the curve of the COVID-19 pandemic through its 'trace, test, and treat' platform which promotes worldwide eradication of the virus.

In its trace stage, Esco designed and created two COVID-19 booths: **Infectious Disease Diagnostic Sampling Booth™** (IDDSB™) and the **Mass Screening Swab Booth™** (MSSB™). The IDDSB™ is a pressure-tested booth that can be integrated with a hydrogen peroxide biodecontamination system for the main purpose of mass testing symptomatic person under investigation (PUI) and person under monitoring (PUM) with COVID-19 like symptoms, it can also be used for repeat testing of COVID-19 positive patients, including sputum/lavage (saliva), thus ensuring protection of the HCW and the environment. On the other-hand, MSSB™ is a non-pressure decay tested booth designed to diagnose asymptomatic person under investigation (PUI) and person under monitoring (PUM) in a short span of time while eliminating the risk of front-liners contracting the virus.

With the booths' programmed pressurization (MSSB™: +ve for HCW and -ve for PUI booth; and for IDDSB™: -ve), strict airflow regime, and partnered with stringent SOPs, Esco guarantees a safe and efficient mass testing in each community to trace and diagnose all asymptomatic carriers and Person Under Investigation with COVID-19 like symptoms, to prevent further spread of the virus.

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