TEMPORARY HEALTHCARE CREATIVE

A Canadian Response to COVID-19

OVERVIEW

We are an industry of designers, manufacturers and constructors who design and build facilities for communities locally and globally. We want to proactively respond to the global humanitarian crisis we now face by putting forward an effective and replicable design to re-purpose existing buildings for healthcare needs.

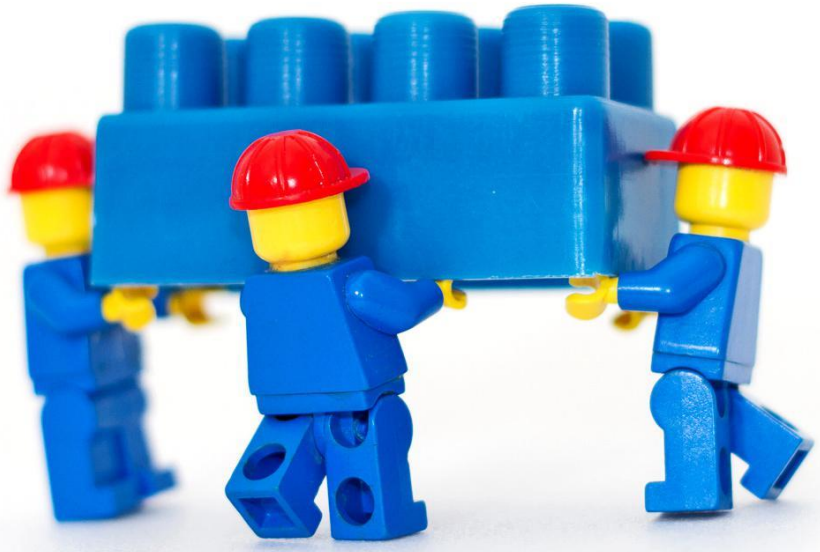
The goal is to create a space to accommodate COVID-19 patients who require treatment and emergency staff alike. We want to ensure the safety and health of the front-line workers with effective and clean air movement, infection control and space planning.

The intent of our approach is to present a realistic solution for a medium scale facility that can be replicated and phased across multiple locations as needed. This will expedite mobilization in a cost-effective way and provide more flexibility when operational based on the needs of the healthcare response teams.

TEAM & RESPONSE

Over the past week, our team have collaborated and put forward their time and ideas in a truly Integrated Canadian Response.

Our approach is to re-purpose existing local ice arenas as they have standard attributes for easy replication; there are multiple locations across Canada; we can create one standard, modular solution which can be implemented anywhere and mobilize quickly.



Contact: Kenny Smith, ksmith@integralgroup.com, 647-205-1744

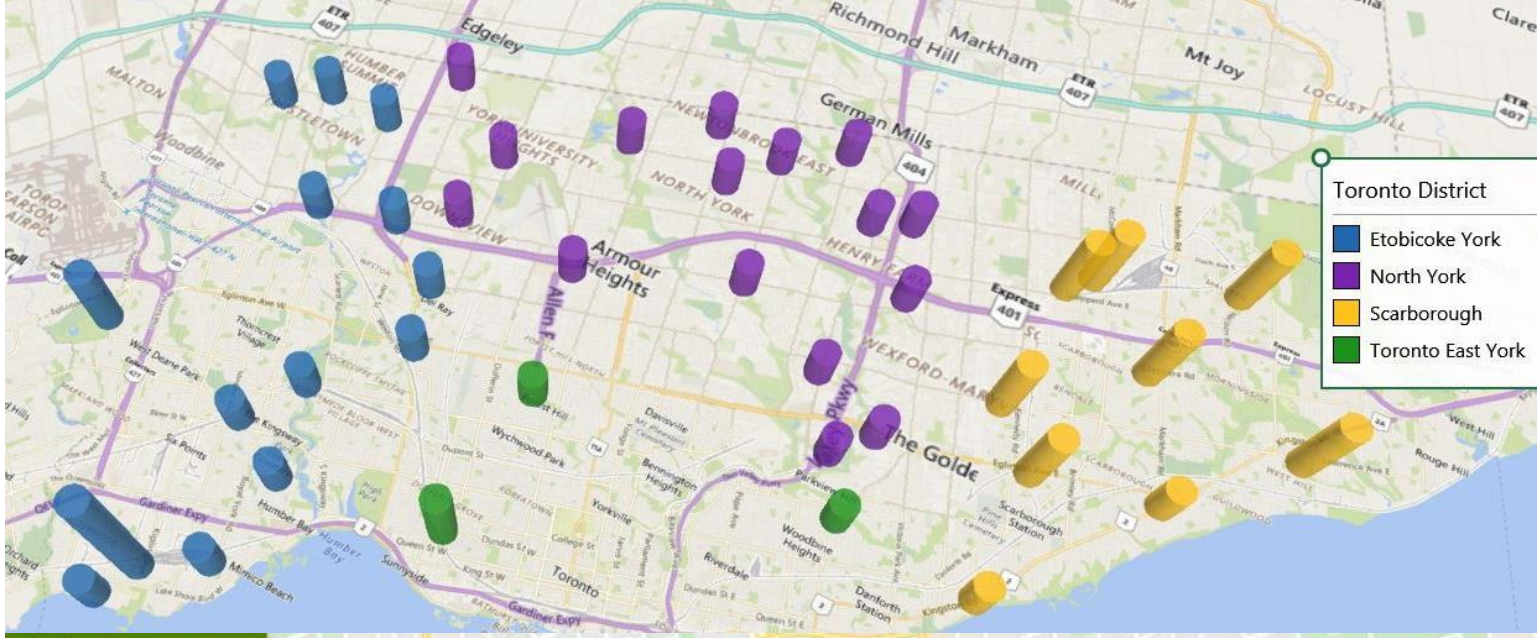
POTENTIAL SITES (GTA)

SITES

There are several Municipally and Privately owned sites locally and within good proximity from existing healthcare facilities.

Moving forward and working with the healthcare response teams, we can identify the most preferable locations to implement.

As our approach is based on a standardized building typology, beyond a local response, our solution can be used in communities across Canada.



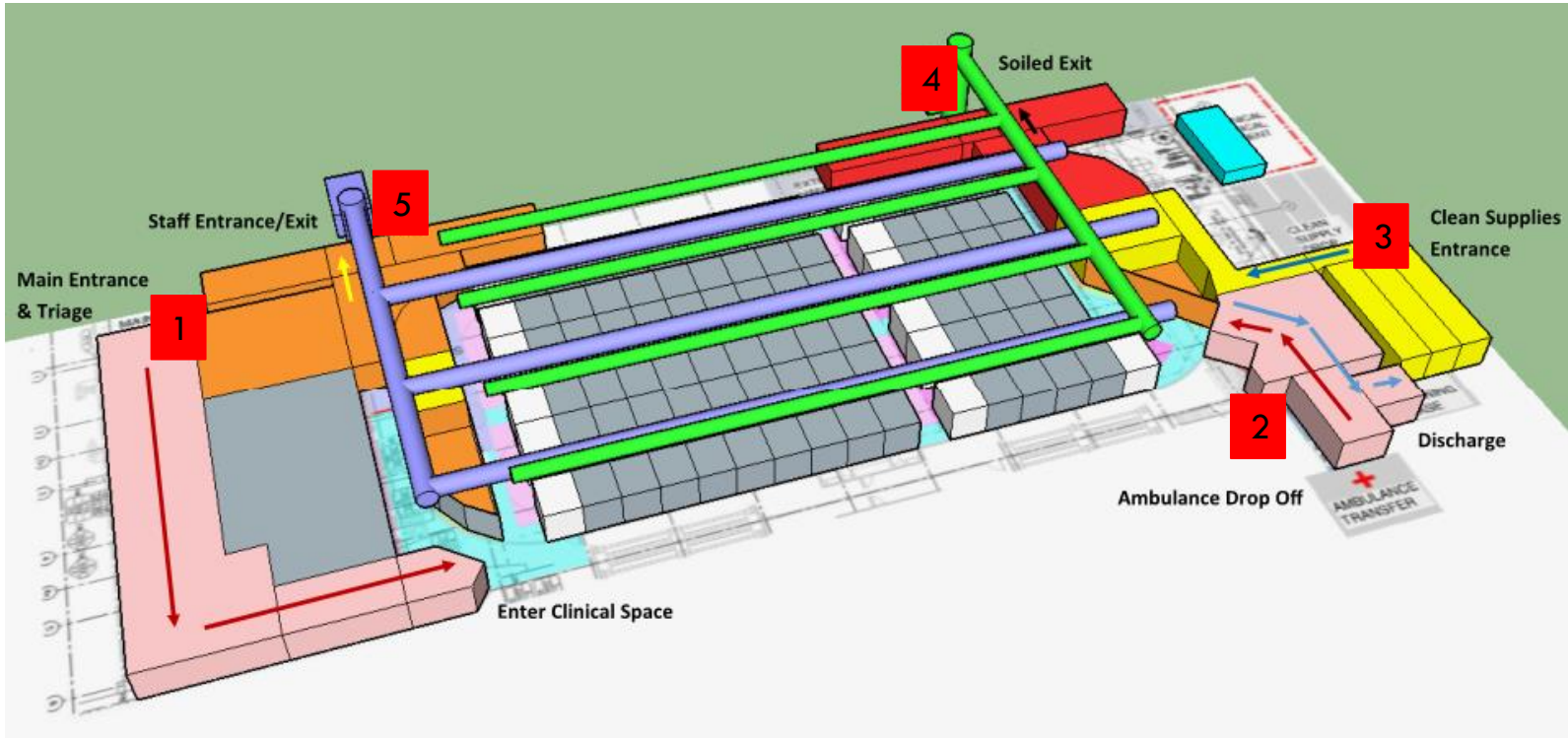
CONCEPT

CONCEPT : CIRCULATION

We want to make use of the existing Entrances and Exits within a typical Arena to create safe circulation for Patients, Professionals and Supplies.

Although the orientation of buildings may vary, we have identified and used (as shown) 5 consistent doorways:

1. Main Entrance
2. Zamboni Entrance
3. Mechanical Room Entrance
4. Fire Exit 1
5. Fire Exit 2



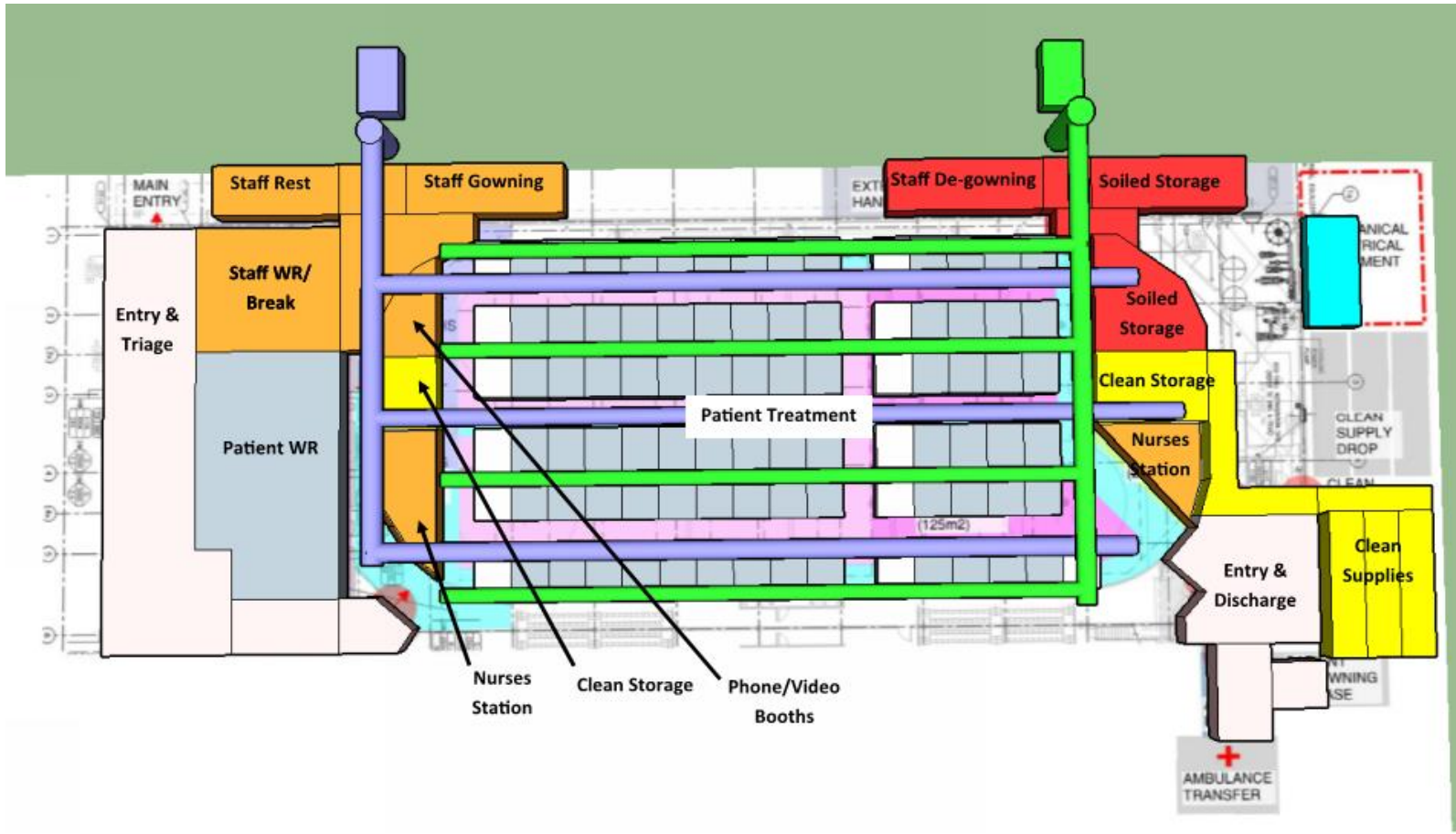
CONCEPT : SPACE

We have broken down the space as shown, maximizing the use of the existing base building and through fast, modular fit up of the main open areas.

This provides a flexible and adaptable solution if site conditions vary and space needs change.

The surrounding outdoor space has also been utilized to accommodate Mechanical & Electrical equipment, storage/drop off and staff amenities.

This gives us approximately a 90-100 bed facility (per ice pad).



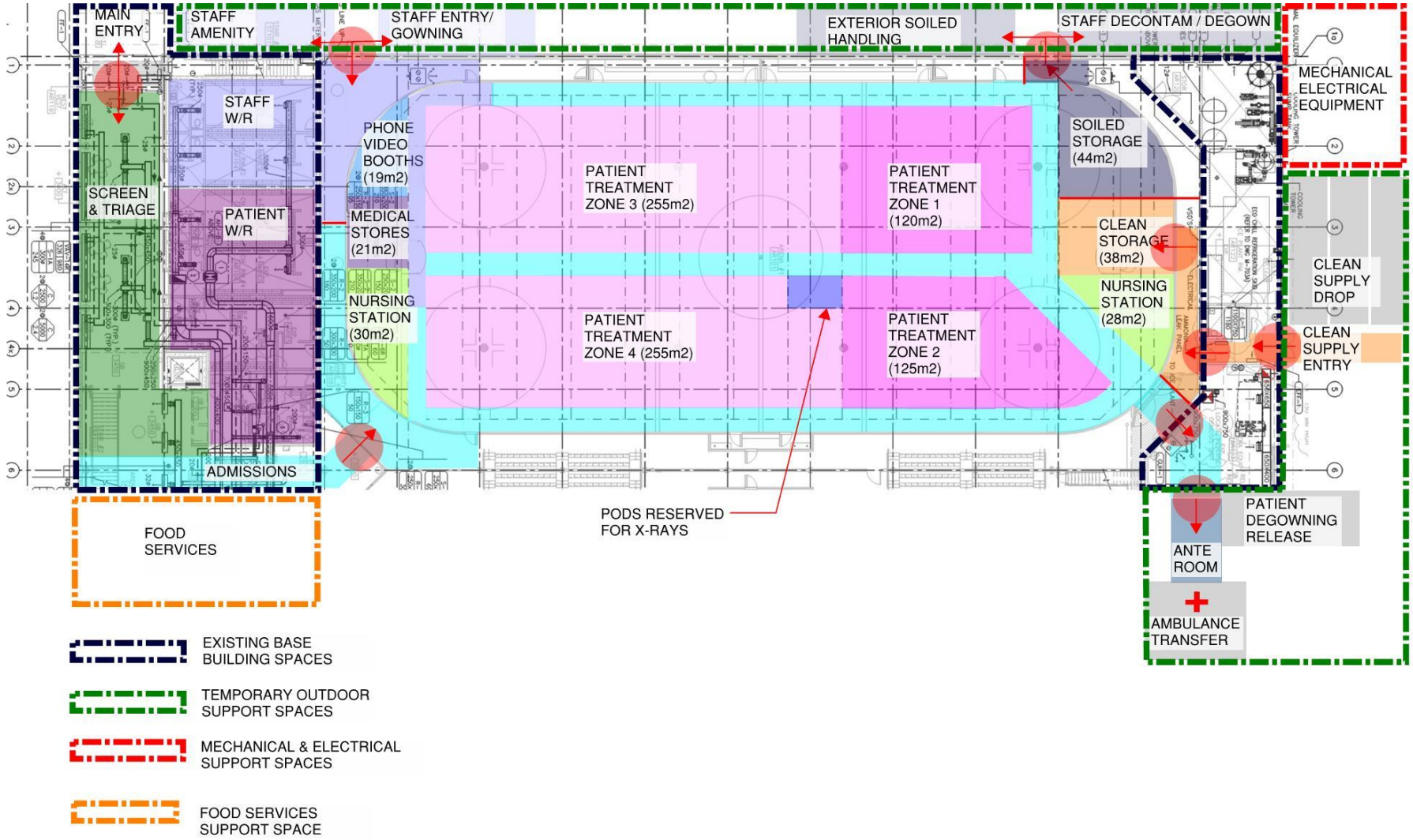
CONCEPT : ZONING

Zoning has been reviewed at the outset to ensure maximum bed capacity is possible.

Within the Patient treatment area, sub-zones can be established for more intensive treatments.

Handwashing and sanitizing stations are regularly positioned with frequent use supplies.

The design considers specific areas to address COVID-19 feedback. Such as phone/video booths for clinical staff use, public visiting family members from behind glass and multiple nursing stations to ensure good visibility.



CONCEPT : BASE SYSTEMS OVERVIEW

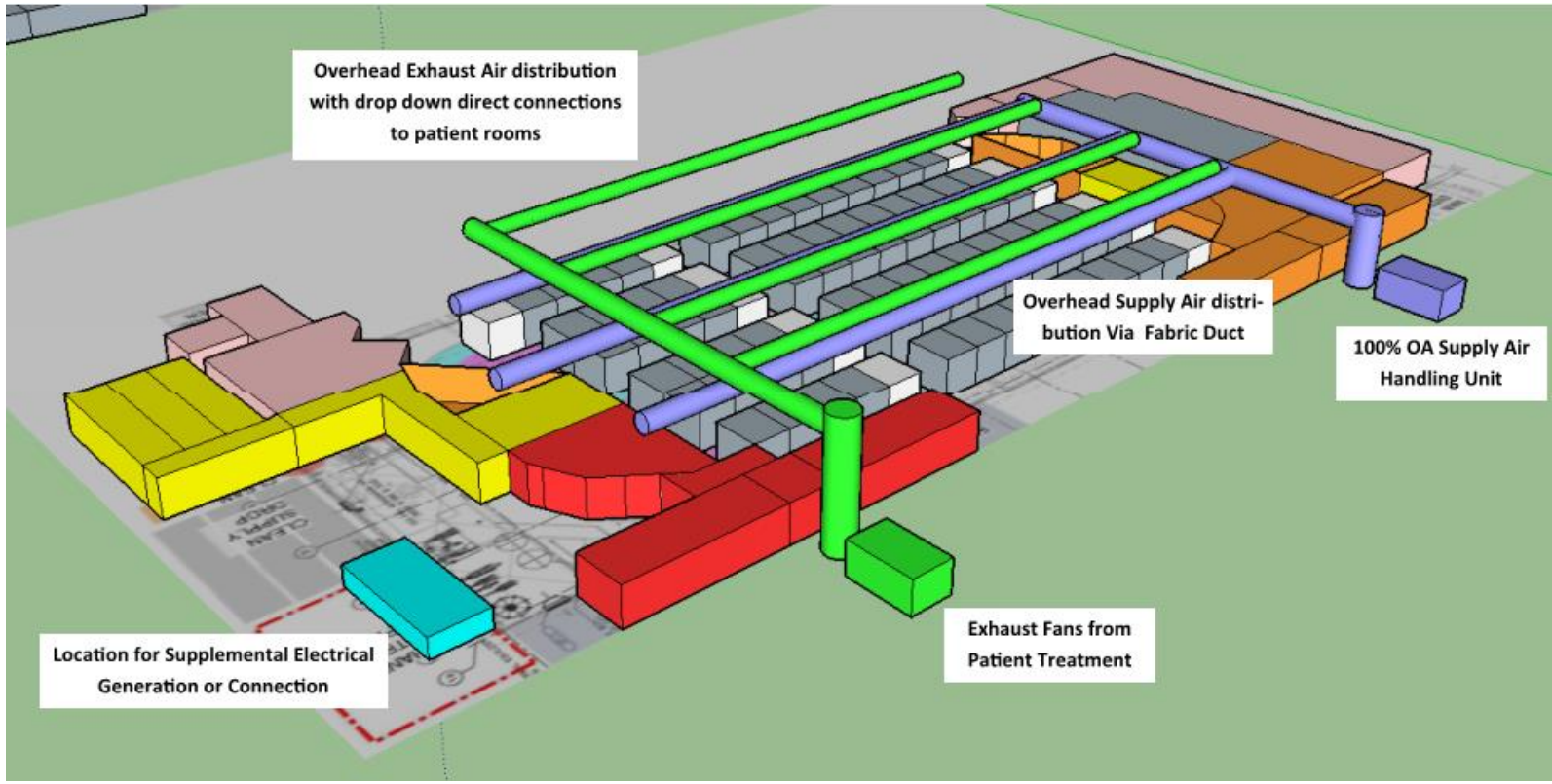
To provide effective distribution of clean ventilation air through the re-purposed space, a temporary 100% Outdoor Air Handling Unit(s) will be located outside, ducted into the building and distributed horizontally at high level.

Exhaust air will be drawn from low level near the patient's head and ducted to high level horizontal distribution to outside. A temporary exhaust fan(s) will be located outside connecting into the distribution system.

The exhaust and supply air locations will be appropriately separated, and final locations verified based on proximity to adjacent buildings.

A temporary generator will be used to support the additional systems and increased load.

The existing base building systems will remain operational for the remainder of the spaces.



CONCEPT : MODULAR DESIGN

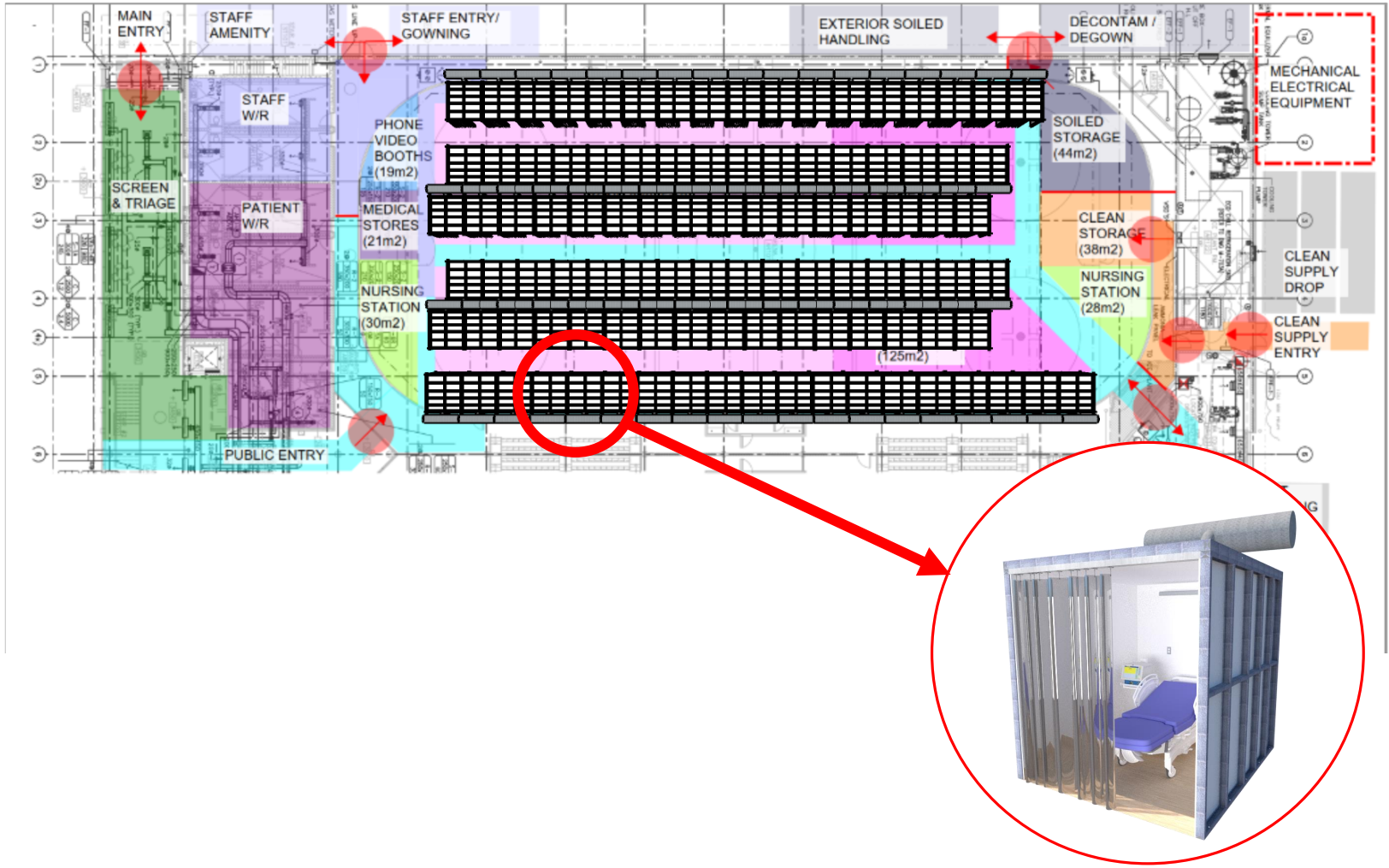
We have developed a modular design for the clinical patient spaces and partitioning systems for the fit out of the main space.

Each module is a pre-fabricated 8'x9'x8'h patient room pod with service chase behind for electrical connections and low-level exhaust air.

The additional spaces would use the same partitioning systems modules and sized to suit.

Each pod would have three hard partitions, a ceiling (either translucent or hard) and a curtained entryway.

With this layout, we can achieve approximately 90-100 beds in the space and maximizes flexibility for alteration after installation.



ARCHITECTURAL

FLOORING

The existing Arenas will have bare concrete floors. For the temporary care facility, the floors will be protected with appropriate and resilient materials. Likely a durable rolled vinyl product with welded seams would work suitably overlaid upon a fire-rated plywood substrate.

This will allow for protection of the floors (help prevent puncture of cooling coils in rink surface) **but most importantly** cleaning and infection control procedures can be observed.

This will also create a rigid surface to install the modular framing system used throughout the fit out.

https://commercial.tarkett.com/

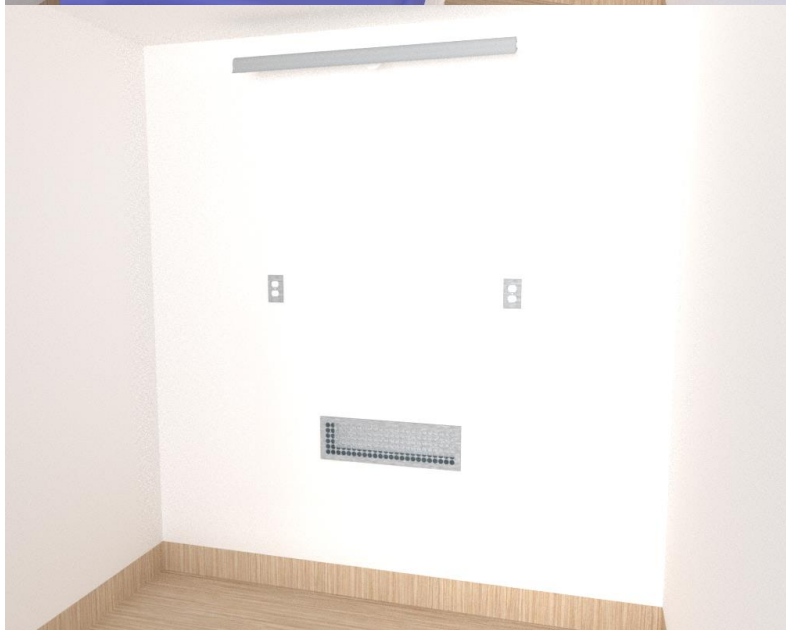
MODULAR PATIENT POD

We have created pre-fabricated private patient rooms with receptacles, task lighting and low-level exhaust air from the patient's head.

This provides and safe, comfortable environment for patient and staff alike.

Our modular approach gives maximum flexibility and adaptability to changes in space needs and clinical functions.

This consistent approach will also be used to create the other clinical spaces as identified in the floor plan.

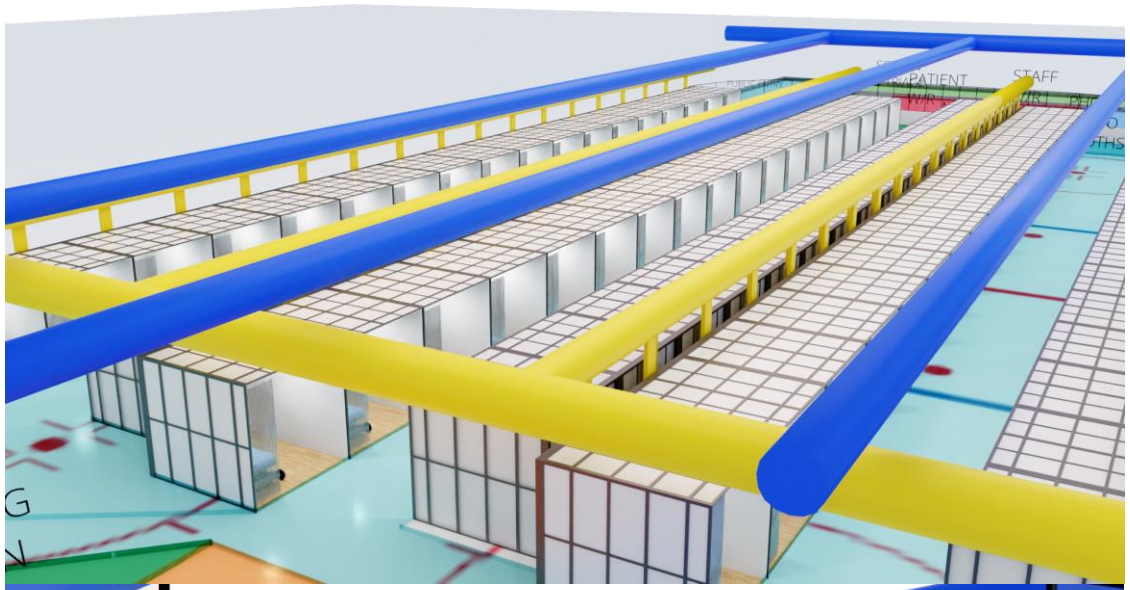


MODULAR PATIENT POD

The modular design looks to use a common typology/platform whereby two approaches have been put forth to maximize deployment across the country, if needed.

One of the approaches looks to use numerous readily available materials to create a kit of parts that can be utilized to create the standard Pod.

Where available, a second design uses specialized roll forming equipment to mass fabricate structural wall panels using light gauge steel or other coiled metals. In this instance wall panels would be made of 3 1/2" x 1 5/8" but similar dimensions could be used.

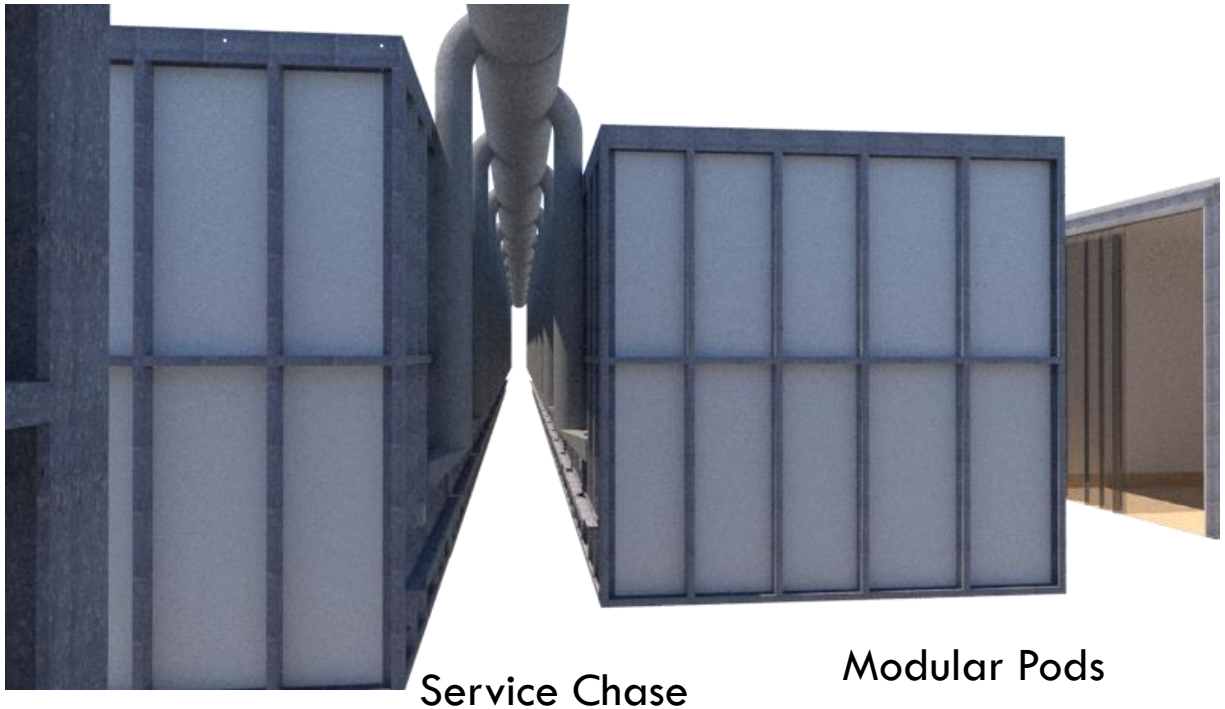


MODULAR PATIENT POD

Panels are assembled by arranging the tubes on a flat table with stops surrounding to hold them square, then face panels bonded with adhesive or VHB tape. they may require pop-rivets or SDST screws ensure integrity

Utility Connections

Staggered Configuration for Access



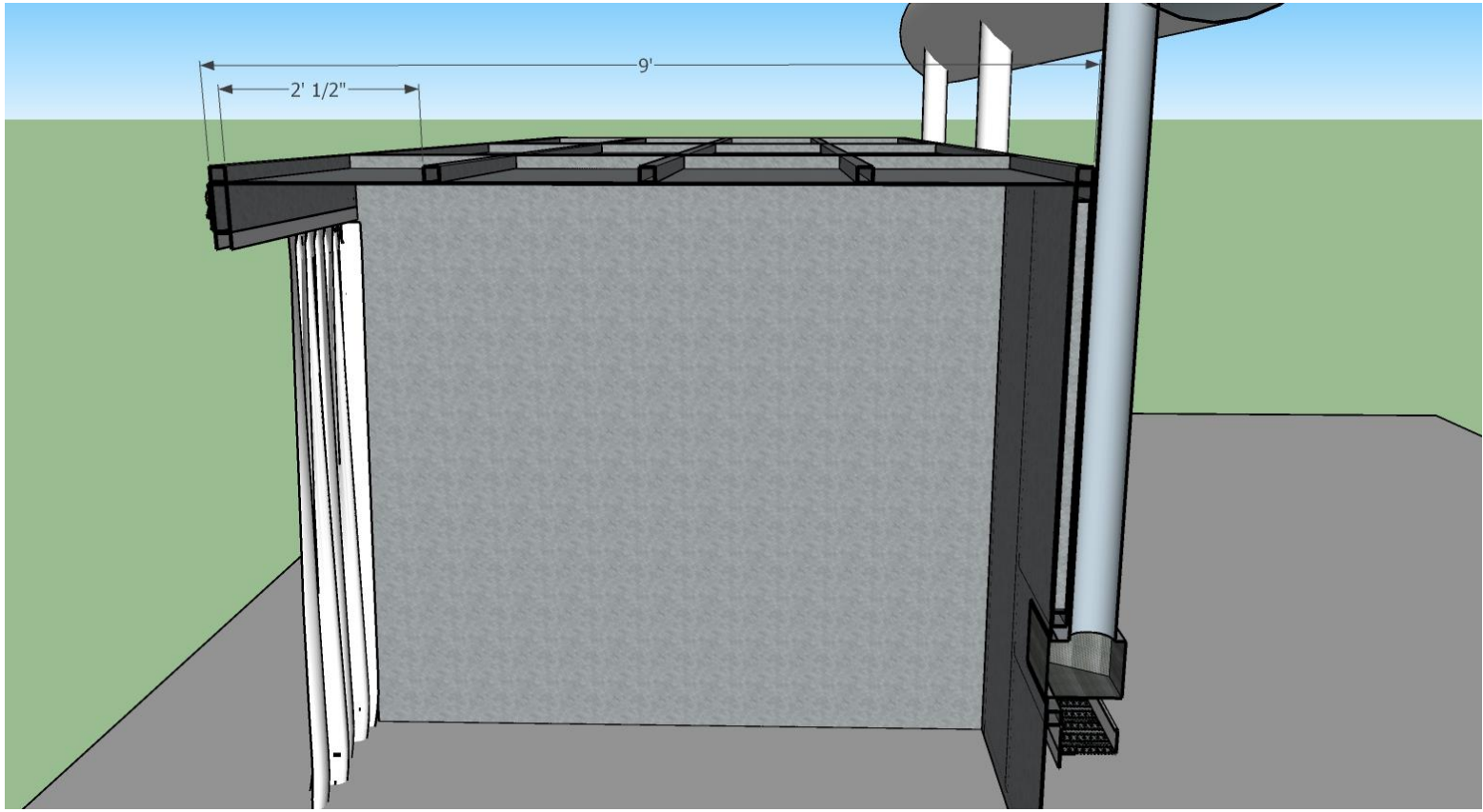
Service Chase

Modular Pods

MODULAR PATIENT POD

The panels we want to make are in two sizes with three facing arrangements:

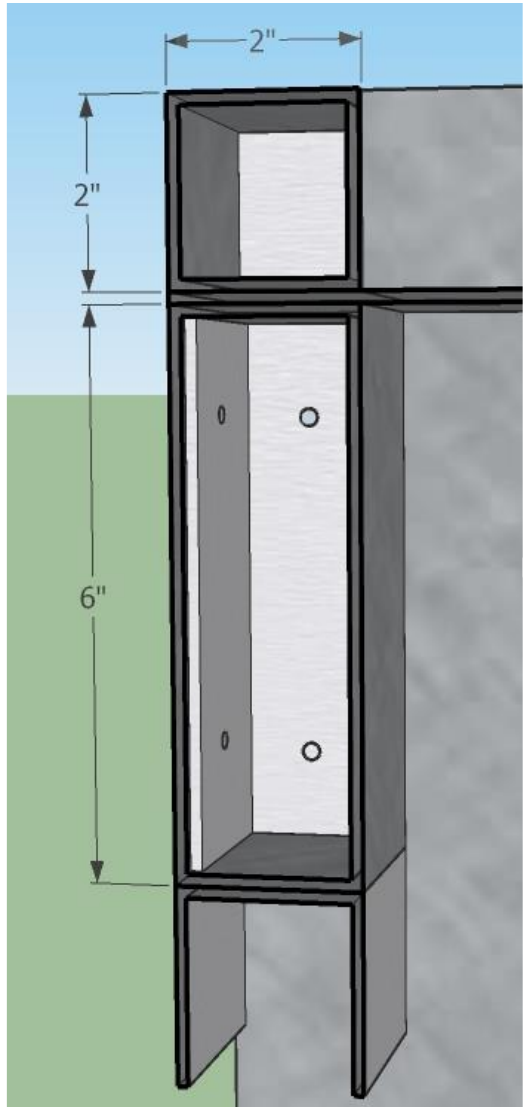
- Wall panels 8' x 9', faced two sides
- Ceiling panels 8' x 9', faced one side
- Headwall panels 8' x 8', faced one side

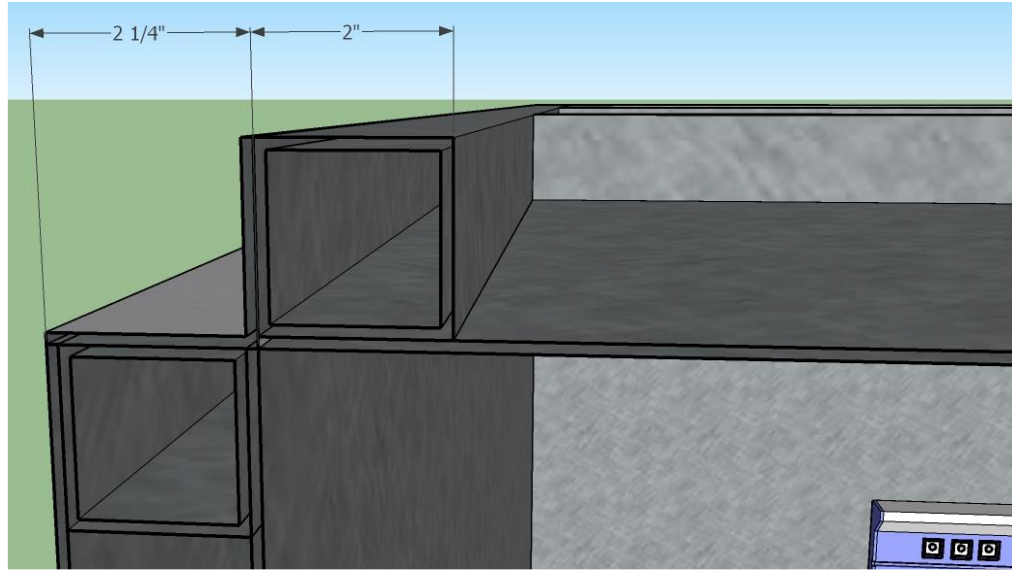


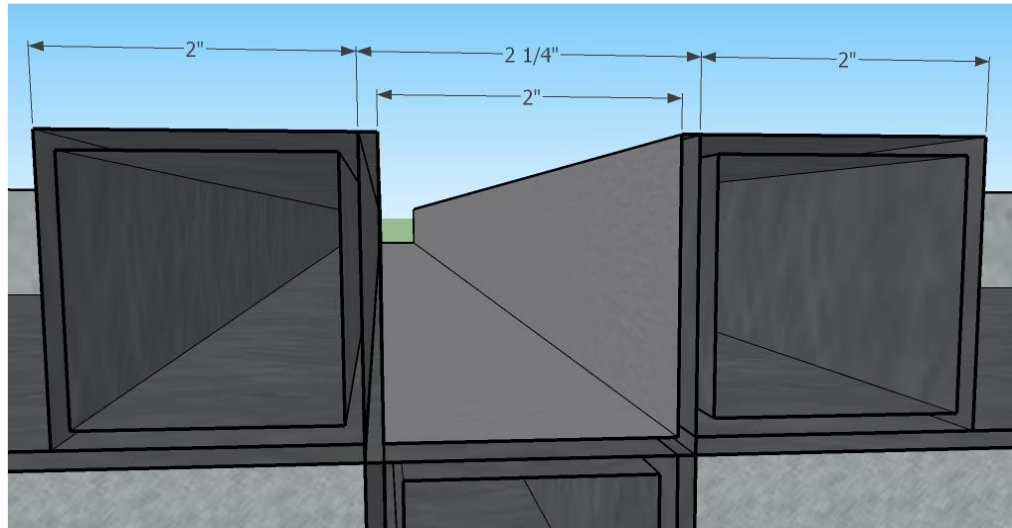
MODULAR PATIENT POD

The basic materials of the partitioning system are as follows:

- Aluminum sheet preferably with a sanitary finish one face, sheets 4' x 8' and 5'x8' x 16 gauge
- 2" x 2" square corner aluminum extrusions, .125" wall and .060" wall
- 1.5" x 1.5" x .125" aluminum angle
- 2" x 2" x 2" x .125" aluminum channel







FIRE SAFETY

Careful attention to best practice fire safety planning for temporary installations will be observed:

Non-combustible pod construction.

PODs will not be sprinklered.

Existing sprinkler system (if present) will remain as is.

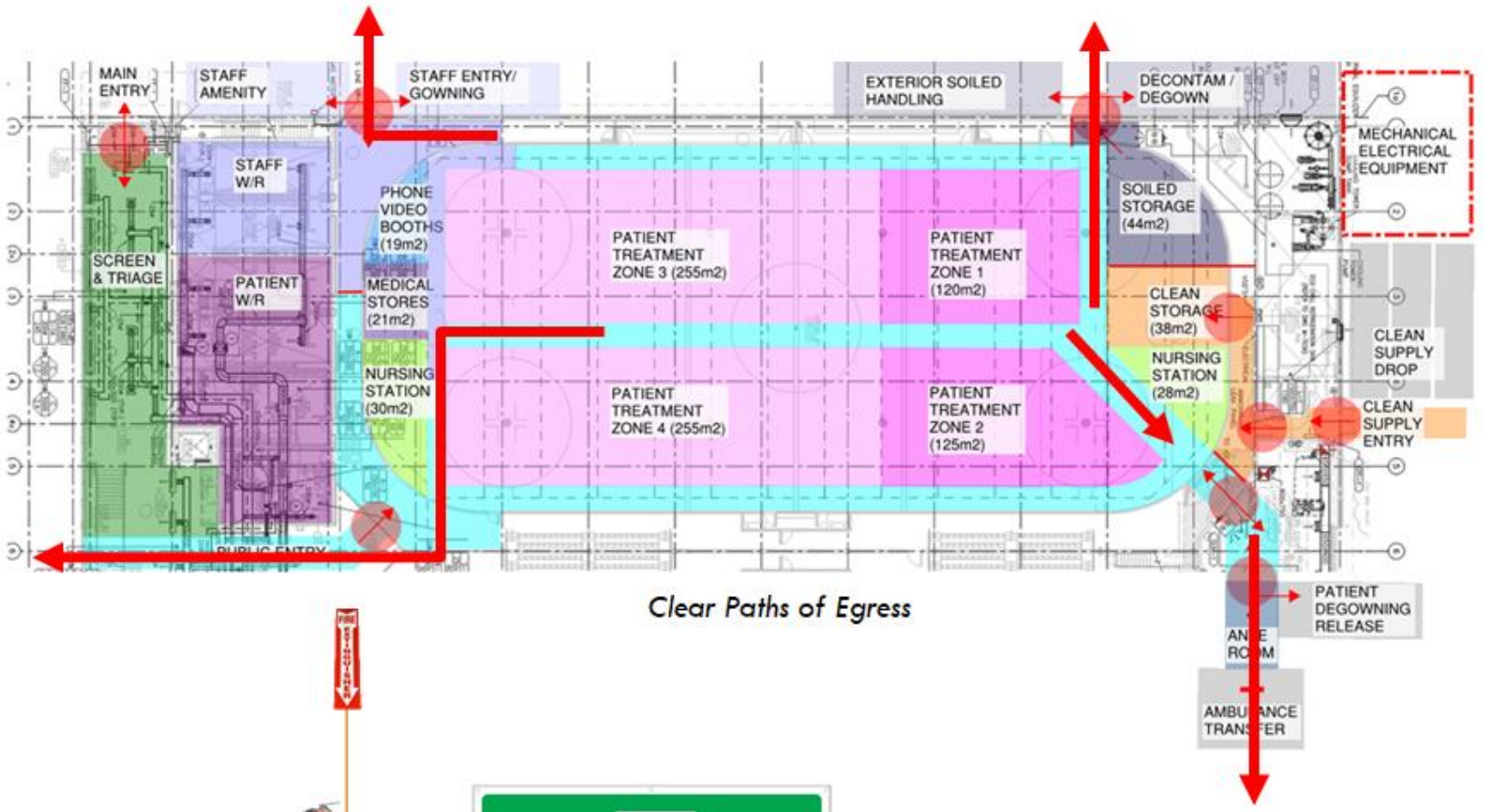
Temporary pull stations will be installed.

Fire Safety Coordinator, full time fire watch and Site Fire Safety Plan (SFSP) established.

Ventilation System Emergency Shut-down.

Provide portable fire extinguishers throughout the facility

Diasble ice plant machinery.



Clear Paths of Egress

Temporary Installations to Enhance Fore Safety

MECHANICAL

MECHANICAL : VENTILATION

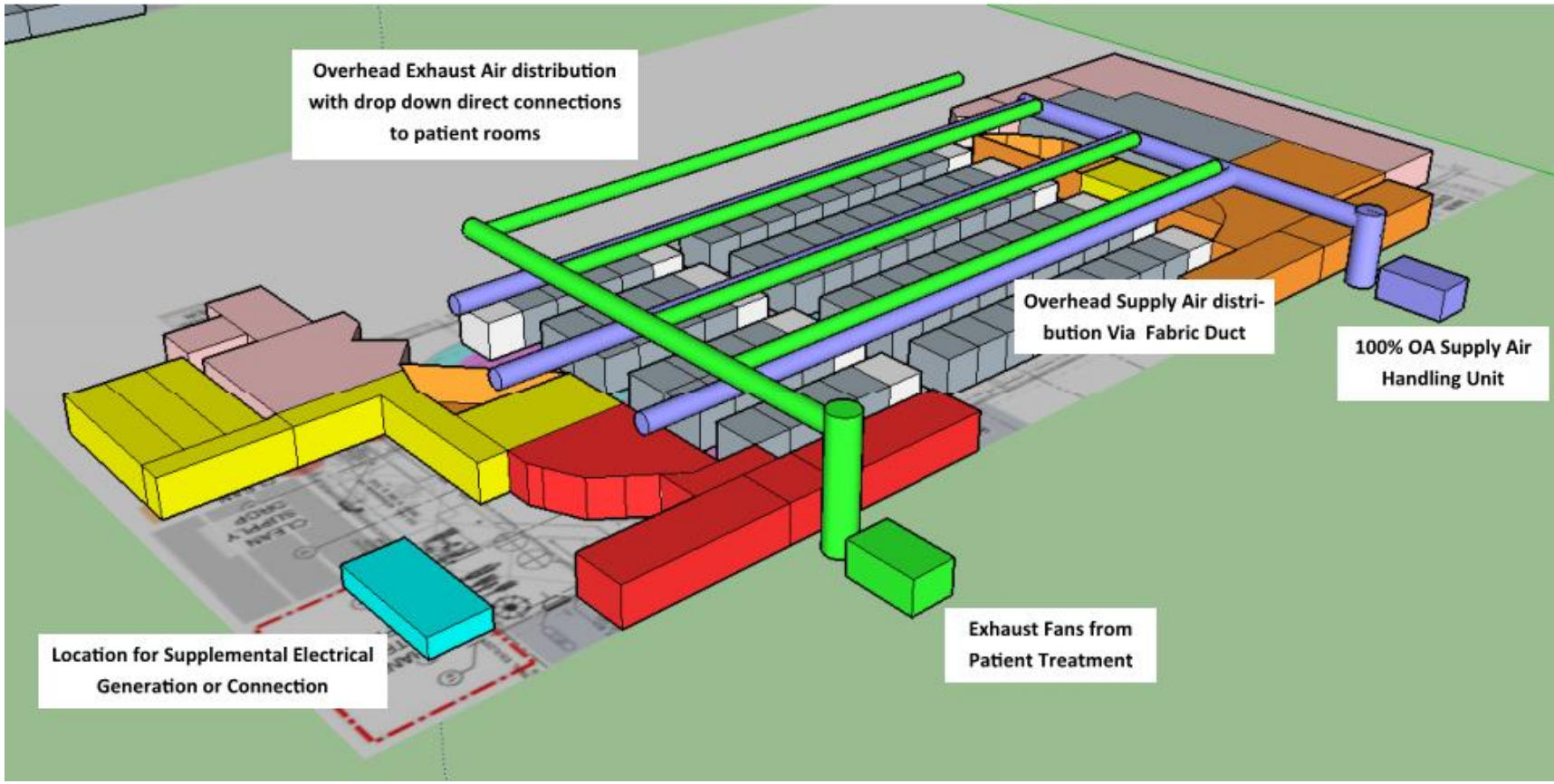
The base building systems generally have very little ventilation capacity and are not anticipated to be suitable for the purpose of serving the primary patient care area.

To address ventilation requirements standalone supply air and HEPA filtered exhaust air systems will be provided. Supply air systems will be complete with mechanical cooling and heating systems to maintain a suitable indoor environment for occupants

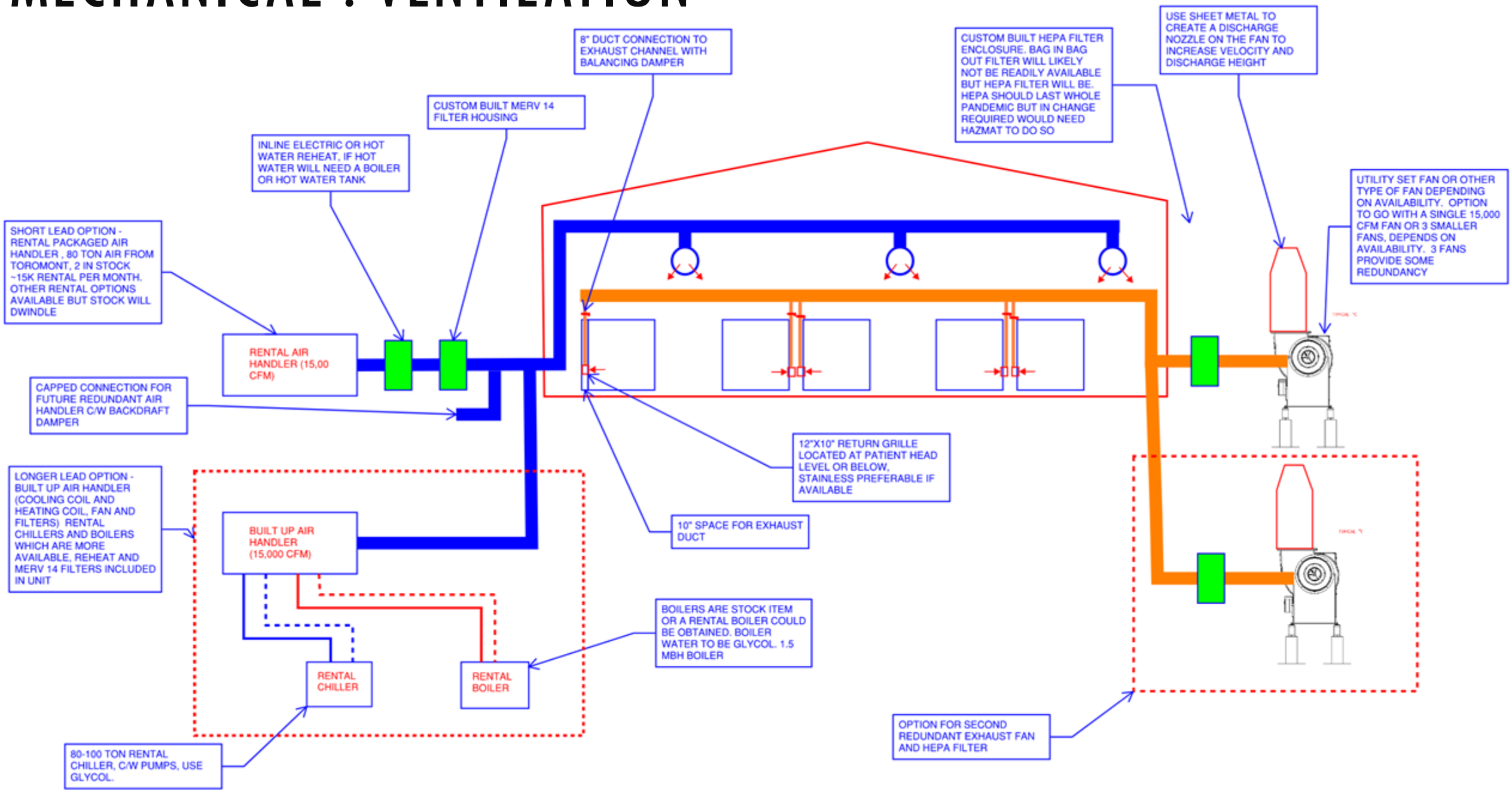
The design aims to provide 12ACH and continuous inward directional airflow for each Patient Treatment Room

Supply air mains are proposed to be fabric type duct suspended at high level. Fabric duct was selected as it integrates distribution and air delivery into a single product, is light-weight and quick to erect.

Exhaust mains are proposed to be rigid spiral wound ductwork with an 8" branch connection to a grille located near the head of each patient bed.



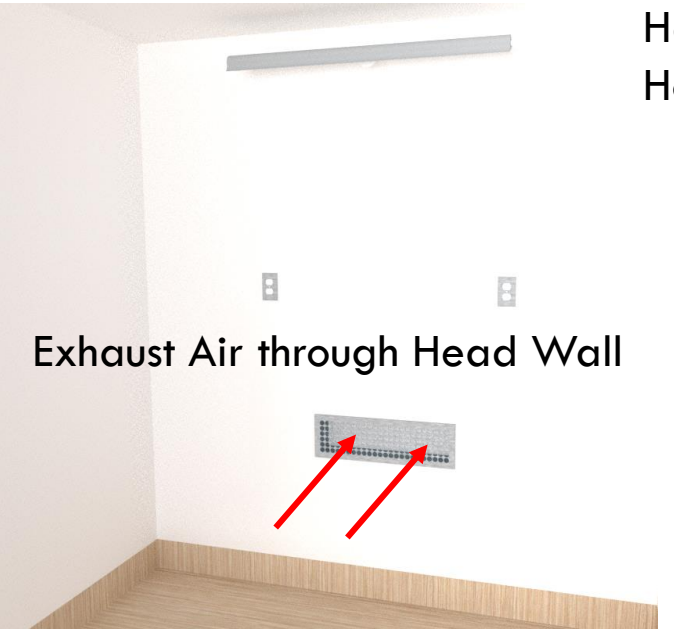
MECHANICAL : VENTILATION



MECHANICAL : VENTILATION

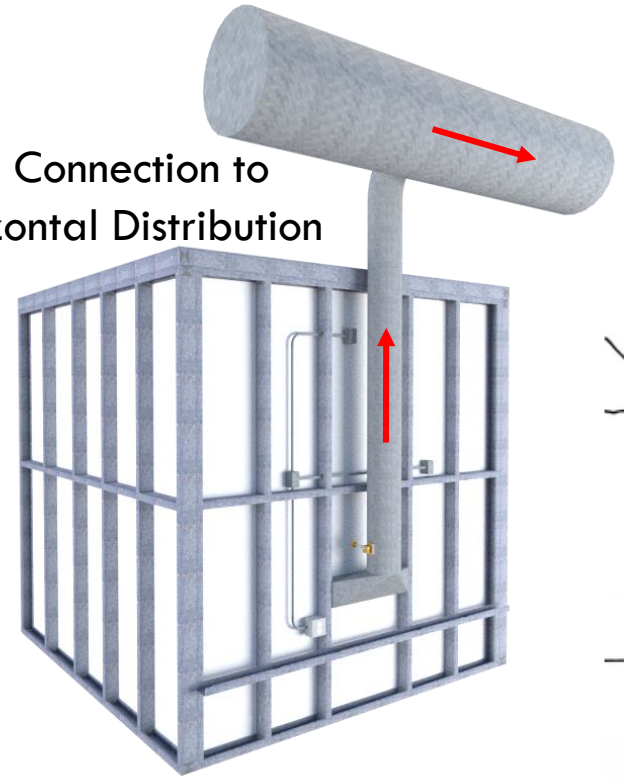
8" round exhaust connections shall drop down within a service chase behind the pod to boots with perforated exhaust grills on the head wall. Direct exhaust connections can also be extended to the ceiling of other spaces as needed such as Soiled supplies and washrooms

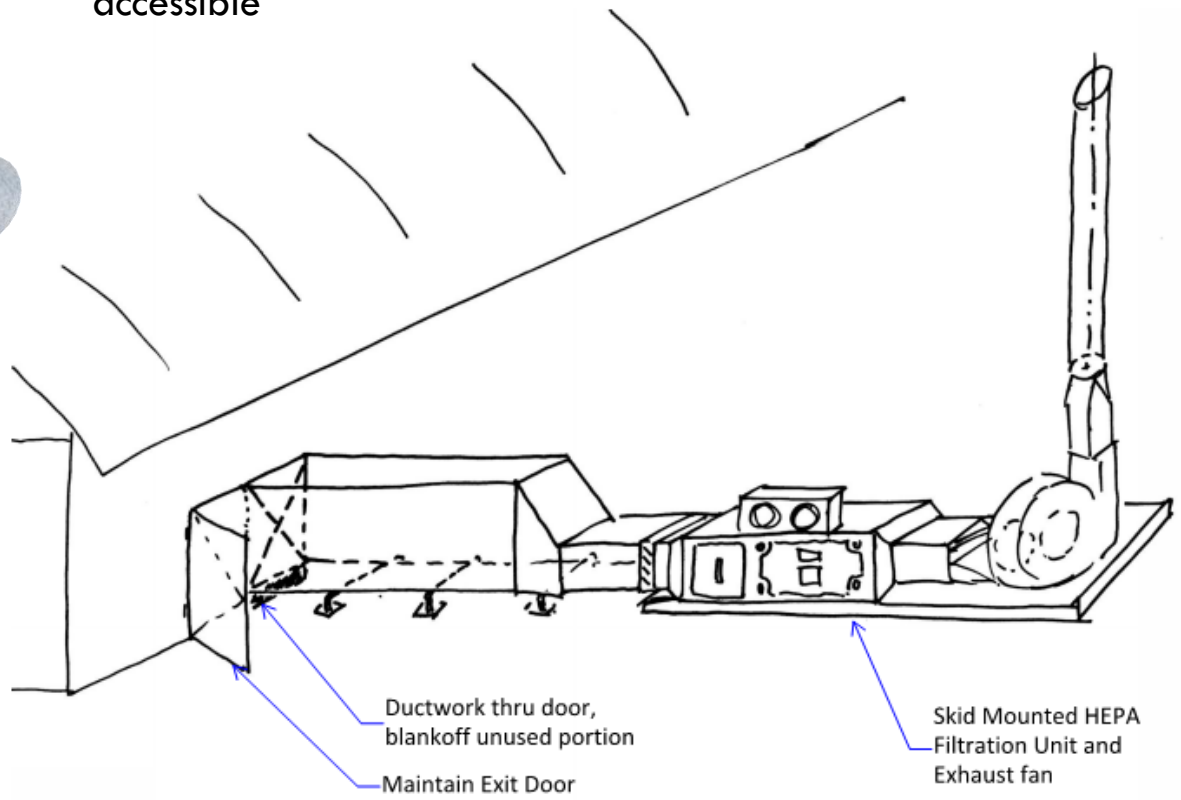
Connections from the main exhaust fan(s) and AHUs located outside shall utilize existing doorways to duct into the building. Hepa filtration units shall be located outside adjacent to the fan(s) and AHUs and easily accessible



Exhaust Air through Head Wall

Hard Connection to Horizontal Distribution





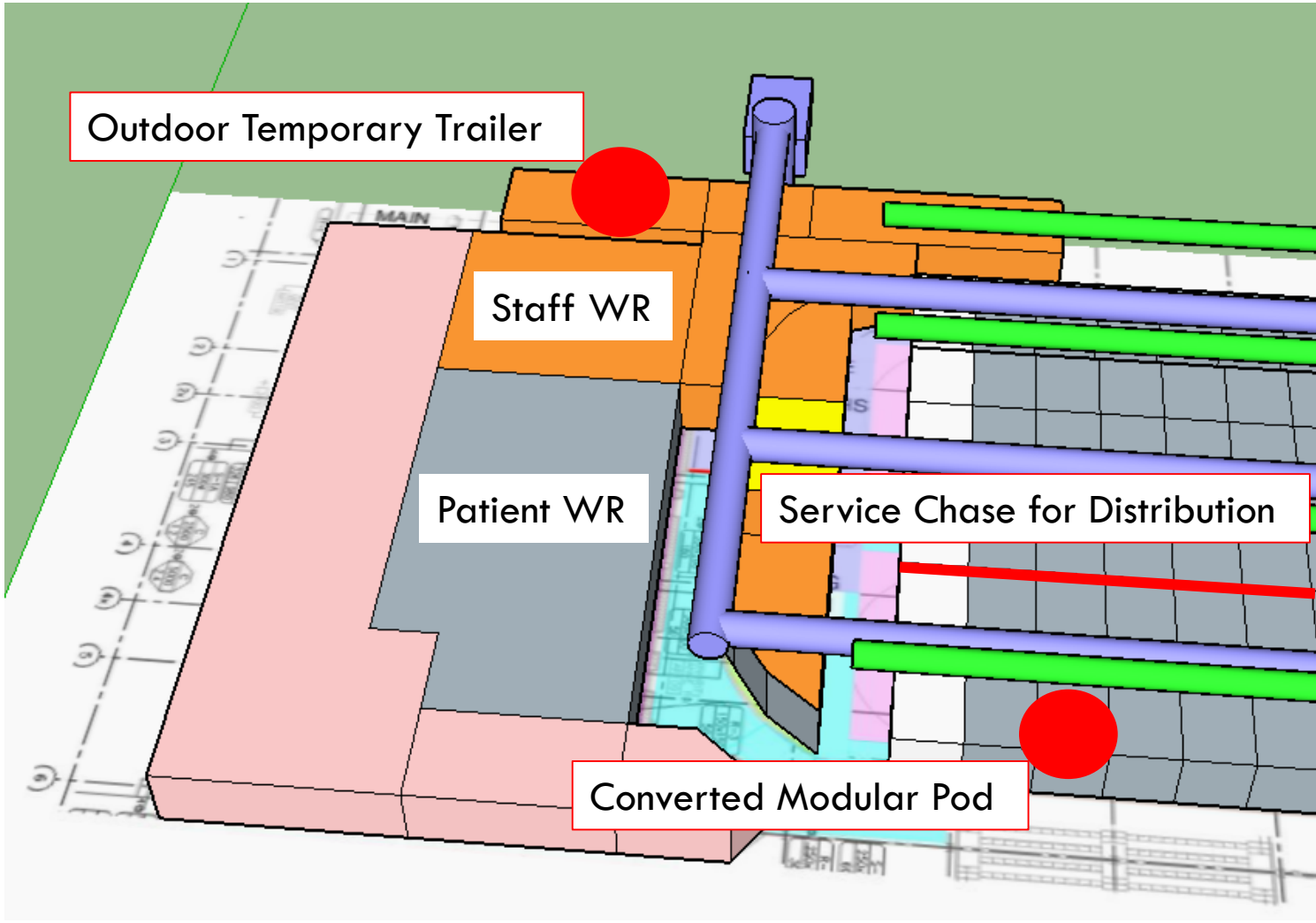
MECHANICAL : PLUMBING

The existing change rooms and washroom fixtures shall be utilized and separated to accommodate patients and staff.

If additional plumbing connections are required to areas with handwashing sinks and additional washrooms in the building, services chases shall be utilized to the space.

Main domestic water connections can be made from the base building system (Mechanical room, hose bibs or existing washroom areas). Individual pumps at the fixture(s) will be used to connect the sanitary to the base building system.

Alternatively, if required, temporary washroom trailers or portable hand sinks can be used in or adjacent to the building.



ELECTRICAL

ELECTRICAL – POWER GENERATION & DISTRIBUTION

As most of the loads associated with the patient care area of the arena are loads requiring essential power, it is proposed that all power be provided by a portable diesel-powered emergency generator. These are available from a number of local suppliers.

Designing with a temporary generator as the power source allows the team to have flexibility in sizing the temporary power system to either accommodate more pods/beds or use multiple generators in tandem without being limited by the existing power feed to the facility.

The existing arena electrical infrastructure will be used for utility spaces and washrooms but would generally remain untouched.

The voltage of the generator will be ideally a 600V 3 phase, 3 or 4 wire. The generator will feed into a new 600V 3 phase main switchboard. The switchboard will feed the major mechanical equipment and a step down 600V to 120/208V 3 phase 4 wire transformer.

The transformer will feed a 120/208V 3 phase 4 wire distribution panel. This distribution panel will feed local power panels for receptacle loads within the patient rooms.

One 64 circuit breaker panel will be located in each quadrant of the floor space, with each panel serving approximately twenty-five rooms.

ELECTRICAL – WIRING DEVICES AND METHODS

Each patient Isolation Room shall be fitted with two 20 amp 120 volt hospital grade receptacles, each on a dedicated circuit. The receptacles will be located on either side of the bed.

All receptacles will be fitted with while-in-use weather-proof covers.

All circuits will utilize copper wires in flexible FT4 rated PVC conduit run on top of the patient room partitions and then down into the partition cavity.

ELECTRICAL – FIRE ALARM & NURSE CALL

Fire Alarm System

The existing facility fire alarm system shall be maintained operational, in most cases these will be single stage systems, likely with horns or bells as the signalling devices.

Generally, this type of healthcare facility would be provided with a two-stage fire alarm system and all patient rooms will be provided with smoke detectors. As this would extend construction to a point of impracticality, it is suggested that a fire watch and portable fire extinguishers would be provided in lieu of a major fire alarm system upgrade.

The existing ice pad public address system could be utilized as voice communication system in the event of an alarm and trained staff would provide instructions to the medical staff and mobile patients in the event of an alarm.

It is imperative that a full fire safety plan be prepared and implemented for each facility.

Nurse Call & Telecommunications

In lieu of a more permanent Nurse Call System, a wireless nurse call system will be implemented included medical staff pendants and cell phone annunciation and communication.

One data drop will provided in each patient room for medical equipment. Data and voice drops will be provided in the Phone/Video Booths and at the Nurse Stations. The drops will run back to floor mounted racks located at either end of the patient room block. The existing arena telecommunications connections to the outside world will be leveraged.

ELECTRICAL - LIGHTING

Patient exam lighting within each pod is something the team has been focused on to ensure that the lighting levels are adequate for a temporary healthcare facility.

The general arena lighting will be utilized to provide hallway/corridor lighting and task lighting utilized within the pods.

For existing spaces within the facility the existing lighting system will be used.

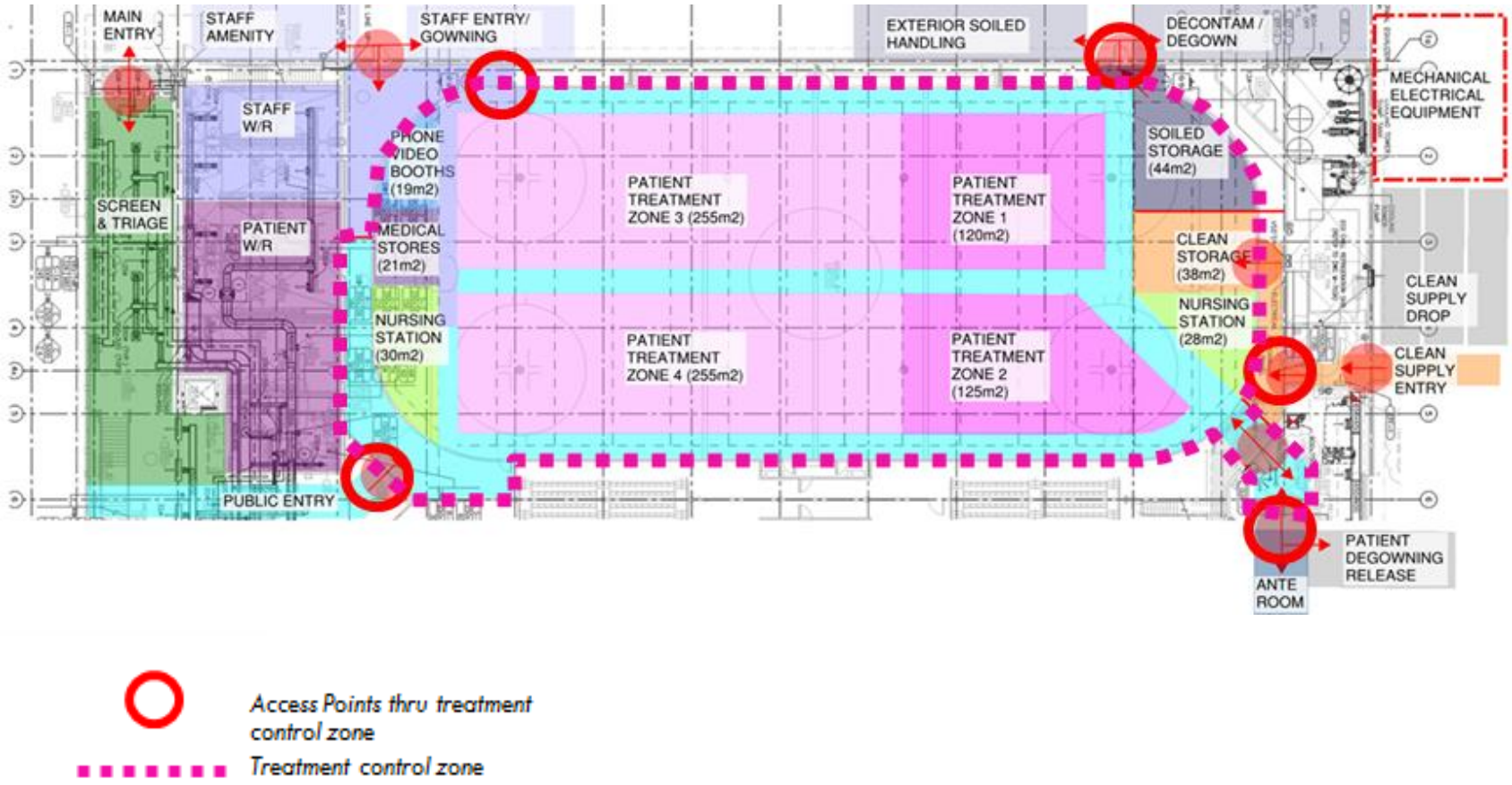
SECURITY

SECURITY

The Rink with fully enclose boards can assist with security control. A full perimeter enclosure around the patient treatment zones can be established.

Security personal can control 5 access points into the treatment zones:

1. Non ambulatory entrance/patient transfer
2. Soiled material exit
3. Staff entrance
4. Ambulatory access
5. Clean supply



INFECTION CONTROL

INFECTION CONTROL - PRELIMINARY WORK

Site Selection will impact the preliminary infection control requirements.

Prior to the majority of construction trades accessing the site, a detailed cleaning and disinfecting of the major touch areas of the facility must be conducted. Follow the Environmental Abatement Council of Ontario (EACO) guideline on Emerging and Existing Pathogen Cleaning - Best Practices for Environmental Professional Services for CoVID-19

During construction of the temporary facility, utilize the precautions and procedures in CSA Z317-13-17, Infection control during construction, renovation, and maintenance of health care facilities.

eaco
Canadian Chapter of the EIA

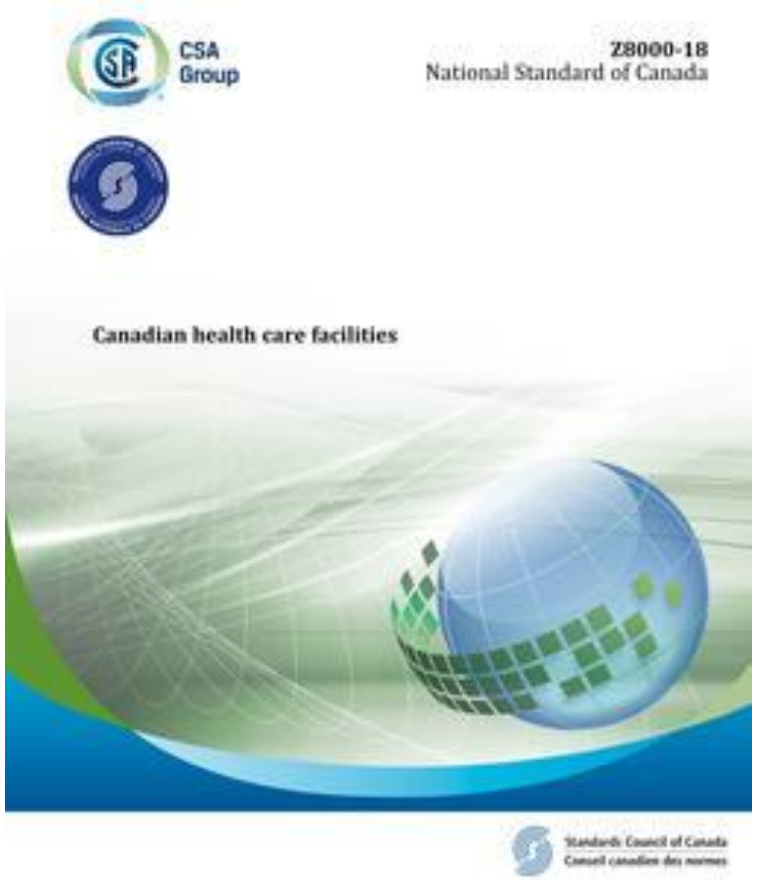
CSA GROUP™

INFECTION CONTROL – DURING OPERATION

During the operation of the temporary facility, utilize the precautions and procedures in CSA Z8000 – 18, Canadian Health Care Facilities, section 4.5 Infection Prevention and Control, which includes:

(a) allocating sufficient space for patient care to prevent the spread of illness (i.e., adhering to minimum clearances and area requirements as specified in this Standard);

(b) using materials in construction that are free of contaminants and excessive moisture and are able to withstand regular use and repeated cleaning;



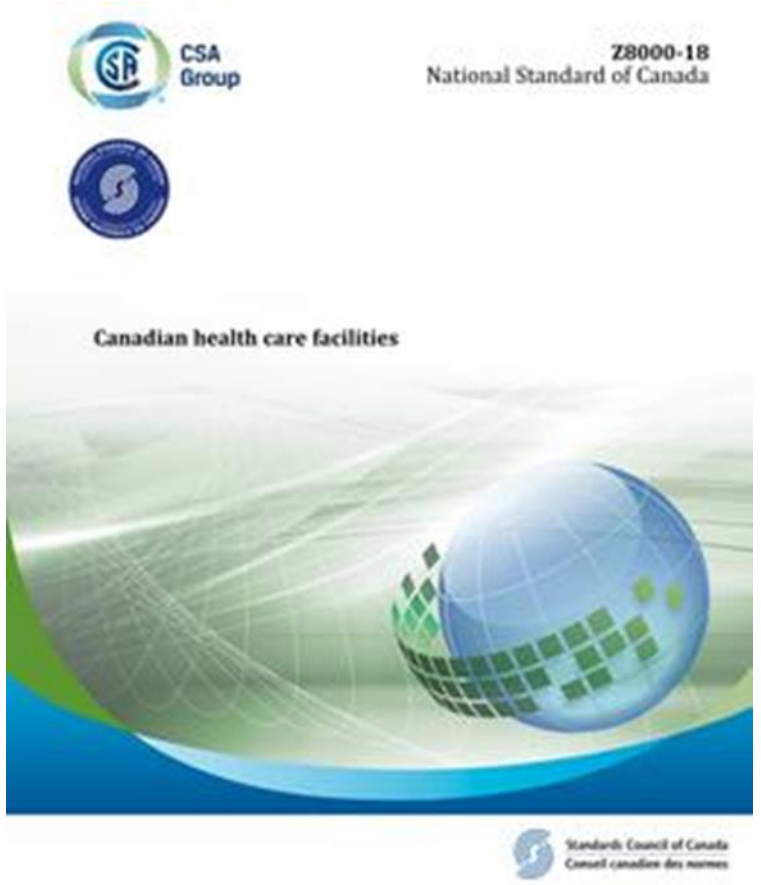
INFECTION CONTROL – DURING OPERATION

c) using antimicrobial fabrics and other materials on furniture, fittings, and equipment;

(d) providing areas for localized waste management;

(e) dedicating areas for storage of supplies and equipment; and

(f) providing accessible hand hygiene sinks and waterless hand hygiene stations designed for caregiver and patient hand hygiene.



INFECTION CONTROL DURING DECOMMISSIONING

Planning for the decommissioning of the facility should be built into the design and construction.

Utilizing easily demountable and cleanable surfaces will facilitate an easier and more efficient dismantling and decommissioning process.

Follow the Environmental Abatement Council of Ontario (EACO) guideline on Emerging and Existing Pathogen Cleaning - Best Practices for Environmental Professional Services for CoVID-19

All materials and equipment utilized at the site should be cleaned and disinfected prior to removal.

Photo: copyright Globe and Mail

COMMISSIONING

COMMISSIONING

Commissioning in a quick installation is going to be key to ensuring that the correct amount of fresh air is reaching the patients and ensuring that the equipment on site is operational.

The team would look to employ some basic measures from proven building commissioning practices (ASHRAE, CAN/CSA, CaGBC)

The team would look to implement basic measures such as equipment start-ups, balancing and measurement, and spot verification.

1. Equipment Start-Ups
2. Balancing of Airside Systems (Fresh Air, Exhaust)
3. Spot Measurement of CO2, and Thermal Comfort Values

With a standard process developed the construction team would be able to complete a few checks and ensure that the system is operating as intended as well as providing the necessary airflows to the staff and patients.