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COVID-19 Design & Construction: Balancing Safety & Speed During a Pandemic State of Emergency

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MKM architecture + design has recently been engaged to help different national healthcare systems with hospitals located in Indiana react to the potential high volume of COVID-19 patients within the hospital(s) and the increase demand placed on the facility's minimal required airborne infection Isolation Rooms (AIIR). The immediate concern of our clients has been to identify the highest risks for the patient, the staff, and the public regarding increased infectious patient(s). Prior to the COVID-19 pandemic, resources were already limited and led to unpredictable material lead times in the construction market. These current market hurdles have made it extremely difficult for healthcare systems to react quickly in a routine setting, let alone in a state of emergency.

Realistically, within the next forty-eight hours, our clients will need to have successfully evaluated and implemented new process and procedures along with partial modifications to each facility. In a national and/or state emergency, when does the immediate health, safety, and welfare of the public outweigh the standard

regulatory process? Time is against us all and we need action.

During an emergency pandemic, we recommend that the State of Indiana consider adopting a policy that provides a 24-hour conditional approval process to review requests for temporary construction efforts within existing acute care settings. In doing so, perspective waivers should be predefined as acceptable during this time for facility reference with the assumption that, following the end of the pandemic, all temporary construction be removed and each facility will be returned to its previous condition. All construction that is being requested to remain permanent construction would then be subject to the full review process as currently administered.

INTENSIVE CARE CONSIDERATIONS

Based on what healthcare systems know today, March 15, 2020. Many locations are expediting Temporary

Negative Pressure Units (TNPU) in lieu of a single existing AIIR within an existing ICCU unit is the primary concern. In the current regulatory requirements, the number of AIIR within an existing ICCU is minimal compared to what a pandemic can require. In our client's larger hospitals, they usually have multiple ICCU teams within a department which allows them the capability to easily separate a TNPU in a state of emergency whereas a Critical Access Hospital (CAH) doesn't have this luxury. In many larger systems, facilities generally use three paths of decision-making in converting their existing ICCU's to a TNPU's:

1. Will the designated TNPU work today in a state of emergency?
2. What must we consider in making TNPU improvements today?
3. How could we convert this TNPU into a permanent Airborne Infection Isolation Unit (AIIU) that meets current state regulations?

With Healthcare systems not having the luxury to submit these temporary spaces to the Indiana State Department of Health (ISDH) for full review, they need to evaluate what is considered High, Medium, and Low Risk as it pertains to process and procedures, facility infrastructure capabilities, and meeting current regulatory requirements (FGI, NPFA, Indiana Building Code, ANSI, etc.). The most critical requirement for AIIRs is to make them negative pressure to immediate areas. Some of the healthcare systems, in collaboration with other knowledge leaders, have established what they think are the most critical items to tackle in transitioning an ICCU into a TNPU. Key considerations include:

- *Most Negative Pressure Space:* The critical care patient room(s) holding the infectious patient(s) should be the most negative pressure spaces in the unit. When dedicated exhausting through windows be sure that no intakes are within the required area.
- *Intermediate Negative Pressure Space:* The unit corridor within the designated TNPU will serve as the anteroom to the infectious patient room. The infectious patient room should be negative to the anteroom (unit corridor). The anteroom is where the staff will gown with appropriate PPE per the hospital infection preventionist (IP).
- *Positive Pressure Space:* The nurse station and required support spaces behind the nurse station should be separated from the anteroom (unit

corridor) to protect staff not immediately caring for patients. The nurse station zone should remain positive to the anteroom (unit corridor).

- *Declutter Units:* Until pandemic is over, remove everything from the room that is not required to provide care (artwork, furniture, etc.).
- *Materials and Finishes:* All exposed wood needs to be replaced or sealed in place so that it is not exposed (i.e. underside of plastic laminate countertops, plastic laminate windowsills). Cubicle curtains must be replaced with disposable curtains.

All surfaces must be caulked and sealed to ensure no cracks, crevices, or gaps exist in or on surfaces in the rooms. If lay-in vinyl-faced/clean room ceilings are installed in lieu of drywall, caulk all tiles to the grids and perimeter walls. Caulk perimeters of light fixtures if installing gasketed fixtures is not feasible. If integral cove base doesn't exist in the rooms caulk the wall base to the floor and wall. Surfaces need to be scrubbable. If paint in the existing room is not epoxy paint, and timing prohibits resurfacing to epoxy paint, the owner will have to repair the paint in the room at the end of the pandemic. Environmental Services (EVS) will review proper cleaning of these rooms with infection preventionist.

Hospital Dietary needs to work with the infection preventionists on process and procedures to deliver of food to the unit (provide disposable utensils, plates, etc.).

- *Doors:* Self-closing doors are a requirement at the infectious patient room and anteroom doors. If not self-closing they need alarmed if left open. Availability of contractors and materials could limit this possibility and would need to be part of process and procedures.
- *Quality Control:* Human error is natural, especially when out of routine. These temporary units being created to handle COVID-19 patients require flows and processes outside standard operations and may require two-step processes to reduce the possibility of falling back on pre-pandemic routines. Hospital needs to review process and procedures on any additional safety measures.

When pandemic is over, careful consideration should be given to understanding how these facilities could convert their TNPU's into permanent AIU's that meet current state regulations. Current state regulations will need to be followed to the fullest extent for an AIU and submitted to ISDH for standard review. Providing an entire AIU would require designated patient toilets and determination if dedicated ante rooms would be desired (not required). There will be no waivers as we would no longer be in an emergency state as a state or country.

NON-INTENSIVE CARE CONSIDERATIONS

Based on what healthcare systems know today, March 15, 2020. As Emergency Department (ED) visits increase with the growing number of COVID-19 patients, our larger hospital clients have created a process and procedure to immediately transport patients under investigation (PUI) from the ED to a separate and designated location within the hospital. The older hospitals often have underutilized bed counts from the decrease in inpatient care over the years. This allows them to shift patient beds around to different non-intensive care floors within the hospital and vacate an entire floor, wing, and/or section of a patient tower. These vacated floors are allowing them to better separate the PUI's from non-infectious patients. Once the PUI is transported to the vacated non-intensive care floor, the hospital can hold them in the PUI patient rooms until the hospitals completes their on-site test screening. If screening detects a presumptive positive, they immediately move them to a negative pressure room on the opposite wing of the same floor for observation. The hospital will then make the determination if the positive-patient is low-risk and can be sent home to quarantine, if they are moderate-risk and need to remain in the negative pressure non-intensive observation room, or if they are high-risk and need to be moved to the ICU floor within the TNPU.

Based on recent meetings, many facilities are treating these designated vacated floors as observation units and the amount of temporary work they will incur to transition these patient room into negative pressure is relative to how fast the demand of potential COVID-19 patients increases within the ED. In one particular case, the vacated floor currently has two existing AIU's on this non-intensive care floor and our client is only temporarily converting approximately (5) five existing patient rooms at a time to dedicated negative pressure. Depending on the timing of the demand, others are using negative air

HEPA filtered scrubbers within the rooms and discharging out the exterior window.

These decisions have been made by the hospital prior to receiving any COVID-19 patients, and already one of the hospitals in Indiana have a positive-tested patient in their critical unit within the TNPU. These processes and procedures made sense at the time to the hospital and we would expect them to make necessary adjustments as the hospital sees the reality of the pandemic growing daily. Most Owners understand and have identified the risk of utilizing a vacated floor for potential infectious patients until screening is determined.

- **Most Negative Pressure Space:** The non-intensive care patient room(s) holding the positive-tested infectious patient(s) should meet the negative pressure levels as required by FGI. Hospitals will have the option to achieve this negative pressure whether it be through new dedicated units outside the patient window or by a negative air scrubber within the patient room. HEPA manufacturers have not yet confirmed if 99.97% HEPA filters provides any protection against COVID-19 particulates. There is no defined protection; however, CDC is recommending it. The hospital proposed HEPA filtration units will provide adequate ventilation and negative pressure for each individual room. Product selection may impact cfm and static pressure ratings depending on the size of the room. They'll need to closely monitor the filters during use as they may need replaced frequently, especially in the beginning. These rooms would be equipped with local manometers to monitor the room pressure differential. This would allow them to better evaluate the performance of the filters from the corridor.
- **Anteroom/Corridor:** To reduce risk of room-to-room contamination on the non-intensive care floors, the corridor will serve as anteroom and gowning of Person Protective Equipment (PPE). Hospitals have determined this would be a low risk strategy as HEPA filters within each designated patient room will be large enough to vent rooms and corridors to the outdoors. Facilities realize that this veers from FGI requirements and IP will need to evaluate what they consider low, medium, and high risk (which

will help gauge appropriate implementation and decision making moving forward).

- Declutter Units: Until pandemic is over, facilities need to remove everything from the room that is not required to provide care (artwork, furniture, etc.).
- Materials and Finishes: All exposed wood needs to be replaced or sealed in place so that it is not exposed (i.e. underside of plastic laminate countertops, plastic laminate windowsills). Cubicle curtains must be replaced with disposable curtains.

Ceilings must be scrubbable surfaces (vinyl-faced clean tiles or drywall lid). If lay-in vinyl-faced/clean room ceilings are installed in lieu of drywall, caulk all tiles to the grids and perimeter walls. Caulk perimeters of light fixtures if installing gasketed fixtures is not feasible. In these non-intensive care rooms, unless there were major cracks, crevices, or gaps the hospital was not planning on caulking all surfaces to ensure no cracks, crevices, or gaps exist in or on surfaces in the rooms. It was understood that all surfaces need to be scrubbable. If paint in the existing room is not epoxy paint, and timing prohibits resurfacing to epoxy paint, the owner will have to repair the paint in the room at the end of the pandemic. Environmental Services (EVS) will review proper cleaning of these rooms with infection preventionist.

Hospital Dietary needs to work with the infection preventionists on process and procedures to deliver of food to the unit (provide disposable utensils, plates, etc.).

- Doors: Self-closing doors are a requirement at the infectious patient room. If not self-closing, they need to be alarmed if left open. Availability of contractors and materials could limit this possibility and would need to be part of an adopted process and procedure.
- Quality Control: Human error is natural, especially when it is during tasks that are out of a normal routine. These temporary units being created to handle COVID-19 patients require standard practices that are outside the standard operations and may require two-step processes

to reduce the possibility of falling back on pre-pandemic routines. The hospital will need to review new processes and procedures to ensure appropriate safety measures and being implemented.

PROPOSED FUTURE BEST PRACTICES

Based on what we know today and looking toward the future, the primary question for facility management is understanding how healthcare systems, A/E firms, and municipalities can make immediate decisions as it impacts the health, safety and welfare of the people – especially during extreme situations such as the current pandemic.

In collaboration with ISDH, temporary waivers can be provided for the sections of regulatory requirements governing Indiana during the COVID-19 pandemic. Some of the existing hospitals could be designed to be “grandfathered” from older codes as improving them to new regulations would be a difficult task. Speed, existing facility modifications, and material lead times are what is driving the non-compliance decisions of healthcare systems.

Resources used to present all the viable options to healthcare systems in order to provide effective strategies at specific locations would include:

- C-Suite
- Hospital Department Leaders/Directors
- Hospital Clinical Teams
- Facilities Director and Engineers
- Facilities Planning Design & Construction Teams
- Hospital Infection Preventionist
- Safety Risk Assessment Teams
- Healthcare Architecture/Engineering Firms
- Healthcare Contractors & Subcontractors
- Owner preferred Vendors and Suppliers

A critical component to the success of this strategy will be the staff and guidance of the ISDH. Their invaluable expertise and guidance during these times for both facilities and design professionals is incredibly important.

About the Author:



Matthew Sparling, AIA, LEED AP

As a Principal, Matt Sparling provides valuable leadership within the firm's healthcare studio. With over fifteen years managing complex healthcare projects for large institutional clients, he has a reputation for successfully planning, designing, and executing right-sized solutions that benefits our client's goals. His ability to skillfully facilitate interdisciplinary design teams and engage diverse user groups has provided invaluable service to our clients. As the youngest managing Principal, Matt offers a unique perspective to the leadership team at MKM. While managing the firm's quality control initiatives, he has taken the skills he honed as an effective project manager and translated them become an effective corporate leader. His obsession with work efficiency and value-added activities have substantially contributed to the firm's continued growth.