

5. PLANNING, DESIGN, AND CONSTRUCTION

In this edition appendix material appears in the main body of the document; however, it remains advisory only.

*5.1 Planning and Design

~~Planning for health care facilities shall include, in addition to space and operational needs, provisions for infection control and protection of patients during any renovations or new construction.~~

~~Continual health care facility upgrade through renovation and new construction involving existing facilities can create conditions that can be hazardous to patients.~~

~~During the programming phase of a construction project, the owner shall provide an Infection Control Risk Assessment (ICRA). An ICRA is a determination of the potential risk of transmission of various agents in the facility. This continuous process is an essential component of a facility functional or master program to provide a safe environment of care. The ICRA shall be conducted by a panel with expertise in infection control, risk management, facility design, construction, ventilation, safety, and epidemiology. The panel shall provide updated documentation of the risk assessment throughout planning, design, and construction. The ICRA shall only address building areas anticipated to be affected by construction.~~

~~The design professional shall incorporate the specific, construction related requirements of the ICRA in the contract documents. The contract documents shall require the constructor to implement these specific requirements during construction.~~

~~The ICRA is initiated in design and planning and continues through construction and renovation. After considering the facility's patient population and programs, the ICRA shall address but not be limited to the following key elements:~~

- ~~(a) The impact of disrupting essential services to patients and employees~~
- ~~(b) Patient placement or relocation~~
- ~~(c) Placement of effective barriers to protect susceptible patients from airborne contaminants such as *Aspergillus* sp.~~
- ~~(d) Air handling and ventilation needs in surgical services, airborne infection isolation and protective environment rooms, laboratories, local exhaust systems for hazardous agents, and other special areas~~
- ~~(e) Determination of additional numbers of airborne infection isolation or protective environment room requirements~~
- ~~*(f) Consideration of the domestic water system to limit *Legionella* sp. and waterborne opportunistic pathogens~~

~~The assessment for internal and/or external construction projects also includes patient protection from demolition, ventilation and water management following planned or unplanned power outages, movement of debris, traffic flow, cleanup, and certification.~~

~~Facility construction, whether for freestanding buildings or expansion and/or renovation of existing~~

buildings, can create conditions that are harmful to patients and staff. For that reason, planning, design, and construction activities for health care facilities shall include, in addition to space and operational needs consideration of provisions for infection control, life safety, and protection of patients during construction.

5.1.A. Infection Control

During the programming phase of a project, the owner shall provide an Infection Control Risk Assessment (ICRA). An ICRA is a determination of the potential risk of transmission of various biological agents in the facility. Based on the ICRA, the owner shall also provide recommendations for design to be incorporated in the program and Infection Control Risk Mitigation Recommendations (ICRMR), which will describe the specific methods by which transmission will be avoided during the course of the construction project. The owner shall also provide monitoring of the effectiveness of the applied ICRMR during the course of the project.

The ICRA shall be conducted by a panel with expertise in infection control, risk management, facility design, construction and construction phasing, ventilation, safety, and epidemiology. The panel shall provide updated documentation of the risk assessment together with updated Mitigation Recommendations throughout planning, design, construction, and commissioning. The ICRA shall address, but not be limited to, the following:

5.1.A1. Design. Building design features shall be addressed when developing the ICRA.

- a. Number, location, and type of airborne infection isolation and protective environment rooms.
- b. Location(s) of special ventilation and filtration such as emergency department waiting and intake areas.
- c. Air handling and ventilation needs in surgical services, airborne infection isolation and protective environment rooms, laboratories, local exhaust systems for hazardous agents, and other special areas.
- d. Water systems to limit *Legionella* sp. and waterborne opportunistic pathogens.
- *e. Finishes and surfaces.

5.1.A2. Construction. Building and site areas anticipated to be affected by construction shall be addressed when developing the ICRA.

- a. The impact of disrupting essential services to patients and employees.
- b. Determination of the specific hazards and protection levels for each.
- c. Location of patients by susceptibility to infection and definition of risks to each.
- d. Impact of potential outages or emergencies and protection of patients during planned or unplanned outages, movement of debris, traffic flow, cleanup, and testing and certification.
- e. Assessment of external as well as internal construction activities.
- f. Location of known hazards.

5.1.A3. Infection control risk mitigation recommendations. The ICRMR shall be prepared by the ICRA

panel and shall address, but not be limited to, the following:

a. Patient placement and relocation.

b. Standards for barriers and other protective measures required to protect adjacent areas and susceptible patients from airborne contaminants.

c. Temporary provisions or phasing for construction or modification of heating, ventilating, air conditioning, and water supply systems.

d. Protection from demolition

e. Measures to be taken to train hospital staff, visitors, and construction personnel.

The owner shall ensure that construction-related requirements of the ICRMR, as well as ICRA-generated design requirements, are incorporated into the project requirements.

The owner shall inspect the initial installation and provide continuous monitoring of the effectiveness of the infection control measures during the entire course of the project. This monitoring may be conducted by in-house infection control and safety staff or by independent outside consultants. In either instance, provisions for monitoring shall include written procedures for emergency suspension of work and protective measures indicating the responsibilities and limitations of each party (owner, designer, constructor, and monitor).

5.1.B. Reserved

***5.2 Phasing**

5.2.A.

Projects involving renovation of existing buildings shall include phasing to minimize disruption of existing patient services. This phasing is essential to ensure a safe environment in patient care areas.

5.2.B.

Phasing will include assurance for clean to dirty airflow, emergency procedures, criteria for interruption of protection, construction of roof surfaces, written notification of interruptions, and communication authority.

5.2.C.

Phasing plans shall include considerations of noise and vibration control that result from construction activities.

***5.2.D.**

Renovation areas shall be isolated from occupied areas during construction ~~using airtight barriers and exhaust airflow shall be sufficient to maintain negative air pressure in the construction zone.~~ based on the ICRA.

5.2.E.

Existing air quality requirements and other utility requirements for occupied areas shall be maintained.

***5.3 Commissioning**

Acceptance criteria for mechanical systems shall be specified. Crucial ventilation specifications for air balance and filtration shall be verified before owner acceptance. Areas requiring special ventilation include surgical services, protective environments, airborne infection isolation rooms, laboratories, and local exhaust systems for hazardous agents. These areas shall be recognized as requiring mechanical systems that ensure infection control, and ventilation deficiencies shall not be accepted. Acceptance criteria for local exhaust systems dealing with hazardous agents shall be specified and verified.

5.4 Nonconforming Conditions

It is not always financially feasible to renovate the entire existing structure in accordance with these Guidelines. In such cases, authorities having jurisdiction may grant approval to renovate portions of the structure if facility operation and patient safety in the renovated areas are not jeopardized by the existing features of sections retained without complete corrective measures.

~~A5.1.~~

~~Partitions and enclosures around renovation areas should be solid in nature, securely attached, and sealed at the floor and structure above. Where life safety does not warrant special constructions, measures should be taken to control the transmission of dust and other airborne substances. One method for achieving this is by means of a separate ventilation/exhaust system for the construction area, thereby maintaining negative air pressure in the construction area. This would require further documentation of the locations of fresh air intakes and filters (where necessary), as well as the disconnection of existing air ducts, as required.~~

~~A5.1 (f). In addition to the consideration of the domestic water system, consider eliminating or monitoring the use of decorative self-contained features such as decorative fountains or water features (water walls, etc.) as they may be a source of Legionella and/or waterborne opportunistic pathogens and are difficult to disinfect.~~

~~The current direction of providing medical care has created a need for the built medical environment to be flexible, to be able to meet changing requirements and not be disruptive to the provision of medical care. This can be accomplished in several ways:~~

- ~~▪ By having adequate space to allow interim program moves~~
- ~~▪ By constructing facilities with interstitial space~~
- ~~▪ By constructing facilities with adequate mechanical/electrical rooms, utility chases, and support corridors to allow expansion or change~~

~~Medical facilities require an infrastructure that is capable of keeping up with changes in medical technology and advancements in equipment and building systems.~~

~~Constructing facilities with interstitial space is often considered to be very expensive and not cost-effective. But when consideration is given to the life of the facility, the use of interstitial space reduces maintenance cost, allows mechanical and electrical activities that normally would shut down program activities, and allows easy additions to the infrastructure systems. Interstitial construction can also shorten the construction schedule by allowing finish work to be accomplished at the same time infrastructure work is being done. A systematic design approach to the use of interstitial space is essential.~~

A5.1.A1.e. Preferred surface characteristics: (the ideal product)

1. Ease of maintenance/cleanable and repair
2. Does not support microbial growth
3. Non-porous – smooth
4. Sound absorption/acoustics
5. Inflammable – Class I fire rating or better
6. Durable
7. Sustainable
8. Low VOC/no off-gassing
9. Low smoke toxicity
10. Initial and life-cycle cost-effectiveness
11. Slip resistance – appropriate coefficient of friction
12. Ease of installation, demolition, and replacement
13. Non-problematic substrate and/or assemblies

14. Seamless
15. Resilient, impact resistant
16. Control of reflectivity/glare
17. Options for color, pattern, and texture
18. Non-toxic/non-allergenic

A5.2.D.

Maintain negative air pressure in the construction zone by means of a separate ventilation/exhaust system for the construction area. Review locations of exhaust relative to existing fresh air intakes and filters, as well as the disconnection and sealing of existing air ducts, as required. If the building system or a portion thereof is used to achieve this requirement, the system must be thoroughly cleaned prior to occupancy of the construction area.

~~Particular attention should be paid to areas requiring special ventilation, including surgical services, protective environment rooms, airborne infection isolation rooms, laboratories, autopsy rooms, and local exhaust systems for hazardous agents. It should be recognized that these areas need mechanical systems that comply with infection control and/or laboratory safety requirements.~~

A5.3 Commissioning

Commissioning is a quality process used to achieve, validate, and document that facilities and component infrastructure systems are planned, constructed, installed, tested, and are capable of being operated and maintained in conformity with the design intent or performance expectations. This process extends through all phases of a new or renovation project from conceptual design to occupancy and operations. Checks at each stage of the process should be made to ensure validation of performance to meet the owner's design requirements. Commissioning should be performed by an entity that is independent from the installing contractor.

Historically, the term "commissioning" has referred to the process by which the heating, ventilation, and air conditioning (HVAC) system of a building was tested and balanced according to established standards prior to acceptance by the building owner. The HVAC commissioning did not include other building components that did not directly affect the performance of the HVAC systems. Today, the definition of commissioning is being expanded to total building commissioning (TBC). The fundamental objective of TBC is to create a process whereby the owner will be assured that all building and system components, not just the HVAC system, will function according to design intent, specifications, equipment manufacturers' data sheets, and operational criteria. Because all building systems are integrated and validated, the owner can expect benefits to include improved occupant comfort, energy savings, environmental conditions, system and equipment function, building operation and maintenance, and building occupants' productivity.

The TBC process should include a feedback mechanism that can be incorporated into the owner's post-evaluation process to enhance future facility designs.

Facility acceptance criteria should be based on the commissioning requirements specified in the contract documents. These criteria specify the tests, training, and reporting requirements necessary for the owner to validate that each building system complies with the performance standards of the basis of design and for final acceptance of the facility.

Key systems and components that need to be tested and validated, as a minimum, during the TBC process

include the design and operations of the HVAC, plumbing, electrical, emergency power, fire protection/suppression, telecommunications, nurse call, intrusion and other alarm devices, and medical gas systems, as well as specialty equipment. Air balancing, pressure relationships, and exhaust criteria for mechanical systems must be clearly described and tested to create an environment of care that provides for infection control. Areas requiring emergency power must be specified and tested. Special plumbing systems must be certified to support the chemicals scheduled for use in them. While all areas of the health care facility are included in the commissioning process, the following areas are of particular concern: critical and intensive care areas; surgical services; isolation rooms, including those used for airborne infection/pathogens; pharmacies, and other areas potentially containing hazardous substances.

A reference source for an existing HVAC commissioning process is ASHRAE Guideline 1-1996.