

# 1.5 Planning, Design, and Construction

*Appendix material, which appears in shaded boxes at the bottom of the page, is advisory only.*

## 1 General Considerations

### 1.1 Applicability

The provisions of this chapter shall apply to all health facility projects.

### 1.2 Environment of Care Considerations

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, health care facility planning, design, and construction activities shall include—in addition to consideration of space and operational needs—consideration of provisions for infection control, life safety, and protection of occupants during construction.

#### 1.2.1 Infection Control Risk Assessment (ICRA)

During the planning phase of a project, after considering the facility's patient population and programs, the owner shall provide an infection control risk assessment. An ICRA is a determination of the potential risk of transmission of various air- and waterborne biological contaminants in the facility.

#### 1.2.2 Owner Recommendations

Based on the ICRA, the owner shall provide the following:

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### A1.3 Design Process and Implementation

**a.** To meet the objectives of this chapter, as well as those of Chapter 1.2, Environment of Care, health care organizations should develop an interdisciplinary design process to guide facility design. The intent of an interdisciplinary design process is to improve building performance by integrating design considerations from project inception. (Also see Section 1.2-A3.)

**b.** An interdisciplinary design team should be assembled as early as possible in the design process. The design team should include but not be limited to administrators, clinicians, infection control, safety officers, support staff, patient advocates/consumers, A/E consultants, and construction specialists. (Also see Section 1.2-A2.1.2.6.)

**1.2.2.1.** Design recommendations. Recommendations for design generated by the ICRA shall be provided for incorporation in the program.

**1.2.2.2** Infection control risk mitigation recommendations (ICRMR). Infection control risk mitigation recommendations shall describe the specific methods by which transmission of air- and waterborne biological contaminants will be avoided during the course of the construction project.

### \*1.3 Design Process and Implementation

Groups (stakeholders) affected by and integral to the design shall be included in the planning and implementation process. (See Section 1.2-2.1.2.6.)

## 2 Infection Control Risk Assessment Process

### 2.1 General

#### 2.1.1 ICRA Panel

The ICRA shall be conducted by a panel with expertise in infection control, direct patient care, risk management, facility design, construction and construction phasing, ventilation, safety, and epidemiology.

#### 2.1.2 Continuous Updates

The ICRA panel shall provide updated documentation of the risk assessment together with updated mitigation recommendations throughout planning, design, construction, and commissioning.

#### 2.1.3 Monitoring

The owner shall also provide monitoring of the effectiveness of the applied ICRMR during the course of the project.

### 2.2 ICRA Considerations

The ICRA shall address, but not be limited to, the following:

### 2.2.1 Design

Building design features, including the following, shall be addressed when developing the ICRA:

2.2.1.1 Number, location, and type of airborne infection isolation and protective environment rooms

2.2.1.2 Location(s) of special ventilation and filtration such as emergency department waiting and intake areas

2.2.1.3 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

2.2.1.4 Water systems to limit *Legionella* sp. and waterborne opportunistic pathogens

\*2.2.1.5 Finishes and surfaces

### 2.2.2 Construction

When developing the ICRA, building and site areas anticipated to be affected by construction shall be addressed, including consideration of the following:

2.2.2.1 The impact of disrupting essential services to patients and employees

2.2.2.2 Determination of the specific hazards and protection levels for each

2.2.2.3 Location of patients by susceptibility to infection and definition of risks to each

2.2.2.4 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

2.2.2.5 Assessment of external as well as internal construction activities

2.2.2.6 Location of known hazards

## 2.3 Infection Control Risk Mitigation

### 2.3.1 ICRMR Preparation

The infection control risk mitigation recommendations

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

2.3.1.1 Patient placement and relocation

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

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

2.3.1.4 Protection from demolition

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

### 2.3.2 Project Requirements

The owner shall ensure that construction-related infection control risk mitigation recommendations, as well as ICRA-generated design recommendations, are incorporated into the project requirements.

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### A2.2.1.5 Finishes and surfaces

Preferred surface characteristics (of the ideal product) include the following:

- a. Ease of maintenance/repair and cleanable
- b. Does not support microbial growth
- c. Nonporous—smooth
- d. Sound absorption/acoustics, where applicable
- e. Inflammable—Class I fire rating or better
- f. Durable
- g. Sustainable
- h. Low VOC (no off-gassing)
- i. Low smoke toxicity
- j. Initial and life-cycle cost-effectiveness
- k. Slip resistance—appropriate coefficient of friction
- l. Ease of installation, demolition, and replacement
- m. Non-problematic substrate and/or assemblies
- n. Seamless
- o. Resilient, impact resistant
- p. Control of reflectivity/glare
- q. Options for color, pattern, and texture
- r. Non-toxic/non-allergenic

### 2.3.3 Infection Control Monitoring

The owner shall inspect the initial installation of the infection control measures and provide continuous monitoring of their effectiveness throughout the duration of the project.

**2.3.3.1** This monitoring may be conducted by in-house infection control and safety staff or by independent outside consultants.

**2.3.3.2** 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).

## 3 Renovation

### 3.1 Phasing

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.

#### 3.1.1 Phasing Provisions

Phasing provisions shall 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.

#### 3.1.2 Noise and Vibration

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

### \*3.2 Isolation

During construction, renovation areas shall be isolated from occupied areas based on the ICRA.

### 3.3 Maintenance of Air Quality and Utilities

Existing air quality requirements and other utility requirements for occupied areas shall be maintained during any renovation or construction.

### 3.4 Nonconforming Conditions

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

## \*4 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.

### 4.1 Mechanical Systems

Acceptance criteria for mechanical systems shall be specified.

**4.1.1** Crucial ventilation specifications for air balance and filtration shall be verified before owner acceptance.

**4.1.2** Areas requiring special ventilation (such as surgical services, protective environments, airborne infection isolation rooms, laboratories, and local exhaust systems for hazardous agents) shall be recognized as requiring mechanical systems that ensure infection control. Ventilation deficiencies shall not be accepted.

**4.1.3** Acceptance criteria for local exhaust systems dealing with hazardous agents shall be specified and verified.

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### A3.2 Ventilation of the Construction Zone

**a.** Airflow into the construction zone from occupied spaces should be maintained by means of a dedicated ventilation/exhaust system for the construction area.

**b.** Locations of exhaust discharge relative to existing fresh air intakes and filters, as well as the disconnection and sealing of existing air ducts, should be reviewed as required by the ICRA.

**c.** If the existing building system or a portion thereof is used to achieve this requirement, the system should be thoroughly cleaned prior to occupancy of the construction area.

## 5 Record Drawings and Manuals

### 5.1 Drawings

**5.1.1** Upon occupancy of the building or portion thereof, the owner shall be provided with a complete set of legible drawings showing construction, fixed equipment, and mechanical and electrical systems, as installed or built.

**5.1.2** Drawings shall include a life safety plan for each floor reflecting NFPA 101 requirements.

### 5.2 Equipment Manuals

**5.2.1** Upon completion of the contract, the owner shall be furnished with the following:

**5.2.1.1** A complete set of manufacturers' operating, maintenance, and preventive maintenance instructions

**5.2.1.2** Parts lists

**5.2.1.3** Procurement information with numbers and a description for each piece of equipment

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### A4 Commissioning

**a.** The commissioning process extends through all phases of a new construction 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.

**b.** Commissioning should be performed by an entity that is independent from the installing contractor.

**c.** Total building commissioning. 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 postoccupancy 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.

**d.** Systems and components to be included in TBC. Key systems and components that need to be tested and validated, at 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 should be clearly described and tested to create an environment of care that provides for infection control.

Areas requiring emergency power should be specified and tested.

Special plumbing systems should be certified to support the chemicals scheduled for use in them.

**e.** Areas to be included in commissioning. 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.

**f.** A reference source for an existing HVAC commissioning process is ASHRAE Guideline 1, *The HVAC Commissioning Process*.

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**5.2.2** Operating staff shall be provided with instructions on how to properly operate systems and equipment.

**5.2.3** Required information shall include energy ratings as needed for future conservation calculations.

### 5.3 Design Data

**5.3.1** The owner shall be provided with complete design data for the facility, including the following:

**5.3.1.1** Structural design loadings

**5.3.1.2** Summary of heat loss assumption and calculations

**5.3.1.3** Estimated water consumption

**5.3.1.4** Medical gas outlet listing

**5.3.1.5** List of applicable codes

**5.3.1.6** Electric power requirements of installed equipment

**5.3.2** All such data shall be supplied to facilitate future alterations, additions, and changes, including, but not limited to, energy audits and retrofit for energy conservation.