2.5 Building Systems

Appendix material, shown in shaded boxes at the bottom of the page, is advisory only.

2.5-1 General

2.5-1.1 Application

2.5-1.1.1 This chapter contains elements that are common to most types of residential health, care, and support facilities. The elements are required only when referenced in a common element or specific facility chapter in Part 3 (Residential Health Facilities), Part 4 (Residential Care and Support Facilities), and Part 5 (Non-Residential Support Facilities).

2.5-1.1.2 Additional specific requirements are located in the facility chapters in Parts 3, 4, and 5. Consult the facility chapters to derermine whether elements in this chapter are required.

2.5-1.2 Building System Design

2.5-1.2.1 Facilities shall have building systems that are designed and installed in a manner that provides for the safety, comfort, and well-being of residents, participants, or outpatients.

2.5-1.2.2 The primary goal in building system design shall be to support resident, participant, and outpatient needs and/or operational functions. Energy consumption and efficiency shall be a secondary goal.

2.5-2 Plumbing Systems

2.5-2.1 General

In the absence of local and state plumbing codes, all plumbing systems shall be designed and installed in accordance with the *International Plumbing Code.*

2.5-2.2 Plumbing and Other Piping Systems

2.5-2.2.1 General Piping and Valves

All piping, except control-line tubing, shall be identified.

2.5-2.2.2 Potable Water Supply Systems

2.5-2.2.2.1 Capacity

(1) Systems shall be designed to supply water at pressures sufficient to operate all fixtures and equipment during maximum demand.
(2) Supply capacity for hot- and cold-warer piping shall be determined on the basis of fixture units, using recognized engineering standards.

2.5-2.2.2.2 Valves. Each water service main, branch main, riser, and branch to a group of fixtures shall have valves.

(1) Stop valves shall be provided for each fixture.
(2) Access panels shall be provided at all valves where required.
(3) Valves shall be tagged, and a valve schedule shall be provided to the facility owner for permanent record and reference.

2.5-2.2.2.3 Backflow prevention

(1) Systems shall be protected against cross-connection in accordance with American Water Works Association (AWWA) *Recommended Practice for Backflow Prevention and Cross-Connection Control.*
(2) Vacuum breakers or backflow prevention devices shall be installed on hose bibs and supply nozzles used to connect hoses or tubing to housekeeping sinks and, where used, to bedpan-flushing attachments.

*2.5-2.2.3 Heated Potable Water Distribution Systems

2.5-2.2.3.1 General. Provisions shall be included in the heated potable water distribution system to limit the amount of Legionella bacteria and other opportunistic waterborne pathogens.

2.5-2.2.3.2 Recirculation of hot water. Heated potable water distribution systems serving resident areas shall be under constant recirculation to provide continnous hot water at each hot water outlet or to provide alternative means for maintaining hot water.

(1) Non-recirculated fixture branch piping shall not exceed 25 feet (7.62 meters) in length.
(2) Alternative means shall be permitted to include the installation of instantaneous systems or another type of water heating system at point of use.

2.5-2.2.3.3 Elimination of dead-end piping

(1) Installation of dead-end piping (risers with no flow, branches with no fixture) shall not be permitted.
(2) In renovation projects, dead-end piping shall be removed.
(3) Installation of empty risers, mains, and branches installed for future use shall be permitted.

APPENDIX

A2.5-2.2.3 Heated potable water distribution systems

a. Legionella response. There are several ways to treat potable water systems to kill Legionella and other opportunistic waterborne pathogens. Complete removal of these organisms is not feasible, but methods to reduce the amount include hyperchlorination (free chlorine, chlorine dioxide, monochloramine), elevated hot water temperature, ozone injection, silver/copper ions, and ultraviolet light. Each of these options has advantages and disadvantages. While increasing the hot water supply temperature to 140°F (60°C) is typically considered the easiest option, the risk of scalding, especially to youth and the elderly, is significant. See CDC *Guidelines for Environmental Infection Control in Health-Care Facilities* (2003) and ASHRAE Guideline 12: *Minimizing the Risk of Legionellosis Associated with Building Water Systems* for additional information. Another reference is "Legionella Control in Health Care Facilities," available from the American Society of Plumbing Engineers.

b. Design for efficient heated potable water distribution. Hot water distribution systems should be designed to deliver hot or tempered water in a reasonable time. Low-flow faucets, longer pipe runouts between a recirculated main and the fixture, and larger diameter pipes increase the time it takes to achieve desired temperatures. Given the water conservation benefits of low-flow faucets, designers should consider reducing the length of uncirculated runouts, reducing the pipe size, providing heat tracing for the runout, or using point-of-use water heaters. Following is a guide that may be used in designing a system based on delivery time.

—Design method. Hot and tempered water distribution systems should be designed using either the maximum pipe length or maximum pipe volume limits provided in this appendix section and in appendix table A2.5-a (Maximum Length of Hot Water System Pipe or Tube). For purposes of this discussion, references to pipe should also apply to tubing and the source of hot or tempered water is considered to be a water heater, boiler, circulation loop piping, or electrically heat-traced piping.

- Maximum allowable pipe length method. The maximum allowable pipe length from the source of hot or tempered water to the termination of the fixture supply pipe should be in accordance with the maximum pipe length columns in appendix table A2.5-a. Where the length contains piping of more than one size, the largest pipe size should be used to determine the maximum allowable pipe length in the table.
- Maximum allowable pipe volume method. The maximum volume of hot or tempered water in hot water distribution piping should be calculated in accordance with the guidance in the paragraph on water volume determination below. The maximum volume in piping to public hand-washing sinks, metering or non-metering, should be 2 ounces (0.06 L). For fixtures other than those at public hand-washing sinks, the maximum volume should be 64 ounces (1.89 L) for hot or tempered water from a water heater or boiler and 24 ounces (0.7 L) for hot or tempered water from a circulation loop pipe or an electrically heat-traced pipe.

—Water volume determination. The volume should be the sum of the internal volumes of pipe, fittings, valves, meters, and manifolds between the source of the hot water and the termination of the fixture supply pipe. The volume should be determined from the liquid ounces per foot column of appendix table A2.5-a. The volume contained in fixture shutoff valves, flexible water supply connectors to a fixture fitting, or a fixture fitting should not be included in the water volume determination. Where hot or tempered water is supplied by a circulation loop pipe or an electrically heat-traced pipe, the volume should include the portion of the fitting on the source pipe that supplies water to the fixture.

—Maximum flow rate. The maximum flow rate of fixtures should be limited to 0.5 gpm when connected to 1/4-inch piping, 1 gpm when connected to 5/16-inch piping, and 1.5 gpm when connected to 3/8-inch piping.

***2.5-2.2.3.4 Capacity.** The water-heating system shall have supply capacity at the temperatures and amounts indicated in Table 2.5-1 (Hot Water Use—Residential Health, Care, and Support Facilities). Storage of water at higher temperatures shall be permitted.

***2.5-2.2.3.5 Hand-washing sinks.** For hand-washing sinks, water shall be permitted to be supplied at a constant temperature between 70°F and 80°F using a single-pipe supply.

2.5-2.2.4 Drainage Systems

2.5-2.2.4.1 Piping

(1) Installation of exposed drainage piping or piping in the ceiling shall be avoided in food preparation centers, food service facilities, food storage areas, central services, electronic data processing areas, electric closets, and other sensitive areas.
(2) Where overhead drainage piping in these areas is unavoidable, provisions shall be made to protect the space below from leakage, condensation, and dust particles.

2.5-2.2.4.2 Kitchen grease traps. If grease traps are used, they shall be located so they are easily accessible for cleaning.

2.5-2.2.4.3 Sewers. Building sewers shall discharge into community sewerage. Where such a system is not available, the facility shall treat its sewage in accordance with local and state regulations.

2.5-2.3 Plumbing Fixtures

2.5-2.3.1 General

The material used for plumbing fixtures shall be non-absorptive and acid-resisrant.

2.5-2.3.2 Hand-Washing Sinks

See Section 2.4-2.2.8 (Hand-Washing Stations) for requirements for incorporating a sink into a hand-washing station.

2.5-2.3.2.1 Basin design

(1) Sinks used for hand-washing shall be designed with basins that reduce splashing.
(2) The nominal open area of the basin shall not be smaller than 144 square inches (929.03 square centimeters), with a minimum dimension of 9 inches (58.06 centimeters) in width or length.
(3) Hand-washing sink basins shall be made of vitreous china, porcelain, stainless steel, or solid-surface materials.

2.5-2.3.2.2 Sink basins shall be installed so they fit tightly against the wall or countertop and are sealed to prevent leaks.

2.5-2.3.2.3 Fittings

(1) The water discharge point of a hand-washing sink faucet shall be at least 8.5 inches (21.59 centimeters) above the bottom of the basin for resident rooms/bathrooms and 10 inches (25.4 centimeters) above the bottom of the basin for all other locations.
(2) Hand-washing sinks used by care and nursing staff and food service staff shall have fittings—including single-lever or wrist blade devices—that allow for hands-free operation.
    (a) Blade handles used for this purpose shall be at least 4 inches (10.16 centimeters) in length.
    (b) The location and arrangement of fittings shall provide the clearance required for operation of blade-type handles.
(3) Hand-washing sinks in resident rooms and dwelling units shall include a single-lever faucet with mixer.
(4) Hand-washing sinks in public toilet rooms that are accessible to residents with dementia shall include a single-lever faucet with mixer.

APPENDIX

A2.5-2.2.3.4 Water temperature is measured at the point of use or inlet to the equipment.

A2.5-2.2.3.5 One way to limit the potential growth of Legionella in a heated potable water system is to distribute water at a temperature lower than 80°F (26.6°C) for hand-washing use. Water at this temperature may be warm enough to encourage good hand-washing practice but cooler than the ideal growth conditions for Legionella.

(5) Sensor-regulated (electronic) faucets

(a) Sensor-regulated faucets shall meet user need for temperature and for length of time water flows.
(b) Electronic faucets shall be capable of functioning during loss of normal power.
(c) Use of sensor-regulated faucets with manual temperature control shall be permitted.
(d) Sensor-regulated faucets shall not be used for hand-washing sinks that are accessible to residents with dementia.

*(6) Anchorage. For hand-washing sinks, allowable stresses shall not be exceeded at any point on the sink where a vertical or horizontal force of 250 pounds (1112N) is applied. See Section 2.4-2.2.8.3 (Anchorage) for hand-washing station requirements.

2.5-2.3.3 Showers and Tubs

2.5-2.3.3.1 General. See common element and facility chapters in Parts 3 through 5 for requirements in addition to those in this section.

2.5-2.3.3.2 Showers. In resident bathrooms, bathrooms in dwelling units, and central bathing rooms or areas with showers, the following shall be provided:

(1) Flush transition between flooring and the shower floor
*(2) Floor that slopes to the drain
(3) Fittings and faucets for showers located within user reach to allow for independent bathing as applicable to the level of assistance required by the resident, participant, or outpatient population

2.5-2.3.4 Reserved

2.5-2.3.5 Clinical Sinks

Clinical sinks shall have an integral trap wherein the upper portion of the water trap provides a visible seal.

2.5-2.3.6 Portable Hydrotherapy Whirlpools

Portable hydrotherapy whirlpools or basins shall not be drained into hand-washing sinks or environmental services sinks. Instead, access to one of the following shall be provided for draining portable hydrotherapy equipment:

2.5-2.3.6.1 A dedicated sink or drain

2.5-2.3.6.2 A soiled utility fixture (a hopper or flushing-rim sink)

2.5-2.4 Medical Gas and Vacuum Systems

See common element and facility chapters in Parts 3 through 5 for requirements.

2.5-3 Heating, Ventilation, and Air-Conditioning (HVAC) Systems

2.5-3.1 General

2.5-3.1.1 Application

Basic HVAC system requirements for residential health, care, and support facilities are defined in this section. See common element and facility chapters in Parts 3 through 5 for additional requirements.

*2.5-3.1.2 Ventilation and Space Conditioning

APPENDIX

2.5-2.3.2.3 (6) Anchorage. See ICC/ANSI A117.1: *Accessible and Usable Buildings and Facilities* for more information.

A2.5-2.3.3.2 (2) Different types of drains have been found effective for this purpose, including trough drains. In addition, provision of rubber gaskets at the edge of prefabricated shower units have been found to successfully create a "dam" between the shower and the surrounding floor area.

A2.5-3.1.2 Humidity control. ANSI/ASHRAE Standard 55: *Thermal Environmental Conditions for Human Occupancy* recommends 30–60 percent relative humidity for comfort. In cold or arid climates, achieving a relative humidity as high as 30 percent may not be practical.

The relationships between humidity and resident comfort and between humidity and resident outcomes (e.g., the influence of humidity on resident dehydration, dry skin, skin tears, skin breakdown, and respiratory conditions) should be evaluated during the mechanical system design process.

For more information about humidification in elder care facilities, see Chapter 25, "Eldercare," by Lew Harriman, Geoff Brundrett, and Reinhold Kittler, in the ASHRAE *Humidity Control Design Guide for Commercial and Institutional Buildings.*

2.5-3.1.2.1 All occupied rooms and areas in the facility shall have provision for continuous ventilation.

2.5-3.1.2.2 Although natural ventilation (via operable windows) shall be permitted, mechanical ventilation shall be ptovided for all rooms and areas in the facility.

2.5-3.2 Mechanical System Design

2.5-3.2.1 Efficiency

The mechanical system shall be subject to general review for operational efficiency and life cycle cost.

*__2.5-3.2.1.1__ Recognized engineering procedures shall be followed for the most economical and effective results.

*__2.5-3.2.1.2__ In no case shall resident comfort or safety be sacrificed for energy conservation.

*__2.5-3.2.1.3__ Facility design consideration shall include site, building mass, orientation, layour, fenestration, and other features relative to passive and active energy systems. See the following sectious for additional information:

(1) Section 1.2-5.5 (Planning for Sustainability)
(2) Section 1.4-2.2 (Sustainable Design)
(3) Section 2.2-2 (Sustainable Design Criteria)

2.5-3.2.2 Air-Handling Systems with Unitary Equipment That Serves Only One Room

See Table 2.5-5 (Maximum Design Criteria for Noise in Interior Spaces Caused by Building Systems) for noise considerations.

2.5-3.2.3 System Valves

Supply and return mains and risers for cooling, heating, and steam systems shall be equipped with valves to isolate the various sections of each system. Each piece of equipment shall have valves at the supply and return ends.

*2.5-3.2.4 Acoustic Considerations for Outdoor Mechanical Equipment

2.5-3.2.4.1 For requirements for outdoor mechanical equipment and noise and vibration mitigation, see Section 2.5-8.2 (Site Exterior Noise) and Section 2.5-8.7 (Design Criteria for Building Vibration).

2.5-3.2.4.2 Outdoor mechanical equipment shall not produce sound that exceeds daytime and nighttime noise limits at neighboring properties as required by local ordinance.

2.5-3.3 HVAC Requirements for Specific Locations

2.5-3.3.1 Resident, Participant, Outpatient, and Related Support Areas

See common element and facility chapters in Parts 3 through 5 for any requirements in addition to those in this section for resident, participant, and outpatient areas and their support areas.

APPENDIX

A2.5-3.2.1.1 A well-designed system can generally achieve energy efficiency with minimal additional cost and simultaneously provide resident comfort.

A2.5-3.2.1.2 See ANSI/ASHRAE Standard 55-2010: *Thermal Environmental Conditions for Human Occupancy* for thermal comfort information.

A2.5-3.2.1.3 Centralized air-handling systems should be designed with an economizer cycle in areas where it is appropriate to use outside air. See ANSI/ASHRAE/IES Standard 90.1-2010: *Energy Standard for Buildings Except Low-Rise Residential Buildings* for additional information. Resident needs and/or operational function should be evaluated as primary concerns and energy consumption and efficiency as secondary concerns.

It may be practical in some areas that include operable windows to reduce mechanical ventilation and use open windows for ventilation during appropriate climatic conditions as long as resident comfort needs can be met.

A2.5-3.2.4 Acoustic considerations for outdoor mechanical equipment. Outdoor mechanical equipment includes cooling towers, rooftop air handlers, exhaust fans, fans located inside buildings with openings on the outside of the building, and other equipment. Special acoustic considerations for the building envelope in residential health, care, or support facility areas near such equipment may be required to mitigate noise. The effects of mechanical equipment noise on adjacent properties should also be considered, with attention to adjacent land uses and jurisdictional noise limits.

2.5-3.3.2 Fuel-Fired Equipment Rooms

Rooms with fuel-fired equipment shall be provided with outdoor air to maintain equipment combustion rates and limit space temperatures.

2.5-3.3.3 Areas of Refuge

Areas of refuge shall be heated or cooled as determined by the geographic location of the facility or setting.

2.5-3.3.4 Commercial Food Preparation Areas

If a facility requires a food preparation area, the following requirements shall apply:

2.5-3.3.4.1 Food preparation areas serving 30 or fewer residents shall be permitted to comply with requirements for kitchens adjacent to open corridors in NFPA 101: *Life Safety Code®*.

2.5-3.3.4.2 Commercial food service kitchens shall have ventilation systems with air supply mechanisms interfaced with exhaust hood controls or relief vents so that exfiltration or infiltration to or from exit corridors does not compromise the following:

(1) Exit corridor restrictions of NFPA 90A: *Standard for the Installation of Air-Conditioning and Ventilating Systems*
(2) Pressure requirements of NFPA 96: *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*
(3) Requirements for food preparation areas open to corridors in NFPA 101
(4) Ventilation requirements in Part 6 (ANSI/ASHRAE/ASHE Standard 170-2013: *Ventilation of Health Care Facilities*, including addenda)

2.5-3.3.4.3 Exhaust hoods handling grease-laden vapors in commercial food service kitchens shall comply with the following:

(1) NFPA 96
(2) NFPA 101

2.5-3.4 Thermal and Acoustic Insulation

2.5-3.4.1 General

See the following documents for requirements in addition to the requirements in this section.

2.5-3.4.1.1 *International Energy Code*

2.5-3.4.1.2 NFPA 255: *Standard Method of Test of Surface Burning Characteristics of Building Materials*

2.5-3.4.1.3 NFPA 101: *Life Safety Code®*

2.5-3.4.2 Thermal Insulation

2.5-3.4.2.1 General

(1) Insulation shall be provided in the building to conserve energy, protect personnel, and prevent vapor condensation.
(2) Existing accessible insulation in identified areas of work shall be inspected, repaired, and/or replaced in compliance with current code requiremenrs.

2.5-3.4.2.2 Vapor barrier

(1) Insulation on cold surfaces shall include an exterior vapor barrier.
(2) A separate vapor barrier shall not be required for material that will not absorb or transmit moisture.

2.5-3.4.3 Acoustic Insulation

See Section 2.5-8 (Acoustic Design Systems) for requirements.

2.5-3.5 HVAC Air Distribution

2.5-3.5.1 General

See common element and facility chapters in Parts 3 through 5 for additional requirements.

2.5-3.5.2 HVAC Ductwork

2.5-3.5.2.1 General. When smoke barriers are required, heating, ventilation, and air-conditioning zones shall be coordinated with smoke compartments insofar as practical to minimize the need to penetrate fire and smoke barriers.

*2.5-3.5.2.2 **Duct humidifiers.** If humidification is provided, the following requirements shall be met:

(1) If duct humidifiers are located upstream of the final filters, the humidifiers shall be placed at least twice the rated distance for full moisture absorption upstream of the final filters.
(2) Ductwork with duct-mounted humidifiers shall have a means of water removal.
(3) Humidifiers shall be connected to airflow proving switches that prevent humidification unless the required volume of airflow is present or high-limit humidistats are provided.
(4) All duct takeoffs shall be sufficiently downstream of the humidifier to ensure complete moisture absorption.
(5) Steam humidifiers shall be used. Use of reservoir-type water spray or evaporative pan humidifiers shall not be permitted.

2.5-3.5.3 Exhaust Systems

2.5-3.5.3.1 To enhance the efficiency of recovery devices required for energy conservation, combined exhaust systems shall be permitted.

2.5-3.5.3.2 Fans serving exhaust systems shall be located at the discharge end and shall be readily serviceable.

2.5-3.6 HVAC Filters

See common element and facility chapters in Parts 3 through 5 for requirements.

2.5-3.7 Heating Systems, Cooling Systems, and Equipment

2.5-3.7.1 General

See common element and facility chapters in Parts 3 through 5 for requirements in addition to those in this section.

2.5-3.7.2 Heating Systems

Facilities shall have a permanently installed heating system capable of maintaining an interior minimum temperature of 72° F (22° C) under heating design temperatures.

2.5-3.7.3 Cooling Systems

Facilities shall be configured and equipped with a cooling system capable of maintaining an interior maximum temperature of 75°F (24°C) under cooling design temperatures.

*2.5-3.7.4 Temperature Control

2.5-3.7.4.1 Rooms containing heat-producing equipment. These rooms, such as laundries or computer rooms, shall be mechanically or naturally ventilated.

2.5-4 Electrical Systems

2.5-4.1 General

2.5-4.1.1 Applicable Standards

All electrical material and equipment, including conductors, controls, and signaling devices, shall be installed in accordance with NFPA 70: *National Electrical Code®*.

2.5-4.1.2 Testing and Documentation

All electrical installations and systems shall be tested to verify that equipment has been installed and operates as designed.

2.5-4.2 Power-Generating and Power-Storing Equipment

See common element and facility chapters in Parts 3 through 5 for requirements.

APPENDIX

A2.5-3.5.2.2 One way to achieve basic humidification may be by a steam-jacketed manifold-type humidifier with a condensate separator that delivers high-quality steam. Additional booster humidification (if required) should be provided by steam-jacketed humidifiers for each individually controlled area. Steam to be used for humidification may be generated in a separate steam generator. The steam generator feedwater may be supplied either from soft or reverse osmosis water. Provisions should be made for periodic cleaning.

A2.5-3.7.4 Individual temperature controls should be provided for resident sleeping rooms.

2.5-4.3 Electrical Receptacles

*2.5-4.3.1 General

Convenience duplex outlets shall be provided as follows:

2.5-4.3.2 Receptacles in Corridors

Duplex-grounded receptacles for general use shall be installed a maximum of 50 feet (15.24 meters) apart in all corridors and within 25 feet (7.62 meters) of corridor ends.

2.5-4.3.3 Receptacles in Resident Rooms and Dwelling Units

See common element and facility chapters in Parts 3 and 4 for requirements.

2.5-4.3.4 Essential Electrical System Receptacles

If an essential electrical system is provided, electrical receptacle cover plates or electrical receptacles supplied from the essential electrical system shall be distinctively colored or marked for identification. If color is used for identification purposes, the same color shall be used throughout the facility.

2.5-4.3.5 Ground Fault Interrupter Receptacles

Ground-fault interrupters shall comply with NFPA 70: *National Electrical Code®*.

2.5-4.4 Electrical Requirements for Ventilator-Dependent Resident Rooms and Areas

2.5-4.4.1 If ventilators are used in a residential health, care, or support facility or setting, the need for battery backup and/or other essential electrical system backup shall be evaluated and addressed.

2.5-4.4.2 If ventilators are used in a facility or setting that has essential electrical power, the following requirements shall be met:

APPENDIX

A2.5-4.3.1 Height and location for receptacles should be evaluated based on the population being served. Receptacles available for residents to charge resident-operated mobility devices should be placed at a height above the finished floor easy for residents to access.

2.5-4.4.2.1 Dedicated circuit(s). This paragraph shall apply to both new and existing facilities serving ventilator-dependent residents.

(1) A minimum of one dedicated essential electrical system circuit per bed for ventilator-dependent residents shall be provided in addition to the normal system receptacles at each bed location required by NFPA 70. This circuit shall be provided with a minimum of two duplex receptacles identified for emergency use.
(2) Additional essential electrical system circuits and receptacles shall be provided where the electrical life support needs of the resident exceed the minimum requirements stated in this paragraph.

2.5-4.4.2.2 Essential electrical system connections

(1) Heating equipment provided for ventilator-dependent resident rooms shall be connected to the essential electrical system.
(2) Task lighting connected to the essential electrical system shall be provided for each ventilator-dependent resident room.

■ 2.5-5 Communications Systems

*2.5-5.1 General

2.5-5.1.1 Application

Requirements for call systems, information systems, and telecommunication systems shall be based on the care population and provided in accordance with requirements in the common element and facility chapters in Parts 3 through 5.

2.5-5.1.2 Communications System Equipment Requirements

2.5-5.1.2.1 A central location and/or decentralized location(s) for communications systems equipment shall be provided based on the care model.

A2.5-5.1 Audiovisual technology

a. If resident monitoring via camera is provided, family members should be able to turn off power for personal privacy.
b. Provision of an in-room computer or integration of the audiovisual system with a television screen should be considered to allow remote resident/family interaction.

2.5-5.1.2.2 Communications system equipment locations shall be permitted to house both communications system equipment and electronic safety and security equipment. See Section 2.5-6.2.2 (Locations for Safety and Security Equipment).

2.5-5.1.2.3 Locations for terminating telecommunication and information system devices shall be provided unless wireless systems are used.

2.5-5.2 Call System

See common element and facility chapters in Parts 3 through 5 for requirements.

2.5-5.3 Technology Equipment and Teledata Room(s)

2.5-5.3.1 General

***2.5-5.3.1.1 Purpose**

(1) The technology equipment room shall house the main networking equipment, servers, and data storage devices that serve the building.
(2) Telephone equipmenr shall be permitted to be included in the main technology equipment room.

2.5-5.3.1.2 Number. Each residential health, care, or support facility shall have at least one main technology equipment room and additional teledata rooms or closets as necessary to accommodate the systems used in the facility or setring.

*2.5-5.3.2 Size

2.5-5.3.2.1 The technology equipment room shall be sized to accommodate the number of racks needed for anricipated servers, networking, and storage.

2.5-5.3.2.2 The technology equipment room shall be sized to provide clearances to meet service requirements for the equipment that will be housed there.

*2.5-5.3.3 Location and Access

2.5-5.3.3.1 The technology equipment room shall be located above any floodplains and, in multi-story buildings, below the top level of the facility to deter water damage to the equipment from outside sources (e.g., leaks from the roof or flood damage).

2.5-5.3.3.2 In areas prone to hurricanes or tornados, the technology equipment room shall be located away from exterior curtain walls to prevent wind and water damage.

2.5-5.3.3.3 The technology equipment room shall be located a minimum of 12 feet (3.66 meters) from any transformer, motors, induction heaters, radio and radar systems, and other sources of electromagnetic interference.

2.5-5.3.4 Technology Equipment Room Facilities

2.5-5.3.4.1 Mechanical and electrical equipment or fixtures that are not directly related to the support of the technology equipment room shall not be installed in, pass through, or enter the room.

APPENDIX

A2.5-5.3.1.1 Technology equipment room. This room is the core of the information and technology system and of the communications system for a residential health, care, or support facility. The room should be environmentally controlled, have a power-conditioned electrical supply, and be fire-protected. It must be a locked space with limited access.

A2.5-5.3.2 Technology equipment room size. The actual size requirements for a technology equipment and teledata room should be clearly defined. A growth factor appropriate to the needs of the facility as recommended by industry organizations such as BICSI (Building Industry Consulting Services International) or the Telecommunications Industry Association (TIA) should be factored into the size of the room.

A2.5-5.3.3 Technology equipment room location and access

a. The technology equipment room should be located or designed to avoid vibration from mechanical equipment or other sources.
b. Locations that are restricted by building components that limit future expansion (e.g., elevators, building structural elements, kitchens, central energy plants, outside walls, or other fixed building walls) should be avoided.
c. Accessibility should be provided for the delivery of supplies and equipment to the space.

2.5-5.3.4.2 All computer and networking equipment shall be served by UPS power.

2.5-5.3.4.3 All circuits serving the equipment in the technology equipment room shall be dedicated to serving the technology equipment room only.

2.5-5.3.4.4 Cooling and heating shall be provided for technology equipment and data room(s).

(1) Cooling systems serving the technology equipment room shall be supplied by the essential power system.
(2) Temperature control systems in technology equipment room(s) shall be designed to maintain environmental conditions recommended in ASHRAE's *Thermal Guidelines for Data Processing Environments* or the requirements for the specific equipment installed.

2.5-5.4 Grounding for Telecommunication Spaces

2.5-5.4.1 Grounding, bonding, and electrical protection shall meet the requirements of NFPA 70 and TIA 607: *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.*

2.5-5.4.2 TGB bar

2.5-5.4.2.1 The telecommunications grounding bus (TGB) bar shall be drilled with holes according to National Electrical Manufacturing Association standards to accommodate bolted compression fittings.

2.5-5.4.2.2 All racks, cabinets, sections of cable tray, and metal components of the technology system that do not carry electrical current shall be grounded to this bus bar.

2.5-5.4.2.3 TGB bars shall be connected by a backbone of insulated, #6 (minimum) to 3/0 AWG stranded copper cable between all technology rooms.

2.5-5.5 Cabling Pathways and Raceway Requirements

Pathways and raceways distributing cabling between teledata rooms shall be enclosed in conduit for protection from damage.

2.5-6 Electronic Safety and Security Systems

2.5-6.1 General

Evaluation of the type of safety and security systems shall be completed and implemented based on the care population being served and the demographics of the project location.

2.5-6.2 Safety and Security System Equipment

*2.5-6.2.1 General

Means for provision of a safe environment for visitor and staff access shall be provided.

2.5-6.2.2 Locations for Safety and Security Equipment

2.5-6.2.2.1 Central location

(1) A central location for safety and security equipment shall be provided.
(2) Safety and security equipment shall be permitted to be located with teledata communications equipment. See Section 2.5-5.1.2 (Communications System Equipment Requirements) for additional requirements.

2.5-6.2.2.2 Locations for terminating safety and security system devices shall be provided.

2.5-6.3 Fire Alarm System

Fire alarm and detection systems shall be provided in compliance with NFPA 101: *Life Safety Code®* and NFPA 72: *National Fire Alarm and Signaling Code.*

APPENDIX

A2.5-6.2.1 Safety and security system equipment. Consider use of security cameras, remote lock access, intercoms, adequate lighting, security alarms, and other types of security equipment to provide a safe environment. In particular, use of camera monitoring equipment in centralized medication preparation areas and in corridors to/from the outside should be considered based on the care population.

2.5-7 Daylighting and Artificial Lighting Systems

2.5-7.1 General

2.5-7.1.1 Application

Parking lots, approaches to buildings, and all occupied spaces in buildings shall be wired and provided with lighting equipment.

*2.5-7.1.2 Lighting Design

2.5-7.1.2.1 Lighting shall be designed to meet the needs of occupants in specific spaces. See Section 1.2-5.1 (Lighting Planning) for requirements.

2.5-7.1.2.2 Unless alternative lighting levels are justified by the functional program, Table 2.5-2 (Minimum Maintained Average Illuminance) shall be used as the minimum required ambient and task lighting levels in all rooms, spaces, and exterior walkways.

2.5-7.1.2.3 Means shall be provided for controlling light levels to suit space use and availability of daylight.

2.5-7.1.2.4 Glare from all light sources shall be minimized.

(1) Daylight shall be controlled and diffused to minimize glare.

*(2) Artificial lighting sources shall be indirect, concealed, or diffused to minimize glare.

2.5-7.1.2.5 The combination of connected lighting equipment shall not produce flickering from ballast/drivers/dimmers and light sources.

*2.5-7.2 Daylighting Systems in Resident Living, Participant, and Outpatient Areas

***2.5-7.2.1** Dining, recreation/lounge, and activity areas for daytime use shall have windows for daylight and views to the outdoors that take up no less than 40 percent of the wall area.

***2.5-7.2.2** Translucent shades, sheers, blinds, or other window treatments shall be provided to control brightness and reduce glare.

2.5-7.3 Artificial Lighting Systems

*2.5-7.3.1 Light Fixtures

Light fixtures in wet areas (e.g., kitchens, showers) shall be vapor resistant and have cleanable, shatter-resistant lenses and no exposed lamps.

APPENDIX

A2.5-7.1.2 Lighting design

a. Additional lighting quality issues to consider include the following:
   — Color rendering properties should be addressed in lamp selection.
   — Finish selection should address light reflectance values (LRV) in conjunction with lamp selection.

b. Other lighting design practices developed by the Illuminating Engineering Society (IES) and described in ANSI/IES RP-28: *Recommended Practices for Lighting and the Visual Environment for Senior Living* should be considered.

A2.5-7.1.2.4 (2) Avoiding glare from artificial lighting. Lighting that creates glare because the bright light source is visible should be avoided since glare is detrimental to visual acuity. Indirect lighting is most effective in residential care and support facilities since the light source is entirely hidden from view. See appendix section A2.5-7.3.2 (Lighting in transition spaces) for additional information.

A2.5-7.2 Daylighting. Because residents benefit from the higher light levels and color associated with daylight, daylighting should be provided in resident living areas. Windows and skylights should be used to minimize the need for artificial light and to allow residents, participants, and outpatients to experience the natural daylight cycle. High levels of daylight are required to entrain circadian rhythms.

A2.5-7.2.1 Light shelves, diffused skylights, and other daylighting techniques should be used to balance the daylight in a space.

A2.5-7.2.2 Glare or brightness from windows can reduce visual acuity or even disorient elders. Placement of windows at the ends of corridors is not recommended unless the excessive brightness of daylight is mitigated by window coverings or building orientation.

A2.5-7.3.1 Light fixtures. Care should be taken to avoid injury from light fixtures. Light sources that may burn residents, participants, or outpatients or ignite window coverings, clothing, or other flammable items by direct contact should be covered or protected.

*2.5-7.3.2 Lighting Requirements for Specific Locations

See chapters in Parts 3 through 5 for requirements.

2.5-8 Acoustic Design Systems

2.5-8.1 General

See Section 1.2-5.2 (Acoustic Planning) for planning requirements.

*2.5-8.2 Site Exterior Noise

*2.5-8.2.1 Existing Exterior Noise Sources

Planning and design of new facilities and retrofitting of existing facilities shall include due consideration of all existing exterior noise sources that may be transmitted from outside a building to its interior through the exterior shell (exterior walls, windows, doors, roofs, ventilarion openings, and other shell penetrations).

*2.5-8.2.2 Facility Noise Source Emissions

Planning and design shall include consideration of sound emissions from facility noise sources that reach nearby residences and other sensitive receptors.

*2.5-8.2.3 Exterior Noise Classifications

2.5-8.2.3.1 Exterior noise classifications shall be used to identify sources of exterior noise that are not produced by the facility. Exterior site noise exposure categories shall be as identified in Table 2.5-3 (Categorization of Residential Health, Care, and Support Facility Sites by Exterior Ambient Sound).

2.5-8.2.3.2 The building façade's sound isolation performance shall depend on the site classification and shall be as required to provide acceptable interior sound levels.

2.5-8.3 Design Criteria for Acoustic Finishes

Facility spaces identified in Table 2.5-4 (Minimum Design Room Sound Absorption Coefficients) shall incorporate acoustic finishes to achieve design room average sound absorption coefficients.

APPENDIX

A2.5-7.3.2 Lighting in transition spaces

a. Substantial differences in lighting levels between exterior and interior spaces at transition points (e.g., from exterior parking lots and building entrances to lobbies and corridors) should be avoided.

b. The pupil of the eye becomes smaller and less elastic as the eye ages, slowing visual adaptation from brighter to darker spaces. In daytime, indoor light levels at entry points need to be high, while at night higher exterior light levels are needed to minimize differences between indoor and outdoor light levels.

c. Upon entering a space with a considerably lower light level, older adults may need to stop or move to one side of the walkway until their eyes adapt to the change in light level. Therefore, seating areas should be placed in lobbies or corridors where residents may wait for their eyes to adjust.

A2.5-8.2 Site exterior noise. The requirements in this section provide a means for screening sites to determine which exterior wall/window assemblies are suitable to address site noise. They are not intended to be used as a means to qualify the suitability of a site with respect to environmental noise exposure.

Examples of noise sources that should be controlled include the facility's power plant, HVAC equipment, and emergency generators. Examples of noise sources a facility cannot control include highways, rail lines, airports, and general urban, industrial, and public service equipment and activities.

A2.5-8.2.1 Future exterior noise sources. Residential health, care, and support facility design should consider potential future noise source development in the vicinity of the project, such as the construction of highways, airports, or rail lines.

A2.5-8.2.2 Facility noise source emissions. Sound from exterior facility equipment can be controlled to achieve acceptable sound levels inside facility spaces and at neighboring receptors by siting noise sources and receptors to take advantage of distance, orientation, and shielding. Sound from exterior facility equipment can also be controlled by selecting quiet equipment and making use of noise control equipment such as silencers and barriers.

A2.5-8.2.3 Exterior noise classifications. By means of exterior site observations or a sound-level monitoring survey, the facility site should be classified into one of the noise exposure categories in Table 2.5-3 (Categorization of Residential Health, Care, and Support Facility Site by Exterior Ambient Sound). Further information for classifying sites according to exterior noise can be found in appendix table A2.5-b (Approximate Distance of Noise Sources for Use in Categorization of Residential Health, Care, and Support Facility Sites by Exterior Ambient Sound).

2.5-8.4 Design Criteria for Room Noise Levels

2.5-8.4.1 Room noise levels caused by HVAC and other building systems shall not exceed the maximnm values shown in Table 2.5-5 (Maximum Design Criteria for Noise in Interior Spaces Caused by Building Systems).

2.5-8.4.2 Room noise levels shall be determined for unoccupied rooms (e.g., without operating medical equipment).

2.5-8.5 Design Criteria for Performance of Interior Wall and Floor/Ceiling Constructions

2.5-8.5.1 Sound isolation shall be considered for all occupied spaces adjacent to construction activities.

***2.5-8.5.2** The composite sound transmission class (STC) rating of demising wall assemblies shall not be less than the ratings indicated in Table 2.5-6 (Design Criteria for Minimum Sound Isolation Performance Between Enclosed Rooms).

*2.5-8.6 Design Guidelines for Speech Privacy

Designated spaces in which protected health information is conveyed shall be designed to meet speech privacy goals using one of the four speech privacy rating methods as shown in Table 2.5-7 (Design Criteria for Speech Privacy for Enclosed Rooms and Open-Plan Spaces).

*2.5-8.7 Design Criteria for Building Vibration

2.5-8.7.1 General

Seismic restraint covered elsewhere in the *Guidelines* shall be compatible with vibration isolation methods covered in this section.

APPENDIX

A2.5-8.5.2 A "demising wall assembly" is a wall assembly that separates one occupied space from another occupied space or from a corridor. Partitions in an occupied space are non-demising partitions. For example, the wall between two resident rooms is demising, but the partition in a resident room that encloses the bathroom for that room is non-demising.

A2.5-8.6 Speech privacy. Federal legislation requires that facilities protect resident, participant, and patient information privacy. This includes speech privacy in all residential health, care, or support facilities wherever resident, participant, or patient health information is discussed, whether between staff, on the telephone, or during dictation.

a. Methods for determining speech privacy. Select only one of the metrics in Table 2.5-7 (Design Criteria for Speech Privacy for Enclosed Rooms and Open-Plan Spaces) for determining speech privacy in closed- and open-plan settings. Examples of closed-plan settings are staff private offices, conference rooms, examination rooms, and single-resident rooms. Examples of open-plan settings are waiting areas, reception areas, and staff open (not fully enclosed) offices.

   All four metrics in Table 2.5-7 define speech privacy in terms of the intelligibility of speech from the transmitted speech signal compared to the continuous background sound at a receptor position. The choice and use of the selected metric should be made by qualified, experienced professionals.

   —Criteria for the AI (Articulation Index) metric are defined in ASTM E1130: *Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index.*

   —Criteria for the SII (Speech Intelligibility Index) metric are defined in ANSI/ASA S3.5: *Methods for Calculation of the Speech Intelligibility Index.*

   —Criteria for the SPC (Speech Privacy Class) metric are defined in ASTM E2638: *Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room* and "ASTM Metrics for Rating Speech Privacy of Closed Rooms and Open Plan Spaces," an article from the September 2011 edition of *Canadian Acoustics*, the journal of the Canadian Acoustical Association.

   —Criteria for the PI (Privacy Index) metric for converting AI values into percentages are defined in ASTM E1130: *Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index.*

b. Speech privacy in open-plan spaces. People working in open-plan spaces are most productive when distraction from voices, equipment, etc. is minimal. Therefore, the acoustic environment should be designed to minimize such distractions. One option for achieving speech privacy in open-plan spaces is provision of a private room where confidential conversations may take place.

A2.5-8.7 Building vibration

a. Building vibration refers to vibration produced by building equipment and activities, not vibration produced by earthquakes.
b. Vibration levels to which occupants are exposed should not exceed those in ANSI/ASA S2.71: *Guide to the Evaluation of Human Exposure to Vibration in Buildings.*
c. Vibration produced by building mechanical, plumbing, and electrical equipment; footfalls, and medical equipment should be considered in facility design.

2.5-8.7.2 Vibration Control and Isolation

Vibration levels in the building shall not exceed applicable guidelines and limits outlined in this section.

2.5-8.7.2.1 Mechanical, electrical, and plumbing equipment vibration

(1) All fixed building equipment that rotates or vibrates shall be considered for vibration isolation.
(2) Bases and supports shall be provided as needed to facilitate attachment of vibration isolators to equipment items. The types of isolators and isolator static deflections shall be as recommended in the *ASHRAE Handbook—HVAC Applications*.

2.5-8.7.2.2 Structural vibration

(1) Footfall vibration in the building structure shall be evaluated using American Institute of Steel Construction (AISC) Design Guide 11: *Floor Vibrations Due to Human Activity* and/or similar guidelines.
(2) The structural floor shall be designed to avoid footfall vibration levels that exceed the peak vibration velocities in Table 2.5-8 (Maximum Limits on Floor Vibration Caused by Footfalls in Residential Health, Care, and Support Facilities).
(3) If medical or laboratory instrumentation is used in a residential health, care, or support setting, more stringent vibration criteria shall be considered.

2.5-8.7.2.3 Structure-borne sound

(1) Structure-borne transmitted sound shall not exceed the limits for airborne sound presented in Section 2.5-8.4 (Design Criteria for Room Noise Levels).
(2) Where necessary, vibration isolators shall be used to control potential sources of structure-borne sound.

2.5-8.7.2.4 Ground-borne vibration. Exterior sources of ground vibration, such as road and rail traffic, shall be considered in the site selection and design of a facility. See Chapter 1.3 (Site Selection) for additional requirements.

2.5-9 Elevator Systems

2.5-9.1 General

See common element and facility chapters in Parts 3 through 5 for requirements.

2.5-9.2 Dimensions and Clearances

See common element and specific facility chapters in Parts 3 through 5 for requirements.

2.5-9.3 Leveling Device

Elevators shall be equipped with an automatic two-way leveling device with an accuracy of ±1/4 inch (± 6.35 millimeters).

2.5-9.4 Installation and Testing

Installation and testing of elevators shall comply with ANSI/ASME A17.1: *Safety Code for Elevators and Escalators* for new construction and ANSI/ASME 17.3 for existing buildings. (See ASCE/SEI 7: *Minimum Design Loads for Buildings and Other Structures* for seismic design and control system requirements for elevators.)

2.5-9.5 Handrails

See common elements and specific facility chapters in Parts 3 through 5 for requirements.

Table 2.5-1

Hot Water Use—Residential Health, Care, and Support Facilities

	Resident Care Areas	Food Service Facilities	Laundry Facilities
Liters per hour per bed[1]	11.9	7.2	7.6
Gallons per hour per bed[1]	3	2	2
Temperature (°C)	21 – <43[2]	60[3]	60[4]
Temperature (°F)	70 – <120[2]	140 (min.)[3]	140 (min.)[4]

[1]Quantities indicated for design demand of hot water are for general reference minimums and shall not substitute for accepted engineering design procedures using actual number and types of fixtures to be installed. Design will also be affected by temperatures of cold water used for mixing, length of run and insulation relative to heat loss, etc. As an example, total quantity of hot water needed will be less when temperature available at the outlet is very nearly that of the source tank and the cold water used for tempering is relatively warm.

[2]The range represents the minimum and maximum allowable temperatures. Where sinks are used primarily for hand-washing and are served by a single pipe supplying tempered water, the tempered water shall not exceed 80° F (21°C).

[3]Provisions shall be made to provide 180°F (82°C) rinse water at warewasher (may be by separate booster) unless a chemical rinse is provided.

[4]Provisions shall be made to provide 160°F (71°C) hot water at the laundry equipment when needed. (This may be by steam jet or

separate booster heater.) However, it is emphasized that this does not imply that all water used would be at this temperature. Water temperatures required for acceptable laundry results will vary according to type of cycle, time of operation, and formula of soap and bleach as well as type and degree of soil. Lower temperatures may be adequate for most procedures in many facilities but higher temperatures should be available when needed for special conditions. Minimum laundry temperatures are for central laundries only.

Table 2.5-2

Minimum Maintained Average Illuminance

	Ambient Light in		Task Light in	
	Lux	**Foot-candles**	**Lux**	**Foot-candles**
Exterior entrance (night)	100	10		
Interior entry (day)	1000	100		
Interior entry (night)	100	10		
Exit stairways and landings	300	30		
Elevator interiors	300	30		
Exterior walkways	50	5		
Administration (active hours)	300	30	500	50
Active areas (day only)	300	30	500	50
Visitor waiting (day)	300	30		
Visitor waiting (night)	100	10		
Resident room/dwelling unit				
Entrance	300	30		
Living room	300	30	750	75
Bedroom	300	30	750	75
Wardrobe/closet	300	30		
Bathroom	300	30		
Makeup/shaving area	300	30	600	60
Shower/bathing rooms	300	30		
Kitchen area	300	30	500	50
Hair salon (day)	500	50		
Chapel or quiet area (active hours)	300	30		
Hallways (active hours)	300	30		
Hallways (sleeping hours)	100	10		
Dining (active hours)	500	50		
Medicine preparation	300	30	1000	100
Nurse station (day)	300	30	500	50
Nurse station (night)	100	10	500	50
Physical therapy area (active hours)	300	30	500	50
Occupational therapy area (active hours)	300	30	500	50
Examination room (dedicated)	300	30	1000	100
Janitor's closet (environmental services room)	300	30		

(Continued)

Table 2.5-2 *(continued)*

Minimum Maintained Average Illuminance

	Ambient Light in		Task Light in	
	Lux	Foot-candles	Lux	Foot-candles
Laundry (active hours)	300	30	500	50
Clean/soiled utility	300	30		
Commercial kitchen	500	50	1000	100
Food storage (non-refrigerated)	300	30		
Staff toilet area	200	20	600	60

*Reprinted with permission from the 2007 edition of ANSI/IES RP 28: *Lighting and the Visual Environment for Senior Living*

Notes

1. "Older adults" include persons age 60 years and older and people of all ages with some form of visual impairment.
2. Ambient light levels are minimum averages measured at 30 inches (76 cm) above the floor in a horizontal plane. Task light levels are minimums taken on the visual task. For makeup/shaving, the measurement is to be taken on the face in a vertical position.
3. It should be understood that the values shown are minimums. The optimum solution for task lighting is to give users control over the intensity and positioning of the light source to meet their individual needs.
4. Use of daylight is encouraged in entryways to provide a transition between outside and inside illumination levels.

Table A2.5-a

Maximum Length of Hot Water System Pipe or Tube

Nominal Pipe Size (in.)	Liquid Ounces per Foot of Length	Maximum Pipe or Tube Length (ft.)		
		System without Circulation Loop or Heat Traced Line	System with Circulation Loop or Heat Traced Line	Public Hand-Washing Station Faucets (metering and non-metering)
¼	0.33	25	16	6
5/16	0.5	25	16	4
⅜	0.75	25	16	3
½	1.5	25	16	2
⅝	2	25	12	1
¾	3	21	8	0.5
⅞	4	16	6	0.5
1	5	13	5	0.5
1¼	8	8	3	0.5

***Table 2.5-3**

Categorization of Residential Health, Care, and Support Facility Sites by Exterior Ambient Sound

Exterior Site Noise Exposure Category	A	B	C	D
General description	Minimal	Moderate	Significant	Extreme
Day-night average sound level (Ldn) (dB)[1]	< 65	65–69	70–74	≥ 75
Average hourly nominal maximum sound level (L01) (dBA)	< 75	75–79	80–84	≥ 85
Exterior shell composite OITC rating ($OITC_c$)[2, 3]	25	30	35	40
Design goal for facility nighttime exterior equipment sound (dBA)[4]	45	50	55	60
Exterior resident seating areas	Generally acceptable	Marginally acceptable	Generally not acceptable without special acoustic consideration	Generally not acceptable

*Also see appendix table A2.5-b (Approximate Distance of Noise Sources for Use in Categorization of Residential Health, Care, and Support Facility Sites by Exterior Ambient Sound).

[1]By definition, the day-night average sound level (Ldn) includes the A-weighting and nighttime penalty.

[2]The exterior shell composite STC ratings are for closed windows. Opening windows effectively reduces shell composite STC ratings to 10 to 15, depending on the amount windows are opened. Consideration should be given to whether windows would be opened and for how long and under what circumstances, and the potential impact of open windows should be identified in the design.

[3]The $OITC_c$ ratings for interior spaces that are not acoustically sensitive (e.g., corridors, atriums, stairways) can be reduced by as much as 10 dB, but should be no less than $OITC_c$ 25. Interior spaces that are more sensitive to noise than a typical resident room (e.g., a teleconferencing space or auditorium) may require special consideration to determine an appropriate $OITC_c$ rating of the exterior façade.

[4]This is a design goal for acceptable emission of equipment sound to adjacent residential receptors in the absence of a local code. For equipment operating only during the daytime, levels may be increased by 5 dBA.

Table A2.5-b

Approximate Distance of Noise Sources for Use in Categorization of Residential Health, Care, and Support Facility Sites by Exterior Ambient Sound

Exterior Site Noise Exposure Category	A	B	C	D
General description	Minimal	Moderate	Significant	Extreme
Distance from nearest highway (ft.)	> 1000	250–1000	60–249	< 60
Slant distance from nearest aircraft flight track (ft.)	> 7000	3500–7000	1800–3499	< 1800
Distance from nearest rail line (ft.)	> 1500	500–1500	100–499	< 100

Note: This table can be used to approximate noise impact on a residential health, care, or support facility based on very conceptual conditions. Actual sound levels at a site can vary dramatically based on traffic volume and frequency of use of the transportation system as well as topological conditions and other features out of the control of the design team or the facility. A more accurate assessment of a site's exterior noise exposure should be made either by performing a sound level survey for a period sufficient to properly characterize noise impacts or by using any number of transportation noise estimation tools, such as software models recognized by the federal government or the noise assessment guidelines in *The Noise Guidebook* published by the U.S. Department of Housing and Urban Development.

Table 2.5-4

Minimum Design Room Sound Absorption Coefficients ($\bar{\alpha}$)

Space[1]	Design Coefficient[2]
Multi-bed/multi-occupancy resident room	0.20
Corridor (public corridor in resident care areas)	0.20
Medication rooms	0.20
Multiple occupant resident care and activity areas	0.20
Quiet room[3]	0.20
Office	0.15
Examination room	0.15

[1]Additional spaces shall be added based on requirements in the functional program.

[2]Use the noise reduction coefficient (NRC) rating for estimating the design room-average sound absorption coefficient when using this table.

[3]Also applies to private speech and hearing services rooms and private music therapy rooms.

Table 2.5-5

Maximum Design Criteria for Noise in Interior Spaces Caused by Building Systems[1]

Room Type	NC / RC(N) / RNC[2,3,4]	dBA
Resident rooms/dwelling units	40	45
Medication rooms	45	40
Multiple occupant resident care areas	45	50
Corridors and community spaces	45	50
Offices, examination rooms	40	45
Conference rooms	35	40
Quiet room[5]	30	35
Community meeting rooms and auditoria	30	35

[1]Additional spaces shall be added based on the building program.

[2]See the version of the white paper "Sound and Vibration Design Guidelines for Health Care Facilities" associated with the 2014 FGI *Guidelines* posted at www.fgiguidelines.org/resources for a discussion of room noise rating criteria.

[3]One rating system shall be chosen to evaluate room noise levels, and noise from building mechanical systems shall be evaluated using that single rating system.

[4]Spaces shall be designed to fall below the maximum values shown in this table with no rattles or tonal characteristics.

[5]Also applies to private speech and hearing services rooms and private music therapy rooms.

Table 2.5-6

Design Criteria for Minimum Sound Isolation Performance Between Enclosed Rooms[1]

Adjacency Combination		STC_c[2]
Resident room/dwelling unit	Resident room/dwelling unit	45[3]
Resident room/dwelling unit	Corridor (with entrance)	35[4]
Resident room/dwelling unit	Community space	50
Resident room/dwelling unit	Service area	60[5]
Examination room	Corridor (with entrance)	35[4]
Examination room	Multiple-occupant resident care and activity areas or public corridor	50[6]
Toilet room	Multiple-occupant resident care and activity areas or public corridor	45
Consultation room	Multiple-occupant resident care and activity areas or public corridor	50[6]
Consultation room	Resident room/dwelling unit	50
Consultation room	Corridor (with entrance)	35[4]

[1]Additional spaces shall be added based on the building program.

[2]The STC values stated assume the need for normal speech privacy (except at corridor walls with doors), assuming a background sound level of at least 30 dBA. When selecting assemblies based on their tested or published STC ratings, it should be noted that STC test reports can, in general, be considered accurate to +/- 2 STC points. Consequently, an assembly with a tested or published STC rating as low as 2 points below the stated minimum may be considered acceptable.

[3]In cases where greater speech privacy is required between resident rooms when both resident room doors to the connecting corridor are closed, the wall performance requirement shall be STC 50.

[4]This is the performance required for the partition excluding the door. Note that sound isolation in these instances will be limited by the door's performance (e.g., STC 20 for a close-fitted 5 psf door). Doors are not required to be sound sealed to maintain the STC rating, although a facility may choose to do so for specialty resident environments such as bereavement rooms, consultation rooms, etc.

[5]Relaxation of STC 60 ratings shall be permitted if compliance with room noise requirements is achieved with lower performance constructions. See Table 2.5-5 (Maximum Design Criteria for Noise in Interior Spaces Caused by Building Systems).

[6]Also applies to private speech and hearing services rooms and private music therapy rooms.

Table 2.5-7

Design Criteria for Speech Privacy for Enclosed Rooms and Open-Plan Spaces[1, 2]

Level	Metrics			
Speech Privacy—Closed Plan	PI	AI	SII	SPC
Secure	N/A	N/A	N/A	≥70
Confidential	≥95%	≤0.05	≤0.10	60–69
Normal	80–94%	0.06–0.20	0.11–0.25	52–59
Defining Standard	ASTM E1130	ASTM E1130	ANSI S3.5	ASTM E2638
Speech Privacy—Open Plan	PI	AI	SII	SPC
Confidential[2]	Special consideration required.[3]			
Normal	80–94%	0.06–0.20	0.11–0.25	52–59
Marginal	60–79%	0.21–0.40	0.26–0.45	45–51
Defining Standard:	ASTM E1130	ASTM E1130	ANSI S3.5	ASTM E2638

[1]The indicated AI and SII values shall be considered the maximum accepted values. The indicated PI and SPC values shall be considered the minimum accepted values.

[2]Equivalence among these metrics, as indicated, has been demonstrated. However, some of these metrics may not be suitable for a particular space. The referenced standards indicate that PI and SI are appropriate for use in open plan spaces, and that SPC is appropriate for closed plan spaces. The referenced standard for SII indicates that SII may be used for either type.

[3]Confidential speech privacy is not readily achievable in open-plan spaces due to the lack of barriers, low ambient sound levels, and typical voice effort.

Table 2.5-8

Maximum Limits on Floor Vibration Caused by Footfalls in Residential Health, Care, and Support Facilities

Space Type	Footfall Vibration Peak Velocity (micro-in/s)
Resident rooms, dwelling units, and other resident areas	6000
Examination rooms	6000
Administrative areas	8000
Community circulation areas	8000
Quiet room	6000