

# Existing Conditions

## **SITE**

Sinai Hospital is part of Lifebridge Health, a regional healthcare organization located in northwest Baltimore, MD.

### *FIGURE 2.1*

Sinai Hospital houses a variety of centers. These are illustrated in Figure 2.2.

**ARCHITECTURE**

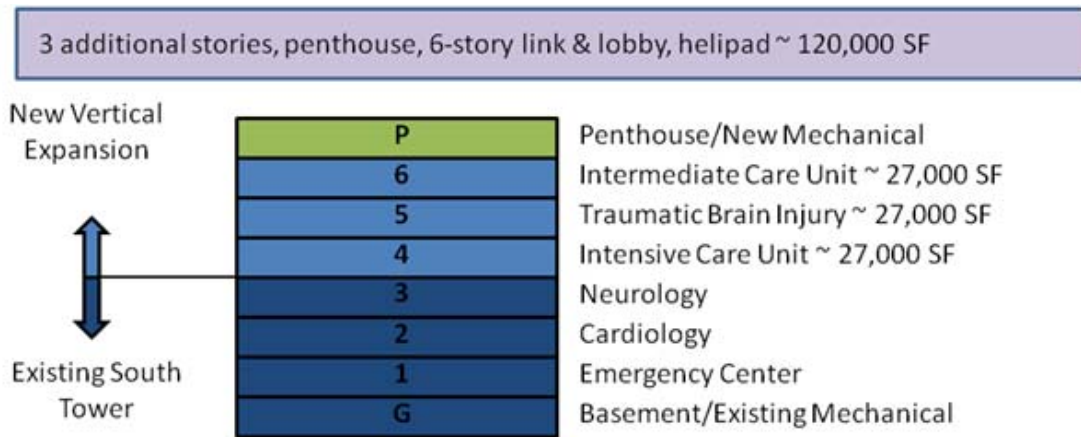


FIGURE 2.2

The Sinai Hospital South Tower Vertical Expansion is a three-story addition onto the existing three-story South Tower, retaining the shape of the existing footprint. In addition, a six-story link enclosing a four-story atrium lobby connects the existing North Tower to this brand new vertical expansion. A helipad and elevator tower round out the new construction. Each floor has its own unique function. The fourth floor houses the intensive care unit. The fifth floor will be the future home of traumatic brain injury care and sterile processing. Lastly, the intermediate care unit is on the sixth floor.

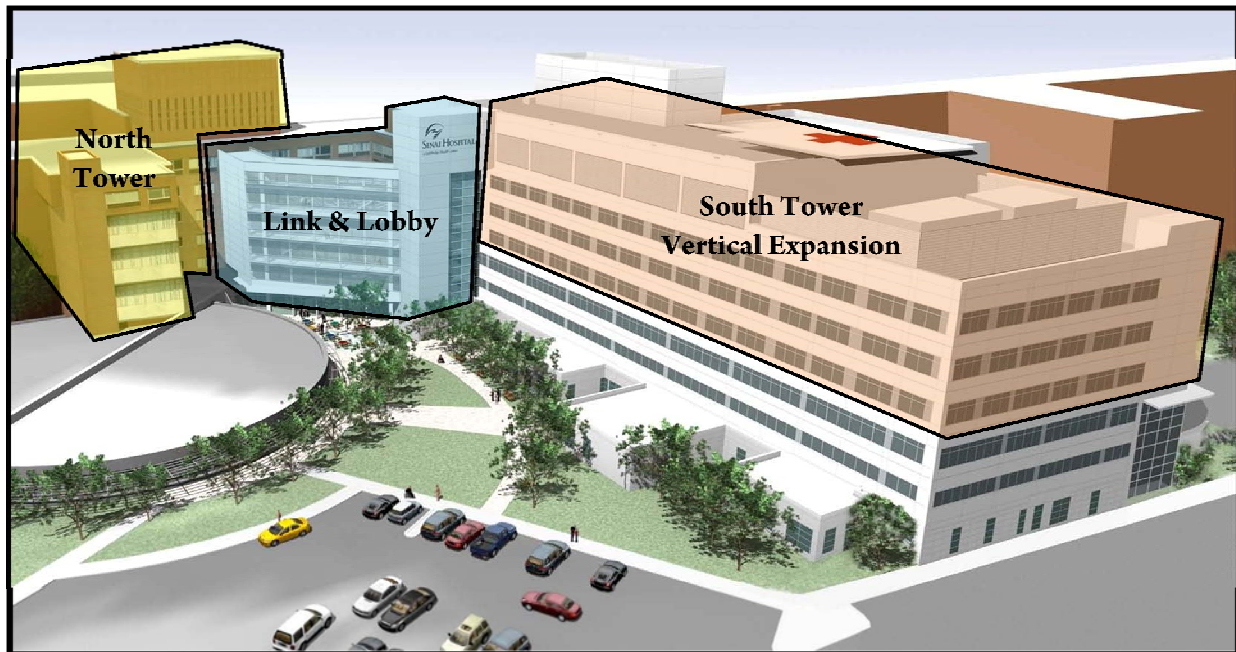


FIGURE 2.3

**LAYOUT**

Figure 2.4 shows how the patient rooms and the isolation rooms on the fourth and sixth floors of the South Tower are responsible for a majority of the building envelope, and consequently, a majority of the cooling load.

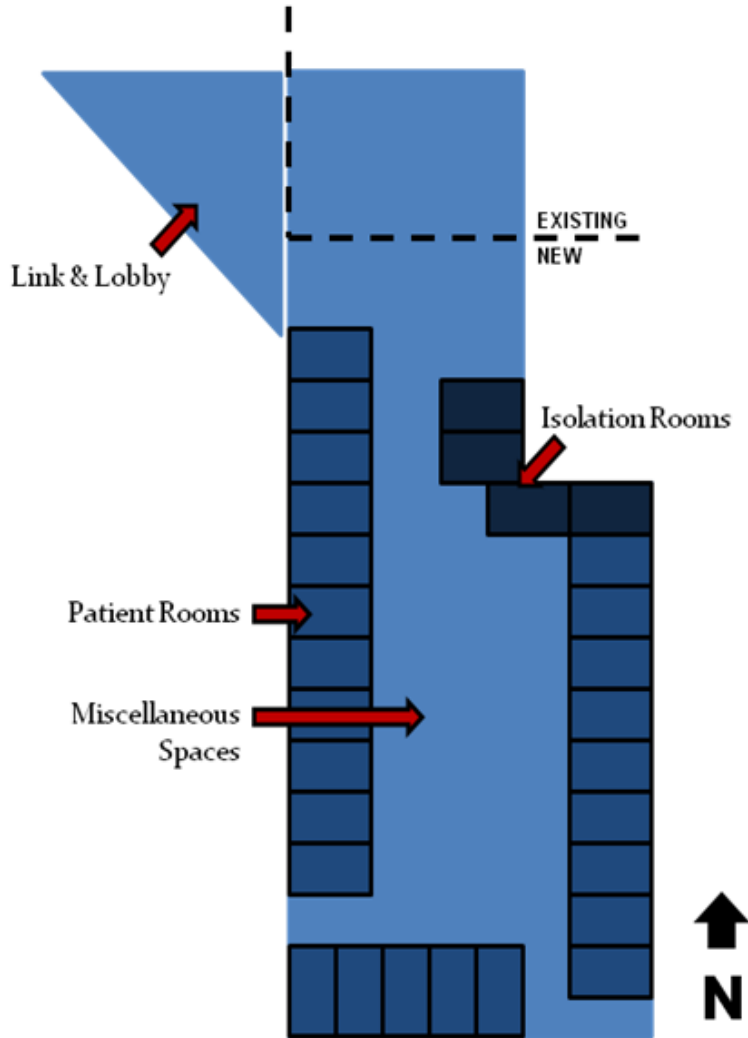


FIGURE 2.4

Table 2.1 describes the coverage of glazed aluminum framing.

	<u>% Of Exterior Wall Area</u>
Link & Lobby:	80
South Tower Vertical Expansion:	50

TABLE 2.1

## **BUILDING ENVELOPE**

The exterior façade of the vertical expansion resembles the façade on the existing three-story tower. It consists of a water-managed exterior insulation finishing system (EIFS) with control joints. The EIFS is over glass-mat-faced gypsum sheathing on 6” structural metal studs with glass fiber batting insulation, vapor barrier, and gypsum wallboard. Glazed aluminum framing is used on part of the vertical expansion and on a majority of the link. Exterior glass (vision and spandrel) is double pane, low-e, and heat-strengthened. Roof construction consists of a roof membrane on rigid insulation and metal decking. In addition, the fourth floor has a green roof garden.

## **MECHANICAL SYSTEMS**

The mechanical systems for the expansion include heating, ventilating & air conditioning, plumbing, fire protection, medical gases, and vacuum. A majority of the existing infrastructure is adequate to accommodate the additional loads.

### AIR-SIDE

The supply and return air systems for the new medical/surgical patient room floors are medium pressure, variable air volume. The South Tower Vertical Expansion includes two new custom fabricated air handling units to provide additional capacity for the expansion. One air handling unit serves floors four, five, and six in the South Tower, and the other serves the six-story hospital link and four-story atrium lobby. The existing rooftop air handling units installed under the previous vertical expansion were relocated to the roof of the sixth floor, providing redundancy in the air distribution system. Ductwork is distributed from two mechanical shafts that extend down through each floor of the expansion from the penthouse. Infectious isolation rooms have a dedicated isolation exhaust system.

### WATER-SIDE

A chilled water plant in the penthouse consisting of a 2,000 ton centrifugal chiller, cooling tower, and chilled and condenser water distribution pumps is required to provide additional infrastructure. Existing heating hot water, steam, domestic water, and medical gas mains are extended from the ground floor to the new air handling units.

Emergency power is provided for the equipment which allows for operation on all six floors in emergency situations.

**DESIGN CONDITIONS**

OUTDOOR

	<u>Dry Bulb Temperature</u>	<u>Wet Bulb Temperature</u>
Summer:	0°F	-
Winter:	95°F	79°F

TABLE 2.2

INDOOR

	<u>Dry Bulb Temperature [°F]</u>	<u>% Relative Humidity</u>
Nurse Stations, Work Rooms, & Ancillary Spaces:	70 -75	30-60
Patient Rooms:	70-75	30-60
Airborne Infection Isolation Rooms:	70-75	30-60
Offices, Conference Rooms, & Waiting Rooms:	72	30-60

TABLE 2.3

VENTILATION

	<u>Volumetric Flow Rate [cfm]</u>	<u>% Outdoor Air</u>
Link & Lobby:	0	0
Fourth Floor:	3,495	14.91
Sixth Floor:	3,056	13.33

TABLE 2.4

HEATING & COOLING

	<u>Heating Load [tons]</u>	<u>Cooling Load [tons]</u>
Link & Lobby:	15	31
Fourth Floor:	70	148
Sixth Floor:	70	148
Total:	155	327

TABLE 2.5

Only the fourth and sixth floors of the vertical expansion have been fit out. The layout of HVAC equipment has not yet been determined for the fifth floor. Heating loads include heat loss through the shell (28.6%) and reheat load (71.4%).

**CHILLED WATER PLANT SCHEMATICS**

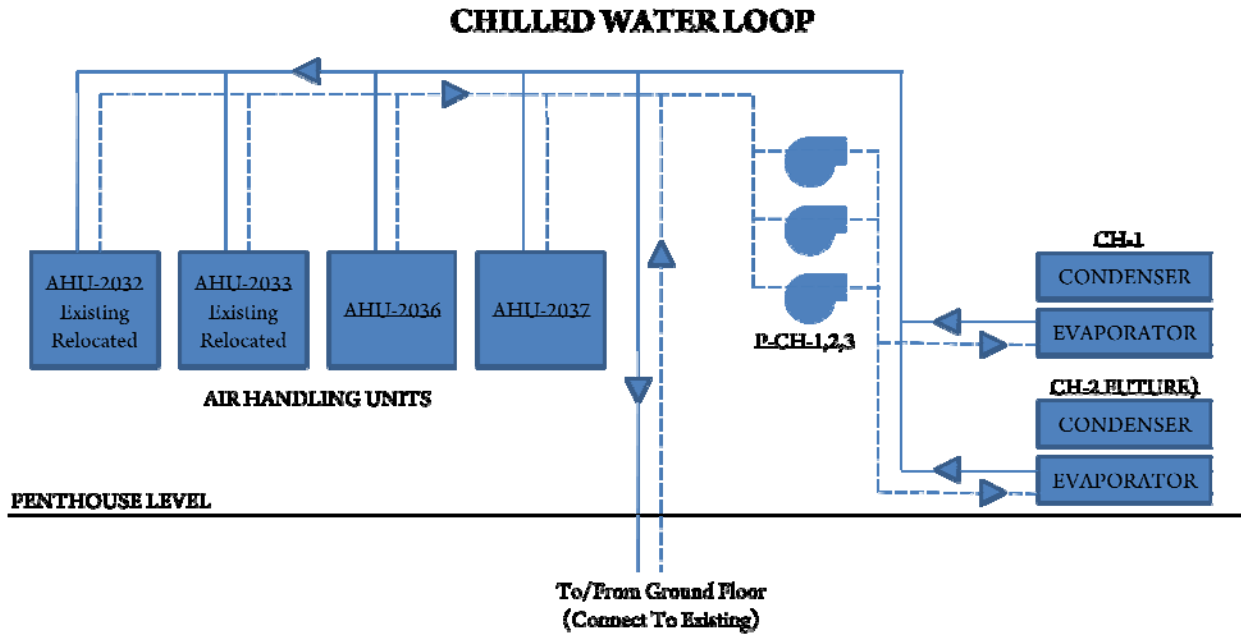


FIGURE 2.5

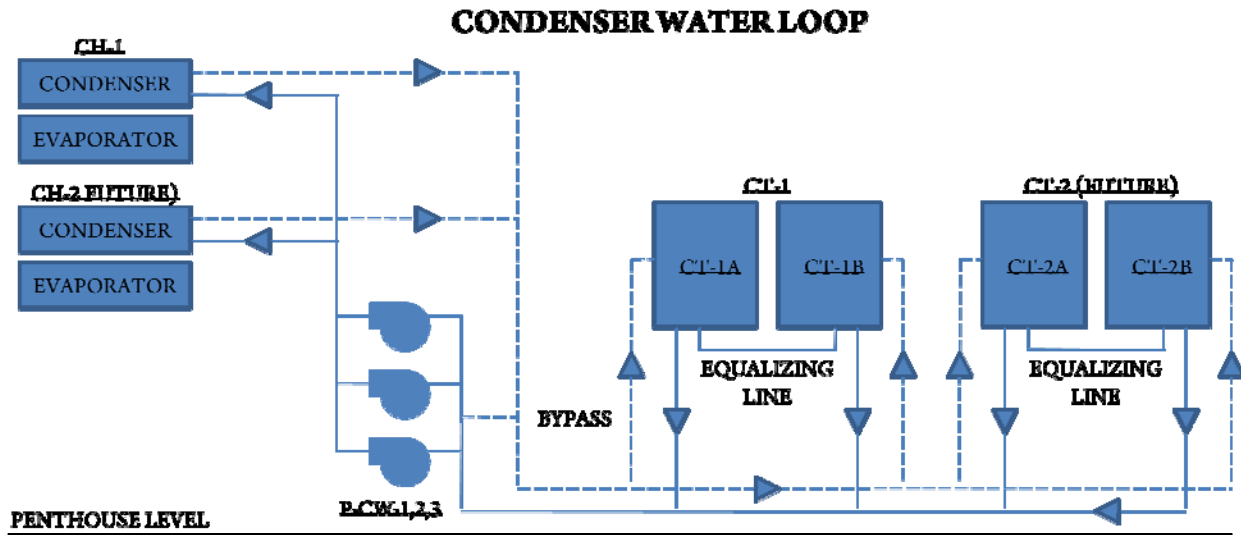


FIGURE 2.6

## **ASHRAE STANDARD 62.1 EVALUATION**

### 5.1 Natural Ventilation

Not applicable.

### 5.2 Ventilation Air Distribution

Each patient room is provided with an individual, digitally controlled variable air volume supply air terminal unit. Up to ten of these units are contained in individual zones, each which have supply and return airflow monitoring.

All air distribution systems including supply, return, outdoor air, and exhaust ductwork is tested and balanced.

### 5.3 Exhaust Duct Location

Airborne infectious isolation rooms on the fourth, fifth, and sixth floors are negatively pressurized and have a dedicated isolation exhaust system. Standard patient rooms have a neutral pressure relationship.

### 5.4 Ventilation System Controls

Custom indoor air handling units are digitally controlled with pneumatic actuation, each having outside air sections with minimum and maximum dampers and actuators. An automatic temperature control system is provided and is an extension of the existing Johnson Metasys direct digital control system in the lower three levels. Supply, return, and exhaust air terminal units are all digitally controlled.

### 5.5 Airstream Surfaces

Ductwork is constructed of prime, first quality galvanized steel and is resistant to mold growth and erosion.

### 5.6 Outdoor Air Intakes

The air handling unit's outdoor air intake (located in the penthouse, not susceptible to rain or snow entrainment) is at a sufficient distance from contaminated exhaust, vents, and the cooling tower.

### 5.7 Local Capture of Contaminants

All exhaust air is discharged directly to the outdoors.

### 5.8 Combustion Air

Not Applicable.

### 5.9 Particulate Matter Removal

The air handling units have pre-filter, intermediate filter, and final filter sections installed. A 30% efficient, 2" pre-filter is followed by a 65% efficient, 12" cartridge intermediate filter. A 95% efficient 12" cartridge final filter mounted in 24" x 24" HEPA holding frames finish the capture of contaminants. This also provides the capability of installing HEPA filters in the future.

### 5.10 Dehumidification Systems

Nurse stations, work rooms, ancillary spaces, patient rooms, airborne infectious isolation rooms, offices, and conference and waiting rooms are all provided with conditioned air with a relative humidity between 30% and 60%.

### 5.11 Drain Pans

Drain pans are provided under coil and fan sections. They are constructed of welded galvanized steel with a bitumastic coating and are insulated with 1", 3PCF fiberglass insulation at the bottom.

### 5.12 Finned-Tube Coils & Heat Exchangers

Coils have adequate intervening access space.

### 5.13 Humidifiers & Water-Sprayed Systems

Humidifiers in the air handling units are of the direct discharge type. Steam is provided from existing steam lines and boilers to be injected into the air for humidification. Each humidifier consists of multiple, vertical steam discharge pipes to provide optimum steam to air contact while minimizing pressure drop.

### 5.14 Access for Inspection, Cleaning, & Maintenance

All rectangular ductwork including outside air, return air, and exhaust air provided on the project conform to SMACNA standards (Sheet Metal and Air Conditioning Contractors National Association, Inc.), which includes providing insulated access doors at a minimum size of 12" x 12" to allow convenient and unobstructed access, cleaning, and routine maintenance of air distribution components.



### 5.15 Building Envelope & Interior Surfaces

An exterior insulation and finish system provides thermal and moisture protection for the building envelope. The installation includes a complete drainage board system, which includes a rolled on waterproof layer on back-up substrate. The substrate consists of a flashing membrane applied over glass mat faced gypsum. Self-adhering sheet waterproofing or hot fluid-applied rubberized asphalt waterproofing is used to treat joints, cracks, deck drains, corners, and penetrations.

An adhered membrane roofing system, vapor retarder, and roof insulation prohibit the passage of water and resist specified uplift pressures, thermally induced movement, and exposure to weather.

Domestic water, chilled water, heating hot water, steam supply, steam condensate, and condenser water piping are insulated. Air conditioning condensate, and supply, outside air, and return ductwork are insulated. Linear supply air diffusers, generator exhaust, air separators, and chilled water pumps are also insulated.

### 5.16 Buildings with Attached Parking Garages

Not applicable.

### 5.17 Air Classification & Recirculation

Isolation exhaust may be classified as class 4 with potentially dangerous particles. All other exhaust may be classified as class 3. Air in patient rooms, offices, common areas, and utilities is re-circulated and can be classified as class 1.

### 5.18 Requirements for Buildings Containing ETS Areas and Non-ETS Areas

Not Applicable.

**ASHRAE STANDARD 90.1 EVALUATION**

Building Envelope

Baltimore, MD is in climate zone 4A.

	<u>Assembly Maximum</u>	<u>Design</u>	<u>Compliance</u>
Roof, Insulation Above Deck	U-0.048	U-0.100	No
Walls Above Grade, Mass	U-0.123	U-0.100	Yes
Floors, Mass	U-0.107	U-0.100	Yes
Opaque Doors, Swinging	U-0.70	U-0.100	No
Vertical Glazing, Metal Framing	U-0.60	U-0.100	No
	SHGC-0.25	SGHC-0.67	No

TABLE 2.6

Safe design values were utilized in the Sinai Hospital South Tower Vertical Expansion in order to be conservative when selecting mechanical system components. Only the U-values for walls above grade and floors complied with the assembly maximum for zone 4A in ASHRAE Standard 90.1.

HVAC Systems

The building complies with section 6 of ASHRAE standard 90.1. Minimum equipment efficiencies are verified and labeled, design loads for sizing systems and equipment were determined, and each zone is individually thermostatically controlled. Duct construction conforms to SMACNA standards. Ductwork is insulated and required to undergo leakage tests. Grilles, registers, and diffusers are adjusted to within 10% of design quantities.

Service Water Heating

Not applicable.

Power, Lighting, & Electric Motor Efficiency

The building complies with section 8 and 9 of ASHRAE standard 90.1.