

Building Systems Overview

Plumbing Systems

Natural Gas:

The natural gas service main has 22,905 MBH heating capacity and enters the building through 6 inch piping. The main pipe branches off and splits before entering the building in the parking level through water-tight sleeves with a 4 inch pipe at 12,105 MBH and an 8 in pipe at 10,800 MBH. The 4 inch pipe has a pressure of 2 psi, and it runs to the three fossil-fuel boilers in the parking level mechanical room. The 8 in pipe is at 10 in wc and runs through the hotel to all the RTUs and the laundry room equipment.

Domestic Hot Water:

The 4 in domestic water service main enters the building through the parking level. The piping then goes through a 250 gpm water softener system and a 270 gpm triplex domestic booster pump system. Also on the parking level are two hot water heat exchangers, two thermostatic mixing valves, and a 158 gal thermal expansion tank. A 4 inch cold water line runs up to the penthouse to two 900 gal duplex gas-fired domestic water heaters with a 77 gal thermal expansion tank and two thermostatic mixing valves.

There are three different temperature ratings for the hot water piping in the building. They include supply and return lines at 120°F, 140°F, and 160°F running to various plumbing equipment throughout the hotel. The domestic hot water services all the plumbing fixtures, including the lavatories, sinks, showers, and bathtubs in all 280 bathrooms of the guest room tower.

Lighting Systems

The lighting system in the hotel consists of both 277V fixtures and 120V fixtures. The lighting fixtures in the parking areas are of the 277V type. Throughout the rest of the building, there is a mixture of lighting fixtures with the two different voltage levels.

Some of the most common types of lights are the incandescent downlights found above the large and small meeting rooms on the ground floor. Another common light is the 1 ft x 4 ft strip fixtures located in all the storage rooms, mechanical rooms, and electrical rooms, as well as in the penthouse.

Other types of lighting in the hotel include the following kinds of fixtures. The pre-function area has many compact fluorescent downlights. More compact fluorescent downlights and metal halide downlights are located in the lobby seating area. The kitchen and employee rooms use 2 ft x 4 ft recessed fluorescent troffers. The restaurant, bar, and coffee bar all have low-voltage incandescent downlights. Accent lighting in these areas is accomplished using compact fluorescent wall washers.

Many of the bathrooms have compact fluorescent downlights. Also, there is a series of compact fluorescent downlights found in the porte cochere area. The swimming pool area on the second floor is the only place to use compact fluorescent lensed downlights. Incandescent downlights and incandescent lensed wall washers are used in the small meeting rooms on second floor.

The hotel has several common types of lights found on all floors of the guest room tower. Compact fluorescent corridor ceiling lights are located in the elevator lobby areas and corridors on all floors. The corridors also have compact fluorescent wall sconces. The two stairwells in the guest room tower have 3 ft long wall mount fluorescent fixtures at all the landings.

There are six aircraft warning lights mounted on the roof of the guest room tower and the penthouse.

Electrical Systems

The main electrical service comes in to the building on the north side from BGE. The main connects into the utility-owned 2500 kVA transformer. The delta primary side is 13,800V, 3 phase, 3 wire and that steps down to the 480Y/277V, 3 phase, 4 wire secondary side of the transformer. This 4000A feeder runs to the main 4000A – 277/480V, 3 phase, 4 wire switchboard in the main electrical room on the parking level.

From the main 4000A switchboard, the 400A feeder runs to the electric panelboards in the building and the 800A – 277/480V, 3 phase, 4 wire distribution panel. There are numerous smaller transformers throughout the building that step down from 277/480V, 3 phase, 4 wire primary to 120/277V, 3 phase, 4 wire secondary.

A 1200A feeder runs from the main lugs only on the distribution panel to the 600 kW diesel standby generator on grade level just north of the building. Junction boxes for the battery charger, jacket water heater, controls, and lighting and receptacles are all mounted on the generator.

The penthouse contains the 2000A – 277/480V, 3 phase, 4 wire switchboard, transformer, and 4000A – 120/208V, 3 phase, 4 wire switchboard. The 2000A switchboard connects to a 2000A busduct that runs up from the main 2000A – 277/480V, 3 phase, 4 wire switchboard located in the main electrical room on the parking level. There are also four 4 inch conduits for stand-by power, two 3 in conduits for emergency power, and two 2 in conduits for controls that run between the penthouse and the ground floor electrical room.

The duplex receptacles in the building have 20A – 125V, 2 pole, 3 wire configurations.

Structural Systems

The ground and second floors are made of cast-in-place concrete with structural slabs. Post-tensioned concrete makes up the third through the eleventh floors, or the guest room floors. The exterior walls of the all the guest room floors are composed of pre-cast concrete panels. The below-grade parking level is comprised of concrete masonry unit (CMU) block walls.

The only structural steel in the building is located above the double-story height spaces on the ground and second floors. The use of steel allows for longer spans to provide more open space in these areas.

The parking level floor is made of 5 in thick slab-on-grade concrete, reinforced with 6x6 W2.0x2.0 welded wire fabric. The ground floor concrete framed slab is mostly 9 in thick and is reinforced with #5 rebar at 12 in on-center each way. The concrete columns for the parking level and ground floor vary in size and shape. Typical shapes are square and rectangular, and sizes range from 12 in x 12 in to 18 in x 18 in and 14 in x 26 in to 18 in x 26. These columns all have different amounts of rebar reinforcing depending on location and loading. There are a total of 93 different concrete beam sizes ranging in sizes from 14 in x 8 in all the way up to 14 in x 75 in and 42 in x 42 in. Other non-typical concrete floor slabs vary in size from 5 in to 12 in thick.

The second floor is primarily 9 in concrete framed slab, reinforced with #5 rebar at 12 in on-center each way. This is the flooring under the mechanical room, exercise room, laundry room, offices, and meeting rooms. The rest of the second floor is the double-story height area above the meeting rooms. Here the main structural steel supports are W8x31 beams, framed around the perimeter by W16x26 beams and several HSS 8x8x1/2 columns along the exterior wall. The adjacent pre-function area is framed by W16x45 beams and W16x40 girders along the perimeter and is spanned by 20LH4 open-web joists and diagonal bracing. The porte cochere also has a structural steel frame with varying sizes of W18 beams and 28LH11, 28LH09, and 28LH07 open-web joists.

The third floor is mostly 9 in concrete framed slab, reinforced with #5 rebar at 12 in on-center each way, under the guest room areas. The roof above the large meeting rooms is composed of 52DLH13 joists, framed by W12x26 and W16x50 beams and W10x33 and W10x39 columns along the exterior walls. The swimming pool roof has W27x94 and W14x30 beams, W24x55 girders, and W10x33 columns. The double-story height lobby area has 24LH11 joists, framed by W18x50 beams.

The fourth through eleventh floors and the penthouse are made of 7-1/2 in post-tensioned concrete slabs, reinforced with #4 rebar at 30 in on-center each way. The penthouse floor and eleventh floor roof is made of 9 in post-tensioned concrete slab, reinforced with #5 rebar at 24 in on-center each way.

The interior and exterior walls have different construction types. The interior partitions most typically use either 1-1/2 inch or 3-5/8 inch metal studs in the walls with fiberglass batt insulation and gypsum wall board. Most of the exterior walls are made primarily of concrete.

There are two main types of roofing structure on the hotel: 8 in cast-in-place concrete slab or 3 in 18 gauge type N galvanized metal roof deck. However, in both cases there is a minimum required layer of 3 in thick R30 rigid roof insulation and fully-adhered EPDM roofing membrane.

The shaft surrounding the bank of four elevators is comprised of concrete shear walls. These shear walls are used to resist the shear forces from the wind load transferred from the exterior walls through the floor slabs to the central core of the guest room tower.

Building Envelope

The exterior wall systems of the building consist entirely of different curtain wall systems, including metal panel systems and pre-cast concrete panels on the exterior. The majority of the walls consist of 5-1/2 in pre-cast concrete panels, 3-5/8 in metal studs with semi-rigid insulation, and 1/2 in gypsum wall board.

There is a significant amount of glass in the building envelope of the BWI Hilton. All along the pre-function area curved exterior wall is a large amount of store-front windows. Granite base panels on the first story and metal panels on the second story frame all this vision glass. The restaurant area is also primarily composed of store-front windows on the north side of the building.

In the nine floors of the tower part of the hotel, every guest room has both casement windows and sliding windows made of either spandrel glass or vision

glass. However, all these window sizes differ due to the varying and numerous sizes of the guest rooms.

Most of the roofing system of the BWI Hilton consists of 3 in thick R30 rigid roof insulation and fully-adhered EPDM roofing membrane. Part of the roof is made of an 8 in thick concrete slab on the guest room tower and above the restaurant area. The sections of the roof above the lobby area and swimming pool area are built with 3 in metal roof decks spanning between the steel structure.

Acoustics

There is not much detail included in the plans of the Hilton Hotel at BWI Airport on the topic of acoustics. However, it is noted that several locations under the third floor slab require 2 in of rigid sound insulation to inhibit the transfer of sound from the mechanical rooms and laundry rooms on the second floor to the guest room areas above.

Also detailed in the BWI Hilton plans are several different wall construction required noise ratings. For the numerous types of walls used in the building, only several of the walls had a minimum STC (sound transmission class) value specified in the drawings. These STC values range between 35 and 55, depending on the wall construction materials and the location of the wall in the building. Also, it is important to point out that many of the walls have no minimum STC value assigned to them since noise considerations are not a major concern in those areas.