Existing Mechanical Systems

Air-Side Systems

The primary air-side components of the mechanical system on the ground and second floors use a VAV system with reheat hot water coils at the boxes in the public and service spaces.

One air handling unit and one rooftop unit on the north side roof of the ground floor provide conditioned air to many of the spaces on the ground level. Also located on the same roof is a make-up air unit to provide adequate ventilation to the kitchen. A long string of linear slot diffusers provide the required amounts of supply air to the spaces from above the large areas of windows in the pre-function area, meeting rooms, coffee bar, and restaurant. Since the sidewall supply registers in the lobby seating area dispense the necessary quantity of supply air for cooling and ventilation requirements, a parallel system of fin tube radiators help to balance the heat loss from the large sections of windows located along the exterior walls.

The second floor mechanical room houses several pieces of large mechanical equipment. One air handling unit (AHU) conditions air for the large double-story height meeting rooms, smaller meeting rooms, and the pre-function area on the ground floor. A second AHU services many of the employee services rooms and offices on the ground floor. Also in the same mechanical room is a pool dehumidifier unit that conditions for the swimming pool area. A rooftop unit on the ground level roof conditions air for several of the laundry and service spaces that are on the second floor. From the mechanical room on the northeast corner of the second floor, another AHU provides air to the offices, meeting rooms, and exercise room/health club.

The positive pressure in both stairwells is maintained by two stair pressurization fans that deliver 11,700 cfm to each stairway. The pressurization required in the corridors on the third through eleventh floors is maintained by three rooftop units located in the penthouse. These rooftop units also provide supply air to the housekeeping areas on all the guest room floors.

Exhaust registers in all of the guest room bathrooms are ducted to sub-ducts and then tapped into the exhaust stacks. There are a total of 17 main toilet exhaust riser stacks connected to toilet exhaust fans mounted on either the eleventh floor roof or the penthouse roof. This sub-duct method, which received a variance prior to design and construction, aims to prevent the spread of smoke to the other guest room floors without using smoke dampers in each of the ducts.

Water-Side Systems

The primary water-side components of the mechanical system include the condenser water system and the hot water system. Due to budget constraints, the originally designed chilled water system was eliminated along with two water cooled chillers and two chilled water pumps. Two induced-draft open-cell cooling towers are located on the north side of the building on grade with the ground floor level. These cooling towers provide condenser water to the air handling units, which operate similarly to heat pumps, and to all the guest room water source heat pumps. Each heat pump is tapped off 1-1/2 inch supply and return piping, and it also has 1 inch drain piping. The condenser water is then looped back to the cooling towers through a reverse return system. For a schematic representation of the condenser water system, please see Figure 2 – Condenser Water Flow Diagram. For a schematic representation of the hot water system, please see Figure 3 – Hot Water Flow Diagram.

Three fossil-fuel boilers in the parking level mechanical room provide hot water for all the reheat coils in the VAV boxes, the freeze protection pumps for the air handling units, and the pool dehumidifier unit. Other pieces of equipment served by the hot water are the unit heaters, finned tube radiators, and hot air curtains located in the vestibules.

The large mechanical room located on the north side of the parking level contains much of the water-side equipment used in the hotel. This includes three boilers and their corresponding pumps, two condenser water pumps, one sedimentation separator filter, two plate and frame heat exchangers, two hot water pumps with variable frequency drives, two diaphragm expansion tanks, and some other pieces of equipment.

Controls

All sequences of controls for the entire building are performed by direct digital controls (DDC). This DDC system monitors all the sensors, and it is able to adjust all the set points and time delays for the equipment. The DDC system also provides start/stop, speed control, monitoring, and alarms for the variable frequency drives (VFD).

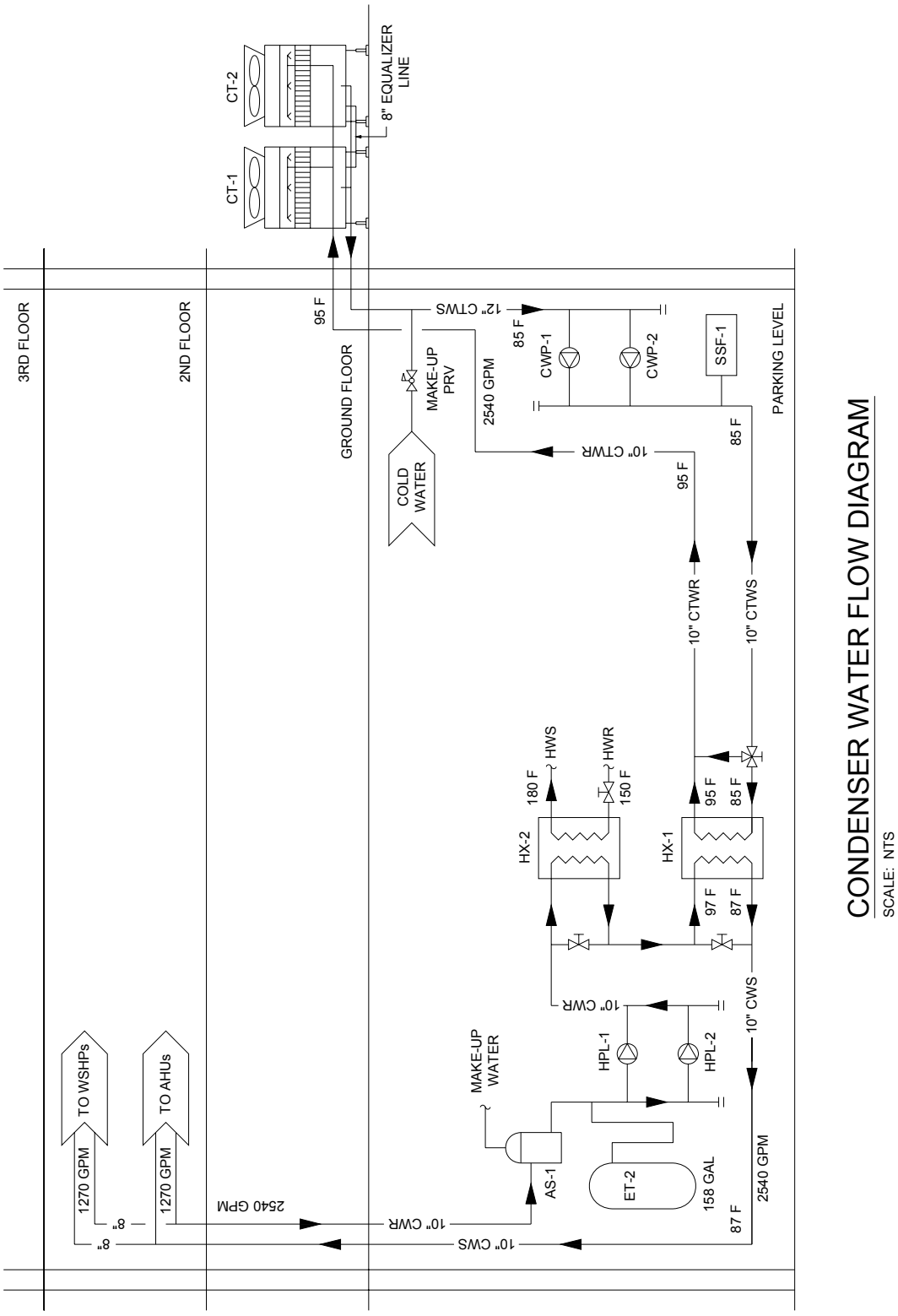

Figure 2 - Condenser Water Flow Diagram

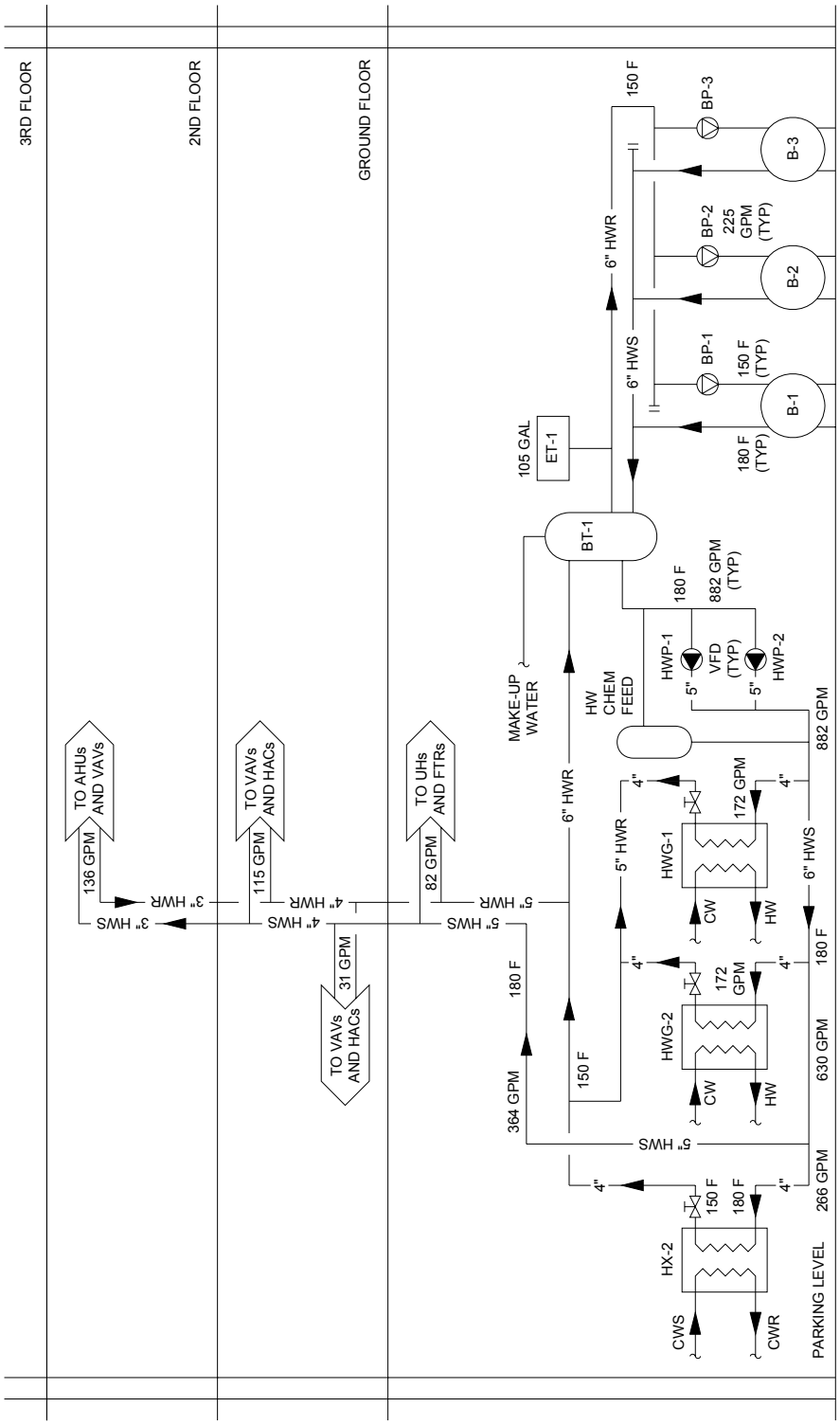

Figure 3 - Hot Water Flow Diagram

Guest Rooms

The “Hilton Design and Construction Standards” list several choices for the possible air conditioning unit types available for use in its guest rooms. For example, the lower-end Hilton hotels mainly use of packaged terminal air conditioning (PTAC) units for all the guest rooms; the higher-end Hilton hotels require the use of a four-pipe fan coil unit (FCU) system with both chilled and hot water for the guest rooms. In this case, the BWI Hilton is allowed to have one of three different guest room units: two-pipe FCUs with resistance heating, water source heat pumps (WSHPs), or four-pipe FCUs.

The four-pipe FCU system is the highest quality system that is currently being used in hotels. The other two options are either the two-pipe FCU system with resistance heating or the water source heat pumps. It was suggested by the mechanical contractor, Southland Industries, Inc., to use the two-pipe FCU system. However, Hilton Hotels preferred the use of the WSHP system for this project, so the original design was completed based on a condenser water and boiler loop.

On the third through eleventh floors, all the guest rooms are equipped with individual water source heat pumps, master thermostats, and control valves in each room. Through the process of value engineering, two air conditioning units located in the penthouse, which were originally scheduled to supply each guest room with 60 cfm of outside air, and all the related ductwork and fire dampers were eliminated.