

Mechanical Design

Existing Mechanical System Design:

The Center for the Arts is a performing arts center located on the University of Delaware campus in Newark, Delaware. The 92,000 square foot Center for the Arts consists of a Proscenium Theater, Recital Hall, Orchestra Rehearsal, and Theater Rehearsal as the major performing spaces as well as 32 practices rooms.

The primary factor contributing to the mechanical system design is the use of the spaces and their acoustical sensitivity. The choice of air delivery to the performing spaces plays a significant role in providing patron comfort and determining architectural volume and acoustical response times. Each of the performing spaces must meet the noise criteria specified by the University of Delaware. The noise criteria allowable noise levels affect the equipment selection and sizing.

Air Handling Units

AHU-1

Air-Handling Unit 1 is a variable air volume unit that supplies 19,200cfm to 19 zones. This air-handling unit serves the Orchard Street lobby on the south side of the building as well as corridors and interior spaces. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 35%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor is 6700cfm.

AHU-2

Air-Handling Unit 2 is a constant air volume unit that serves the Proscenium Theatre seating area and supplies 7,900cfm to that single zone. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 44%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor air is 4,000cfm.

AHU-3

Air-Handling Unit 3 is a constant air volume unit that serves the Proscenium Theatre stage supplies 9,450 cfm to that one zone. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 8%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor air is 950 cfm.

AHU-4

Air-Handling Unit 4 is a variable air volume unit that supplies 35,000cfm to 62 zones. This air-handling unit serves the theatre rehearsal and back of the house interior spaces on the lower level, and practice rooms on the second level. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 33%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor air is 11,700cfm.

AHU-5

Air-Handling Unit 5 is a constant air volume unit that supplies 10,500cfm to one zone through an under floor distribution system. This air-handling unit serves the Recital Hall seating area and stage. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 17%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor air is 1,800cfm.

AHU-6

Air-Handling Unit 6 is a constant air volume unit that supplies 7,000cfm to one zone. This air-handling unit serves the Orchestra Rehearsal room. According to ASHRAE Standard 62.1-2004, the minimum outdoor air percentage was found to be 42%. In order to comply with ASHRAE Standard 62.1 the scheduled minimum amount of outdoor air is 3,000cfm.

Chilled Water System

The chilled water for the Center for the Arts is supplied from the campus chilled water mains. There are two pumps, located in the lower level mechanical room, that each has a

dedicated variable frequency controller to modulate the speed of the pump in order to maintain adequate system differential pressure. The pumps pump the chilled water to the cooling coils in the air handling units and the fan coil units that cool the electrical equipment room.

Heating Water System

The heating system for the Center for the Arts is supplied from the campus steam mains. The steam enters the Center for the Arts as medium pressure steam then reaches a pressure reducing station where the steam is converted to low pressure steam. The low-pressure steam is then converted to 200°F water in one of the two steam-to-water converters. There are two pumps, located in the lower level mechanical room, that each has a dedicated variable frequency controller to modulate the speed of the pump in order to maintain adequate system differential pressure. The heating water is then pumped throughout the building supplying heating water to the air-handling unit preheat and reheat coils, the unit heaters, duct mounted reheat coils and other equipment.

Humidification System

Each of the six air handling units that service the Center for the Arts are equipped with a gas fired steam humidifier. Humidification control is vital to the performance quality within the spaces in the Center for the Arts. Changes in humidity levels affect the tonal quality of tuned instruments. Each of the performance spaces is equipped with humidity sensors so that the humidity levels can be maintained.

Proscenium Theater Existing Mechanical Design:

The Proscenium Theater contains seating for 500 occupants on two levels. The front two rows of seating on the first floor can be either for patrons or for an orchestra. When the orchestra uses the front two rows, those rows are hydraulically lowered to a storage area and a ten-foot vertical opening is left for the orchestra to play out of.

The ventilation air for the Proscenium Theater is supplied by air handling units 2 and 3. Air handling unit 2 provides air for the seating area and air-handling unit 3 provides air for the stage of the Proscenium Theater. The seating area air is supplied from a constant volume unit that delivers air to occupants from forty feet above the occupants breathing zone. The overhead diffusers are located above the catwalk level. Directly below the overhead diffusers there is a sound lined board so that the air falls over the edges to reduce the dumping effect.

The theater contains a 180-seat balcony that hangs over the back three rows of the first floor seating area. In order to accommodate the ventilation requirements for the occupants under the balcony there are linear slot diffusers along the back wall of the theater seating area.

In the four corners of the Proscenium Theater seating area there are return airshafts. On the first level, the return grilles are located in the back two corners of the seating area. On the balcony level, the return grilles and plenums are located in the front corners closest to the stage. From each of the return air plenums on their respective levels the air is ducted up to the gallery level where the return air exits the theater and is taken back to the air-handling unit.