

Acoustical Design

Acoustical Analysis:

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 acoustical consultants for the University of Delaware on the Center for the Arts Building classify the Proscenium Theater as a critical space. A critical space must meet background noise levels in the terms of Room Criteria (RC) of RC 18-22 (N).

Underfloor supply systems can be extremely effective in controlling background HVAC noise levels. It is recommended to use low-pressure air distribution because noise from high or medium velocity ductwork typically exceeds the required Room Criteria for acoustically critical spaces.

The reverberation times in the Proscenium Theater are higher dependent on shape of the theater as well as the materials. Neither the shape nor the materials in the theater are changing as a result of the implementation of the underfloor air distribution system. Since the original design for the theater was made in accordance with acceptable reverberation times in a theater space, 1.8-2.0s, the underfloor system will not create a variance in this number.

NC and RC Values:

The Trane Acoustical Program (TAP) analyzes the noise levels produced by and attenuated through HVAC equipment. The supply air fan is the component of the air-handling unit that creates the most significant amount of noise that carries through the ductwork to the theater space. The manufacturer of the product specifies the fan sound power levels for the supply air fan.

In TAP, the path of the sound begins at the supply air fan where the custom sound power levels are entered. The ductwork sizes, lengths, and thickness lining affect how the sound and vibrations pass through the ductwork. The sound power level from the diffuser is the last element of HVAC equipment before the air enters the room. TAP calculates the Noise Criteria (NC) and Room Criteria (RC) based on the inputted values.

For the theater, the NC and RC level was determined for the first level and the balcony level. Both the first level and the balcony resulted in NC-16 and RC-17 (N). The output also indicates that there will be no rumble from the low octave band frequencies or hiss from the high octave band frequencies. These levels are below the specified RC 18-22 (N) levels set by the University of Delaware.