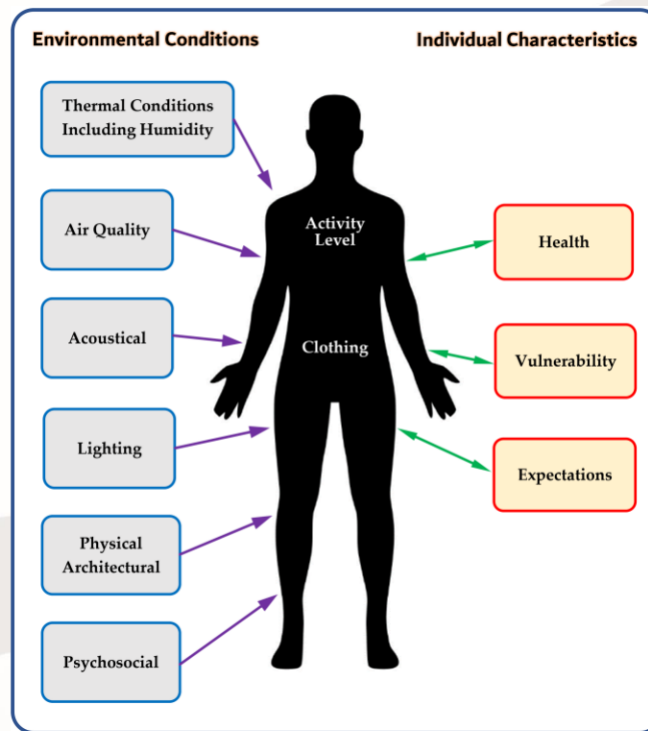




Attributes Influencing Human Comfort – Part 1

In the beginning, “Provide a comfortable environment for the occupants” sounds like a simple objective, until you start to consider the variety of factors that influence the comfort of an individual. In the following figure, is simplified diagram of the three main groups of factors that affect comfort.



Personal Environment Model (adapted with permission from “The construct of comfort: a framework for research” by W.S. Cain¹)

Attributes of the Space Influencing Comfort

As you can see, six attributes of the space influence comfort: thermal, air quality, acoustical, lighting, physical, and psychosocial. Of these, only the thermal conditions and air quality can be directly controlled by the HVAC system.

The lighting and architectural aspects are another field, but these can influence how the HVAC is perceived. The psychosocial environment (how people interact socially, or unsocially!) in the space is largely dependent on the occupants, rather than the design of the space. We will briefly consider these six aspects of the space and their influence on comfort:

1. **Thermal Conditions** — include more than simply the air temperature. If the air speed is very high, the space will be considered ‘drafty’. If there is no air movement, occupants may consider the space ‘stuffy’. The air velocity in a mechanically conditioned space is largely controlled by the design of the system. On the other hand, suppose the occupants are seated by a large unshaded window. If the air temperature stays constant, they will feel very warm when the sun is shining on them and cooler when clouds hide the sun. This is a situation where the architectural design of the space affects the thermal comfort of the occupant, independently of the temperature of the space.

¹ Cain, W.S. 2002. “The construct of comfort: a framework for research” Indoor Air 2002, *Proceedings: Indoor Air 2002* Volume II, pp.12–20



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2. **Air Quality** — in a space is affected by pollution from the occupants and other contents of the space. This pollution is, to a greater or lesser extent, reduced by the amount of outside air brought into the space to dilute the pollutants. Typically, densely occupied spaces, like movie theatres, and heavy polluting activities, such as cooking, require a much higher amount of outside air than an office building or a residence.
3. **Acoustical** — environment may be affected by outside traffic noise, other occupants, equipment, and the HVAC system. Design requirements are dictated by the space. A designer may have to be very careful to design a virtually silent system for a recording studio. On the other hand, the design for a noisy foundry may not require any acoustical design consideration.
4. **Lighting** — influences the HVAC design, since all lights give off heat. The lighting also influences the occupants' perception of comfort. If the lights are much too bright, the occupants may feel uncomfortable.
5. **Architecture Aspects** — of the space that have an influence on the occupants include both the architectural design aspects of the space, and the interior design. Issues like chair comfort, the height of computer keyboards, or reflections off computer screens have no relation to the HVAC design, however they may affect how occupants perceive the overall comfort of the space.
6. **Psychosocial Situation** — the interaction between people in the space, is not a design issue but can create strong feelings about the comfort of the space.