

Much of a building operator's time is spent responding to occupant comfort concerns. People are different, and each one has their own preference for temperature. Individual preferences can be grouped statistically to find a range of temperatures that will satisfy the majority of building occupants. Understanding human comfort needs can help building operators and managers get the right balance between comfort and energy efficiency. Heating and cooling setpoints have a big impact on energy use. For example, moving from a tight one-degree temperature variation to a five-degree deadband will save about 10% of heating energy and from 20% to 30% of cooling energy in commercial buildings.

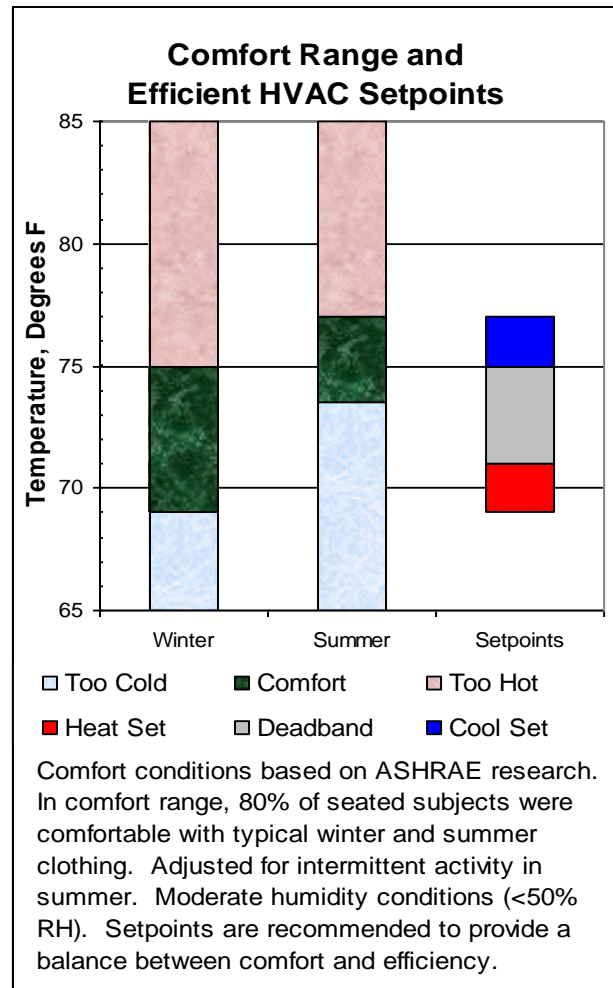
Human Comfort Ranges

Scientific study of human comfort indicates what temperatures **most** people will be comfortable for both summer and winter conditions. The comfort zone shown at the right is related to ranges of dry-bulb air temperature. The comfort zone is based on extensive scientific research by the American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE). In fact, 80% of test subjects said they were comfortable or neutral in these ranges. They were neither slightly warm nor slightly cool.

The important thing to realize is that **some people (about 20%) will always be at least slightly uncomfortable**. So the truth is that you cannot please all the people all the time. If you move building temperature setpoints outside the comfort zone to appease someone, you will surely make someone else uncomfortable.

The solution is to arrive at reasonable setpoints for thermostats, and keep them there. This is best done with management backing. The following setpoints match the seasons and are based on scientific experiments by ASHRAE. These settings will result in the greatest number of occupants being comfortable:

- ❑ Set thermostats between 69 and 71 degrees F for heating.
- ❑ Set thermostats between 75 and 77 degrees F for mechanical cooling. Note that typical setting of 72 degrees is outside the summer comfort zone for sedentary humans.
- ❑ When economizer cooling is available and control systems can allow separate setpoints, use a 74 degree F setpoint for



economizer cooling. This helps pre-cool the building before afternoon mechanical air-conditioning is needed and works with multi-stage thermostats.

- ❑ Resist the temptation to set the heating thermostat at 75 in the winter and the cooling thermostat at 68 in the summer. Its an expensive way to “feel” the effects of your heating and cooling system. Expect people to adapt to weather changes.
- ❑ Always make sure there is a deadband of 4 to 6 degrees between heating and cooling setpoints where only ventilation is provided. A true deadband may not be possible on all system types such as VAV, but controls can be adjusted to provide a low-energy range.

Comfort Management

These set-points may be controversial. Many people have heard that “72 is the perfect setting.” This probably comes from the influence of major control manufactures that are located in humid parts of the country, where lower setpoints may be necessary to compensate for high humidity. In the West, humidity is moderate-to-low most of the time, and lower summer settings are simply not necessary. Another impact is an expectation that we “feel” the conditioning system. On a hot summer day, we want to be more than just comfortable in a building. We want to feel cool. In the winter the reverse can be true. We want to feel warm, not just comfortable. Why do we need to take a jacket to the movie theatre or restaurant during the summer? Are we wasting irreplaceable fuel to over-condition our spaces? Does too low a cooling setpoint result in space heaters in use under desks in the summer?

Implementing a wise approach to comfort requires knowledge of a reasonable comfort range based on scientific study. It then takes a systematic approach to keep comfort on track.

- ❑ Get management support. Adopt an “Acceptable Temperature” policy for your building.
- ❑ Encourage more casual, seasonal dress and encourage staff to dress with layers so they can adjust their clothing to maintain personal comfort.

Energy Myth: 72 degrees (or some other single value) is the single “right” temperature for human comfort.

Energy Fact: The human body adapts well to changes in temperature and humidity. In a well insulated building with moderate humidity, **most** people are comfortable between 69 and 77 degrees F. HVAC systems should provide heating and cooling at the edges of this range, not try to achieve a “perfect” temperature in the middle. Setpoints of 70°F for heating and 76°F for cooling strike the right balance.

- ❑ Use quality measurement devices to confirm temperature in the occupied space.
- ❑ Pacify: “You know I’m supposed to set the heating at 68, but for you I’ll set it at 70.”
- ❑ Fix other impacts on comfort by making sure you have:
 - Carpet or cork tile on cold floors.
 - Double pane windows, or shoulder curtains where staff sit near windows.
 - Blinds on windows to avoid direct sunlight.
 - Quiet work areas (20% more thermal complaints if noisy).
 - Small fans or footrest heaters for isolated comfort problems.

A sample “Acceptable Temperature Policy” for your building

We strive to provide a comfortable workplace in balance with wise use of energy. We recognize that comfort varies for individuals, and these guidelines are based on scientific studies to create comfortable conditions for the greatest number of staff.

In general, during regular business hours, buiding interior spaces shall be maintained between 70 and 76 degrees F. During extreme weather conditions or periods of high electric demand, temperatures may be maintained in the range of 68 to 78 degrees F. Ancillary spaces such as hallways, lobbies, and stairwells will be tempered in the range of 63 to 82 degrees F.

Staff are encouraged to wear clothing that can be adjusted to maintain personal comfort. Where necessary, individual fans or footrest heaters will be provided. Space heaters over 200 Watts are not permitted to avoid power quality problems and reduce fire hazard.



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