

AIR CONDITIONING SYSTEM DESIGN CRITERIA

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Introduction

It is important for building owners to understand the criteria by which air conditioning systems are typically designed. These criteria which have been established by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and are referenced by most energy codes. This memo presents the typical design criteria and explains their ramifications. It also explains why air conditioning systems are not typically designed to cool rooms below 75°F and why they may not appear to work properly on very hot days.

What are the criteria for AC system design?

- Indoor design temperature: 75°F
- Outdoor design temperature: 85°-90°F
- Outdoor relative humidity: 50%

What does this mean?

What this means in practical terms is that a properly designed air conditioning system will cool a building to 75°F on a day when it is 85°-90°F outdoors with 50% relative humidity (the temperature varies depending on the geographic location of the building).

What are the consequences of these design criteria?

It is important to understand the following:

- The system is not designed to cool a building to less than 75°F on the hottest days.
- If the outdoor temperature and humidity exceed 85°-90°F and 50%, the building or certain areas of the building may not be able to be cooled as low as 75°F.
- Temperatures and humidity may exceed these values for several days at a time during a "hot spell".

Why aren't systems designed to cool buildings fully during these hot spells?

- The hot spells occur relatively infrequently - the design temperature and humidity occur less than 2.5% of the time.
- Sizing the system to meet the most extreme condition would increase the system cost dramatically.
- If the system is designed to meet the most extreme conditions, it will be greatly oversized for "normal" conditions: oversized air conditioning systems do not do a good job of reducing humidity so the result is a cool but humid environment.
- The energy codes require that a system not be oversized because it wastes energy.

75°F feels like beach weather - how can I get the Engineer to design it cooler?

- Inform the Engineer of your request before the system is designed. Codes offer exceptions where

necessary to prevent damage to materials or equipment within the building. Inform the Engineer of why you request an exception.

- Inform the Engineer of the interior and exterior design criteria you believe are necessary.
- Be prepared to spend up to twice as much for such a system.
- Be prepared for the fact that the building may experience relatively high humidity during normal weather.
- Expect to pay considerably greater electric bills.