

MET 466 – Thermal Processes Lab

LAB #3 Psychrometric Analysis Lab

Assigned: 2/19/09

Due: 3/5/09

Introduction

The objective of this lab is to demonstrate the dew point at two different temperatures and to exit the comfort zone defined in ASHRAE 55-1992.

Technical background

Comfort is a major concern in the HVAC industry. Not everyone can be made completely comfortable by one set of conditions, but a fairly clear understanding of what is involved in providing comfort to most of the occupants in a controlled space has been developed as shown in Figure 1. It has been shown that bodily heat loss/gain is interdependently related to the following four environmental factors:

Dry Bulb Temperature

Wet Bulb Temperature

Mean Radiant Temperature

Relative Humidity

Air Movement

In this particular experiment air movement will not be measured.

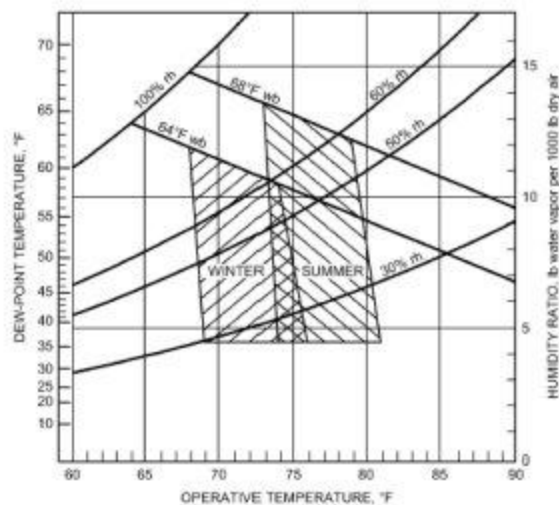


Figure 1: Comfort Chart

Equipment

The experiment will be performed in the East room in the HVAC lab in EPS 008E. The following equipment will be used:

1. Sling psychrometer.
2. IR Thermometer.
3. Installed relative humidity, dry and wet bulb temperature resistance temperature detectors (RTD's)
4. 2 way radios for communication purposes.

Procedure

- 1) Record initial conditions; wet and dry bulb temperatures with sling psychrometers. Also record the floor, wall, ceiling, window, and door temperatures with the IR thermometer.
- 2) Moisture will be added to the room via steam while a constant temperature is maintained (as closely as possible). Continue to take measurements every 2 to 5 minutes until condensation appears. Record all conditions when condensation appears on the floor. Condensation can be observed by wiping a finger across the floor or by seeing footprints on the floor.
- 3) The steam will be turned off and then sensible heat will be added. At this point, the conditions of the room will be leaving the comfort zone defined by ASHRAE 55-1992. Continue to take measurements every 2 to 5 minutes.
- 4) After the temperature rises to approximately to 85 degrees the heat will be turned off and steam will be added. Continue to take measurements every 2 to 5 minutes until condensation appears. Record all conditions when condensation appears on the floor.

Results

- Plot dry and wet bulb temperatures on a Psychrometric chart for all recorded data.
- Identify the points where condensation was first observed on the Psychrometric chart.
- Comment on accuracy of determining the dew point by touch and the level of comfort during the experiment.
- Plot conditions at procedure steps 1, 4 and 7 on a Psychrometric comfort chart.
- Compare Psychrometric measurements taken to those of the comfort zone and comment on them.
- Calculate Mean Radiant Temperature after step 1, 2, and 4 in the procedure.