

**Local Air Supply at Workstations  
for Energy Efficient  
Summer Comfort**

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**In a presentation at the June 2006 ASHRAE meeting in Quebec, Dr. Richard Aynsley, Director of Research and Development at Big Ass Fan Company in Lexington, KY, showed the dramatic effect of moving air on people. A survey by the University of California at Berkeley showed in addition that most people prefer more moving air.**

**The best use of the cooling effect of moving air is to get away from the mind set of air conditioning buildings – with a “one fits all environment” that fits no one.**

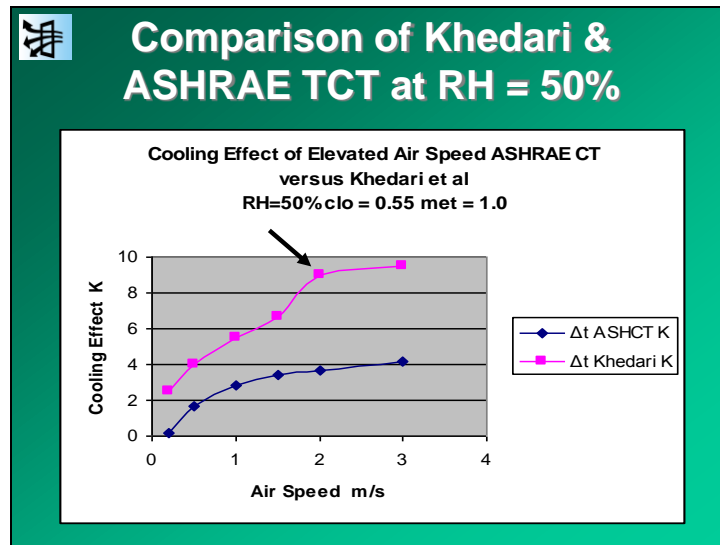
Slide 2



**The aircraft and automotive industries have taken advantage of moving air controlled by occupants for many, many years.**

**People can adjust conditions to meet their PERSONAL need for thermal comfort by simply adjusting airflow.**

**Unfortunately, because of lack of space, the velocities of the air in both cases is on the high side and tends to feel drafty.**



**ASHRAE Standard 55, on page 6, suggests the use of moving air, provided it's under personal control.**

**As Dr. Aynsley found, the effect shown in the standard is understated – and is probably based on sensible cooling only.**

**Tests by Fred Bauman and his group at UC Berkeley have demonstrated that changing the air flow can change the cooling temperature perceived by occupants from 0° to 15°F.**

**For example, in a study by Khedari of 288 college students, air at 27°C (80°F) moving at 2 meters/sec (400 FPM) feels like 18°C (65°F).**

**So, by varying the air flow you can control the perceived temperature from 80°F to 65°F.**

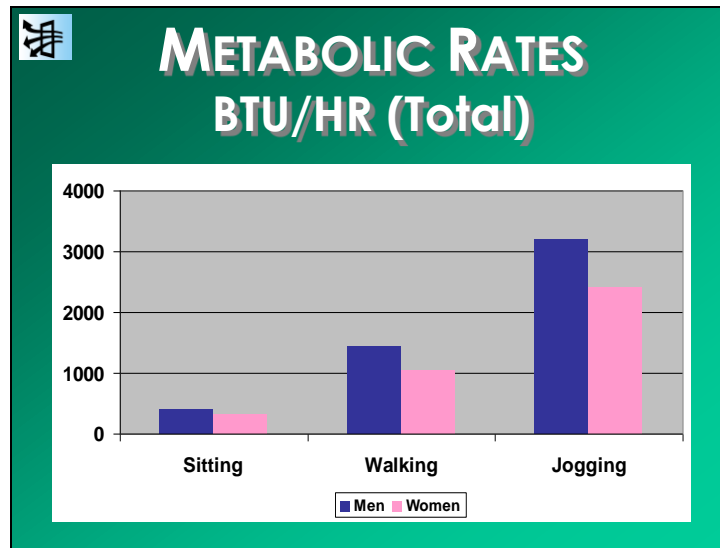
**That range will satisfy 100% of the occupants at all times.**

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**By providing personal control, we can eliminate the number one complaint and improve productivity in every office.**

**We do so by accommodating the vastly different needs of people for comfort.**



**Why is there so much difference? Because basic metabolism varies from person to person.**

**On top of that, metabolism can vary at any time due to varying conditions, such as controversial phone calls; or being rushed; or not feeling well due to health problems, etc.**

**People are comfortable when the heat removed is equal to the heat they generate.**

	Height	Weight	Basal Metabolism (kcalories)
Man	5'9"	180 lbs	1960
Woman	5'4"	125 lbs	1360
Difference			600 <b>44%</b>

Basal metabolism: 10-12 kcalories per pound of body weight per day

Source: Mayo Clinic (www.mayoclinic.com)

**According to information from the Mayo Clinic, the basal metabolic rate for people is 10-12 kilocalories per pound of body weight per day.**

**The slide compares the caloric output of 1360 kilocalories for a typical woman weighing 125 pounds compared to that of 1960 for a typical man weighing 180 pounds: a difference of 600 kilocalories, or 44%!**

**If more heat than is generated through basic metabolism is removed, the person feels cold. Any less and he feels hot.**

**Is it any wonder that both people cannot be comfortable under the same temperature conditions?**


**In addition, differences in radiation efficiency and clothing can affect the cooling needs of men vs. women. A smaller body is a more efficient radiator, further aggravating the need for individual environmental control.**

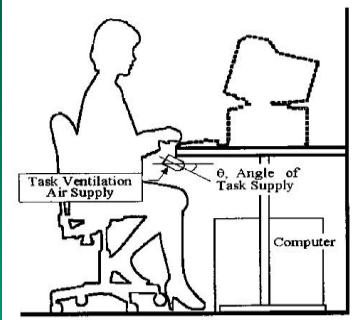


**Here is a simple solution:**

**By introducing air at the desk level, the occupant can change the cooling effect with a damper - just like in his car. But because of better space availability compared to a car, velocities are lower, and, therefore, air flow is quieter and more comfortable.**

**And this design is familiar to everyone without special training!**

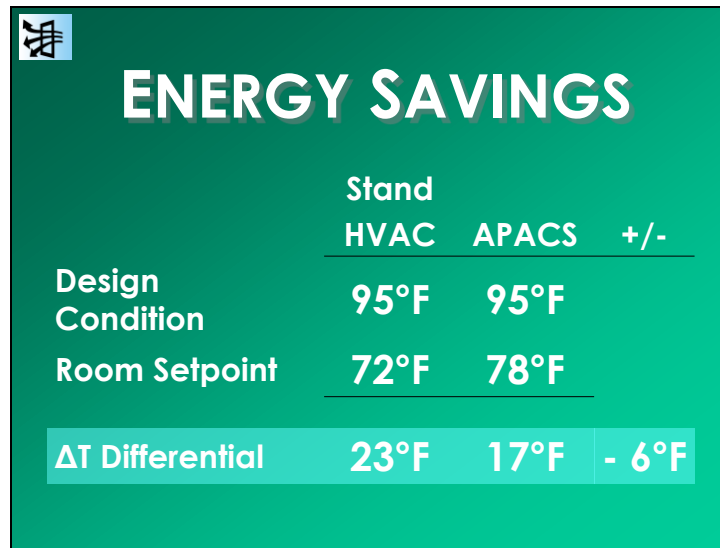
 **VENTILATION EFFECTIVENESS**



Air Change Effectiveness:  
1.4 – 2.7

Source: "Ventilation Efficiencies of a Desk-Edge-Mounted Task Ventilation System." Faulkner, D., et al., Proceedings of Indoor Air 2002, Monterey, CA 2002. Study supported by US DOE.

**Tests at UC Berkeley show that because supply air flow discharges near the occupant, this design increases ventilation effectiveness - a savings both in energy and the cost of filtration.**



The table is titled "ENERGY SAVINGS" and compares Stand HVAC and APACS systems. It lists Design Condition, Room Setpoint, and ΔT Differential for both systems. The APACS system shows a significantly lower ΔT differential, indicating energy savings.

	Stand HVAC	APACS	+/-
Design Condition	95°F	95°F	
Room Setpoint	72°F	78°F	
ΔT Differential	23°F	17°F	- 6°F

Furthermore, by using moving air instead of cold air, a very great saving in energy is achieved.

Room temperatures can be set substantially higher because of the cooling effect of the moving air.

As we have seen, moving air lets people set “perceived temperatures” from 80 down to 65°F – a range of 15°F (9°C).

**Conserving Energy  
Can Save You Money**

**Simply Follow These Tips to Lower Your Cooling Costs**

Florida weather is heating up. Unfortunately, hotter temperatures – coupled with the effect of higher oil and natural gas prices – mean you’ll be spending more each month on electricity.

Raising your thermostat to 80° and using ceiling fans can save you up to 14% more on your cooling costs. But remember to turn fans off when you leave the room.

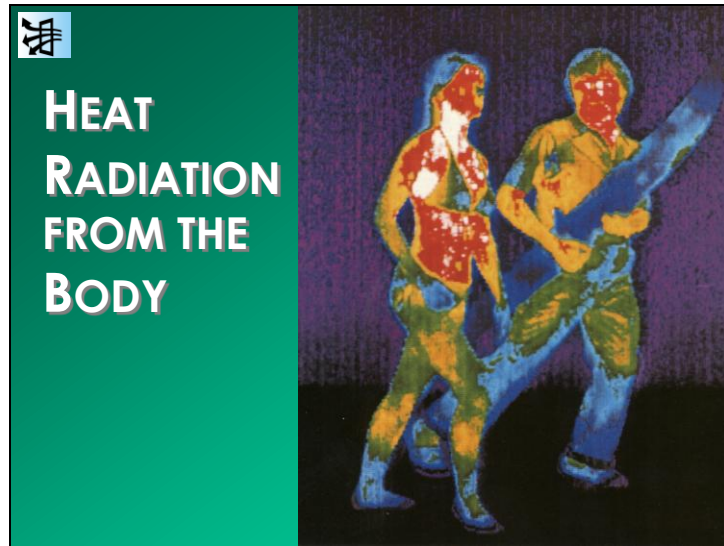
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**FPL ENERGY NEWS**  
For Customers of Florida Power & Light Company

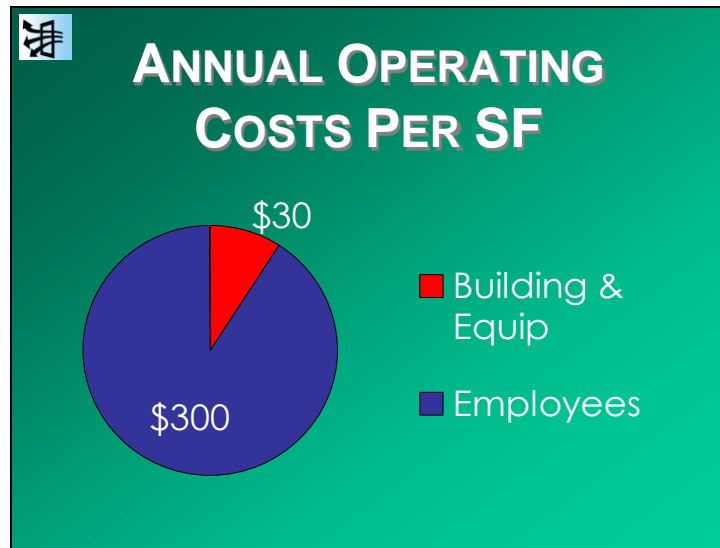
**Florida Power and Light indicates a 14% savings in energy in Florida. Where economizer cycles are available much higher savings will result.**

**A 6°F increase in temperature will add 1000 or more hours of “free cooling!”**

**This can cut cooling cost in half or better!**



**This thermograph shows 60% of heat is given off by the upper body, and, thus, a task air outlet positioned at the worksurface is most effective in making people comfortable.**



**Many studies show that increased comfort means increased productivity.<sup>1</sup>**

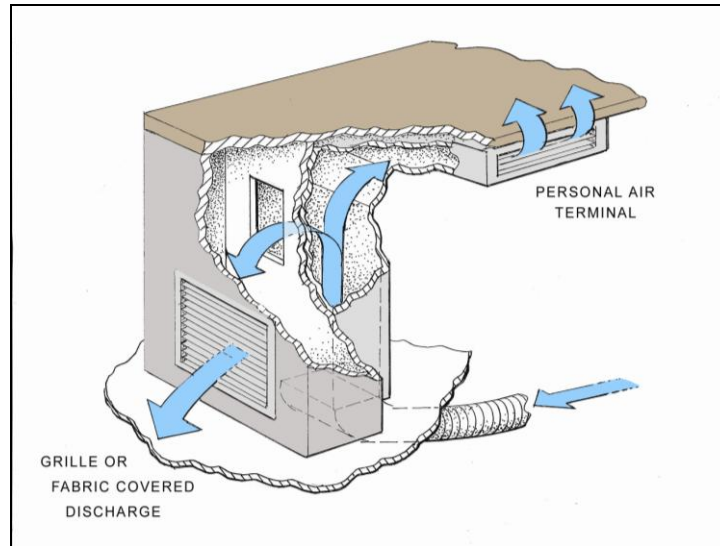
**Let's put productivity in perspective.**

**Annual payroll costs in office buildings are approximately \$200 to \$300 per square foot, or 90% of the total costs of owning and operating an office facility.**

**Even a small increase in productivity can offset total annual building costs of \$20 to \$30 per square foot.**

**So, while the savings in power is substantial, savings in people energy is far more valuable.**

<sup>1</sup>Michael Brill (BOSTI Study), Volker Hartkopf, Vivian Loftness

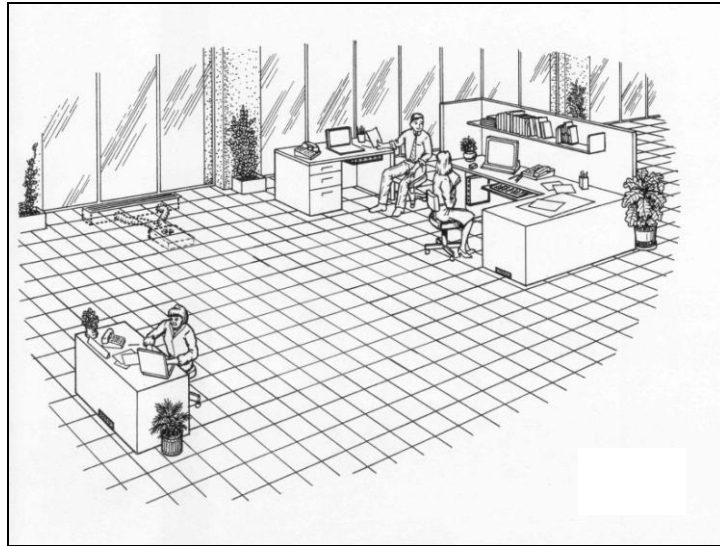


**This illustrates a desk or workstation with a personal air terminal.**


**Note that displacement ventilation can easily be added for better IEQ, cleaner air and reduced cross contamination.**

**Displacement ventilation has been proven to increase comfort, save energy and reduce absenteeism.**

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**This shows a typical office with integrated task/ambient personal control and displacement ventilation.**



**LEED™ CREDITS**

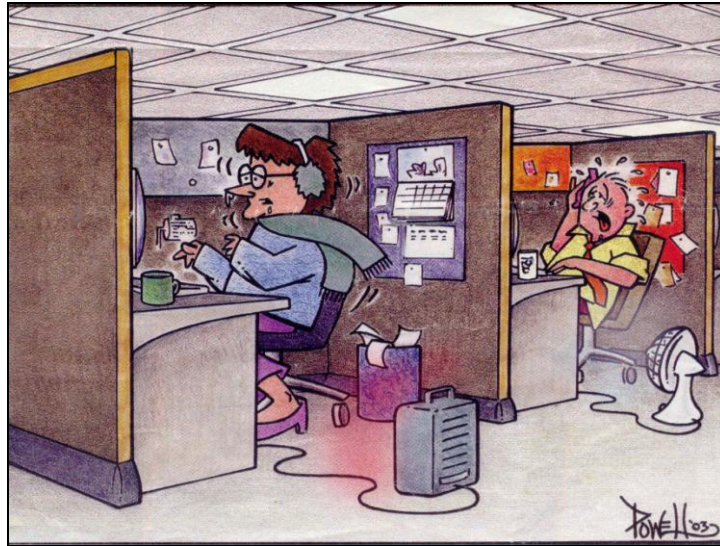
**INDOOR ENVIRONMENTAL QUALITY**

CREDIT	REQUIREMENT
Controllability of Systems	Individual occupant control (1 point)
Thermal Comfort	ASHRAE 55-1992 (1 point) Operator control over thermal comfort (1 point)

**This design also fulfills requirements for credits in the LEED Green Building Rating System, including points -**

**For individual occupant control,  
For compliance with thermal comfort standards in ASHRAE Standard 55,  
For a system configured to provide operator control for personal comfort,  
For better IEQ, and  
For lower energy consumption.**

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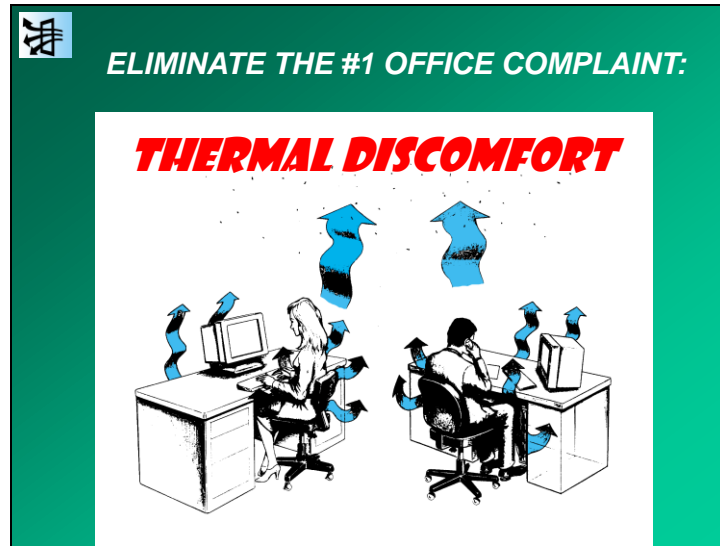


**Yes –**

**we can eliminate the #1 complaint of office workers,**

**save energy,**

**and increase productivity . . . . .**



..... By using moving air with task/ambient personal control and displacement ventilation.

You can earn LEED credits with

- a sustainable green indoor environment,
- control by occupants,
- better IEQ,
- and lower energy cost,

Achieve greater productivity,

And do all this at reduced first cost!