SEEK COMFORT ACHIEVE PERFORMANCE

Z SMITH ESKEW+DUMEZ+RIPPLE

BEAUTY COMFORT PERFORMANCE





WE MEASURE EVERYTHING











EDR Office Expansion









EUI = kBtu/sf/yr.

WE MUST BE GENIUSES







Net EUI: 3kBtu/SF/yr Regional average: 42 kBtu/Sq.Ft.

WE MUST BE IDIOTS



ENERGY DATA kBTUs/Sq.Ft. 45 40 35 30 25 20 15 10 5 0 ELECTRICITY ELECTRICITY GAS USED PRODUCED

> Net EUI: 61kBtu/SF/yr Regional average: 42 kBtu/Sq.Ft.

IT MUST BE THE OCCUPANTS



Figure 1. Even though all homes had two or more occupants, with identical appliances and equipment, energy use varied by 2.6:1 from the highest to the lowest consumer 2004 Electric Bills for 11 Beazer Homes in Sacramento, CA (from SMUD)





PREDICTION VS. PERFORMANCE

r² = 0.33?

Why is the correlation so poor?

The suspects:

- 1. Architect
- 2. Engineer
- 3. Energy modeler
- 4. Contractor
- 5. Building operations staff
- 6. Occupants



Figure 21: Measured versus Design EUIs (kBtu/sf)





Clark Brockman, SERA









THE LONG ROAD TO PERFORMANCE #1





THE LONG ROAD TO PERFORMANCE #2



Apalachicola National Estuarine Research Center Eskew+Dumez+Ripple



THE LONG ROAD TO PERFORMANCE #3





Dinwiddie Hall Tulane University Waggonner & Ball

VARIATION AMONG BUILDINGS OF ONE TYPE





Source: New York University

VARIATION WITHIN TYPE MUSEUMS





VARIATION DUE TO OPERATION SCHOOLS



VARIATION AMONG OCCUPANTS HOUSING



930 Poydras apartments AIA Gulf States Design Award



Field Studies

Friends

BENCHMARKING PERFORMANCE

930 Poydras



BUT THE GOAL IS BEST COMFORT AT LEAST ENERGY

NCARB Grant (Tulane + EDR)

"Field Studies to Inform Design of Healthy, High-Performance **Buildings**"

\$13,000 equipment (T, RH, fc, dB, air velocity)

New course at Tulane School of Architecture: "Buildings, Climate, Comfort"

Document & interpret

- 'objective' comfort ٠
- 'subjective' comfort •
- energy use











BUT THE GOAL IS BEST COMFORT AT LEAST ENERGY

16 student teams per semester Document

- 'objective' comfort
- 'subjective' comfort
- energy use



FIELD STUDIES

Old and new buildings

State of the art buildings and standard / historic construction



FIELD STUDIES RESULTS

THERMAL COMFORT RICHARDSON MEMORIAL

ENERGY USE GLOBAL GREEN HOUSES





ANECDOTE & DATA



Sarah Morasso I'm cold af in 204 right now. 20 hours ago via mobile · Like · 🖒 1



Alyssa Rogut The only thing worse than sitting in 204 is that clicking noise in 404

20 hours ago via mobile · Like · 🖒 5



Kevin Atkinson What do you mean by comfort levels? 204 is always really warm and smells funny. about an hour ago via mobile - Like



Calla Mae The projector never shows up right in 204. It makes my eyes uncomfortable. Also the extreme temperatures but that's more like exciting world travels in my mind about an hour ago via mobile · Like



Surveying actual occupancy of stacks, study areas, and common areas

Eskew+Dumez+Ripple staff working with student teams from the Tulane School of Architecture



Locations of data-logging occupancy sensors during study Occupants located by manual survey...

- 10 PM
- 1 AM

Where people are when: Automated & Manual surveys

HTML gets 3000 visitors per day-but use varies greatly over time-of-day and location

WHAT IS COMFORT? PASSIVE HOUSE, ACTIVE OCCUPANT



COMFORT

"It's been a rather cool winter after the warm weather around Mardi Gras"

"Fires were only lit on evenings with temperatures in the 40s"

"Thermostat is set for 64 on cool days when I'm home; at night and when I leave home, the thermostat is at 50."

"In cool weather indoors, I increase 'clo' by one unit, when getting up, by two units."

Living Room Temparature and Light: Passive Solar and Wood Fire Heat Gains

Atypical Heat Gain: Wood Fires at Night?

NEW ORLEANS DESIGN CHALLENGES

- · 2776 cooling degree days
- High latent loads / Relative humidity
- · No major prevailing winds
- · 62 inches of rain annually

TEMPERATURE °F

43.8 KBTU/SF/YR

CURRENT AVERAGE SINGLE FAMILY DWELLING EUI

21.9 KBTU/SF/YR 2030 CHALLENGE (50% TARGET) EUI

33.15 KBTU/SF/YR

KLINGMAN'S DWELLING EUI

COMFORT: THE CANARY IN THE COAL MINE

Before: Avg CO_2 levels 1581 ppm High energy use After intervention: Avg CO_2 levels 828 ppm Energy use down

COMFORT: THE CANARY IN THE COAL MINE

Transfiguration of the Lord Church Repaired after Katrina

Anticipating the set point Who's Setting the Thermostat?

Priest:

CLO - 1.6 to 2.5 MET - 1.6

CLO - 0.6 to 1.0 MET - 1.0

Church Psychrometrics

Temperature

Collecting Data

Transfiguration of the Lord Church June 25 - July 10

Church Service

Predicted Percentage Dissatisfied AHSRAE 55 - 2007

IMPROVING COMFORT LOWER BILLS

Electricity

use (kWh)

70,000 60,000 50,000 40,000 30,000 20,000 10,000 0 Nov Jan Feb Mar Nov Dec Jan Sep Feb ð Apr May n ٦ Aug đ Apr Mar

Transfiguration of the Lord Church Design / Contractor / Client team

EXPERIMENTING ON OURSELVES

Firefox •	- 0 - X
EDR Office Comfort Survey +	
🔄 🕙 www.surveymankey.com/s/VLGSE 🏫 🛪	C 🔚 - Google 🔎 🏦
🕈 Hotmail 🞾 EDR ShareFile 🖾 Blackboard Acad	demic 🤫 🖾 Bookmark
EDR Office Comfort	Eall this survey
*1. Your name	
Z Smith	
<u>.</u>	d -
*2. How is your thermal comfort	right now?
Very hot	
Slightly hot	
O Comfortable	
Slightly cold	
Very cold	1
Other (please specify)	
*3. Please estimate your clo valu the email 2	e - see diagram in
0.4	
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O 1	
Other (please specify)	
Done	
Powered by <u>SurveyMo</u> Check out our <u>sample surveys</u> and crea	nkey Ite your own now!

DISCOMFORT AS DIAGNOSTIC

Experimenting with surveys

Comfort in the EDR Studio – July 2012

70° - 72°

Comfort - Before modifications

Comfort - After modifications

75° - 77°

COMFORT & CONTROL HELPING PERFORMANCE

COMFORT IN A CHALLENGING CLIMATE

MORE CONTROL BETTER COMFORT LESS ENERGY

VENTILATION

2 ACH 4 ACH 12 ACH 12 ACH + max fume hood

Giving occupants control over their lab's ventilation rate cut energy use substantially

0

COMFORT AS DIAGNOSTIC

For the most part, quite good

...except for 1 lab...

LONG TERM RELATIONSHIPS

