CREATING SPACES
THAT WORK
(and what to do when they don’t)

Edith Green–Wendell Wyatt Federal Office Building

Mark Perepelitza
CBE webinar
18 May 2016
high performance objectives

Transformation of a 512,400 sf, 18-story, 1974 office building into a LEED Platinum cornerstone of GSA’s green building portfolio.

BUDGET: $141,000,000

Upgrade building systems:
Seismic, MEP, telecom, fire protection
EUI target: 34-36 kBtu/yr/sf

Update work environment:
Improve daylighting, electric lighting, air quality

Improve accessibility
design, analysis, documentation

integrated facade & HVAC analysis —
thermal control, lighting & daylighting
ENERGY STRATEGY

ENERGY BREAKDOWN COMPARISONS

VAV : Variable Air Volume
RADIANT : Radiant Heating and Cooling
DOAS : Dedicated Outside Air System
HR : Heat Recovery
MECHANICAL SYSTEMS

RADIANT ADVANTAGES

• Net rentable area increase / more efficient floor plate

• Ceiling height / fewer beam penetrations

• Expanded comfort range

• Reduced operations and maintenance

• Improved indoor air quality

• Less air / reduced fan power

• Quick to respond to changes

• Future flexibility
DESIGN PROCESS
ENERGY CONSERVATION MEASURES

WEST FACADE

HEAT LOAD WITHOUT EXTERNAL SHADES

TOO HOT

28,875 BTU/hr

COOLING CAPACITY OF RADIANT PANELS

HEAT LOAD WITH EXTERNAL SHADES

WEST FACADE
ENVELOPE
STUDY SCOPE

Thermal analysis
- Percentage glazing
- Shading

Daylight analysis
- Surrounding buildings shading
- Building integrated shading
- Interior light quality
- Energy savings

Energy Sensitivity Analysis
**DESIGN/ANALYSIS**

**PERFORMANCE STRATEGIES**

**SOUTH + EAST**

- Low Glazing to Wall Ratio
  - 40% glazing

- Low Infiltration Rate
  - 0.06 CFM

- Well-Insulated Wall

- Daylighting
  - Light shelves bounce light 16ft. into interior

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**Summer mid-day sun**
(high angle)

**Equinox morning sun**
(lower angle)
Shading reduces the heat gain on the building minimizing the energy needed for cooling.

West Facade
Reeds provide avg. 50% shading

North Facade
No shading

Each facade is tuned for its orientation to the sun.
post-occupancy evaluations

occupant satisfaction surveys
occupant satisfaction surveys

• PRE-OCCUPANCY SURVEYS
  – Robert Duncan Plaza Building
  – 1st & Main Building

• OCCUPANCY SURVEY TOPICS
  – thermal comfort
  – air quality
  – lighting & daylighting + added module on solar control
  – acoustics + added GSA module including awareness
  – office layout & furnishings
  – cleanliness & maintenance
  – building features
OCCUPANT SURVEY
EGWW & PRE-OCCUPANCY LOCATIONS

Robert Duncan Plaza

1st & Main

EGWW
24.3 How satisfied are you with the building overall?

![Bar chart showing satisfaction levels]

- Dissatisfied: 17%
- Neutral: 14%
- Satisfied: 69%

Mean: 0.99

N=308
OCCUPANT SURVEY
THERMAL SATISFACTION

9.2 How satisfied are you with the temperature in your workspace?

- Dissatisfied: 45%
- Neutral: 19%
- Satisfied: 36%

Mean: -0.21

N=319
OCCUPANT SURVEY
THERMAL SATISFACTION

Mean: 0.37
West - Upper
(floors 10-17)

Mean: -0.21
East - Lower
(floors 3-9)

Mean: -0.81
Building average

Mean: -0.22
North - Upper
(floors 10-17)

Mean: 0.37
West - Upper
(floors 10-17)
“How would you best describe the source of thermal discomfort?”

a. air movement too low (50%)
b. incoming sun (29%)
c. my area is hotter than other areas (32%)
d. heating or cooling system does not respond quickly enough to the thermostat (27%)
post-occupancy observations & insights

occupant feedback

- OVERALL OCCUPANT SATISFACTION
  - good, but averaging masks localized responses

- RESULTS FILTERING - PRIORITIES
  - thermal comfort
  - daylight and glare

- FILTER PARAMETERS
  - solar orientation
  - building level, upper levels (10-17) vs. lower (3-9)

- IMPLEMENTING SOLUTIONS
THANK YOU!

MARK PEREPELITZA  markp@serapdx.com
DIRECTOR OF SUSTAINABILITY & TECHNICAL DESIGN
SERA ARCHITECTS

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