HOW DOES YOUR ENVIRONMENT

IMPACT YOUR HEALTH, HAPPINESS & PRODUCTIVITY
DESIGN SPACES AND PLACES WHERE PEOPLE ARE HEALTHIER, HAPPIER AND MORE PRODUCTIVE...

...AND TOUCH THE EARTH LIGHTLY
PRODUCTIVITY: A NATIONAL PROBLEM

Constant price GDP per hour worked selected G7 countries 1997-2014
Source: Office for National Statistics
SQUEEZING MORE IN AND REDUCING COSTS
HEALTHY, HAPPINESS AND PRODUCTIVE

Genzyme HQ, Boston, USA.

One Angel Square, Manchester, UK.

The High Line, New York, USA.
FOCUS ON...

90% STAFF
9% RENT
1% ENERGY

COSTS

2X PROFIT
INCOME

INCOME

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A combination of what *people* experience and *do*
**HOLISTIC THINKING IS NECESSARY**

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Higher sales price
Quicker sales
Increased occupancy rates
Slower depreciation
Health and wellbeing
Improved productivity
Increased long term profitability
CSR
Brand
Attracts better staff

DEVELOPER
Why would I want

TENANT
Why would I want

OWNER
Why would I want to own this green building?

Air Quality
Thermal Comfort
Light
Noise/Acoustics
Views
Biophilia

Site
Massing
Orientation
Building Form
Facade
Room Proportions
Ventilation Strategy
Constructions
Lighting

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AIR QUALITY

ELEMENTS

Natural ventilation, air conditioning, and mixed mode strategies impact health and wellbeing and must be balanced against thermal comfort.

ENVIRONMENT

For high indoor air quality (IAQ) the optimum ventilation rate is between 20 and 30 l/s to renew oxygen and dilute pollutants.

EXPERIENCE

Short term sick leave is 35% lower in offices ventilated by an outdoor air supply rate of 24 l/s compared to 12 l/s. (Milton et al, 2000)

ECONOMICS

Better air quality can result in 8-11% overall improvement in overall productivity. (Loftness et al, 2003)
## THERMAL COMFORT

### ELEMENTS
- HVAC, thermal insulation, solar gain and heat from people and equipment influence thermal comfort.

### ENVIRONMENT
- Recommended operative temperatures to achieve thermal comfort vary with season and environment type, but the zone of thermal comfort is typically achieved above 15°C and below 30°C.

### EXPERIENCE
- Occupants who remain within their thermal comfort zone have lower heart rate, respiratory ventilation and higher oxygen saturation, which improves task performance. (Loftness et al, 2003)

### ECONOMICS
- 3% gains in overall productivity as a result of personal control of workspace temperature.
LIGHTING AND DAYLIGHTING

ELEMENTS

Access to windows, facade design, dynamic lighting, quantity of light, quality of light, and glare impact occupant health and wellbeing.

ENVIRONMENT

Optimum quality of light can be achieved with a Colour Rendering Index of 90 or above.

EXPERIENCE

A study showed office workers with windows receive 173% more white light and slept an average of 46 minutes more per night. (Chueng, 2013)

ECONOMICS

A study showed increasing the amount of daylight in retail environments can increase sales by up to 40% (Heschong Mahone Group, 1999)

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Acoustic comfort considerations include acoustic insulation, absorptive surfaces, workspace variety and flexibility, and background noise levels.

Optimum background noise levels vary for different environments. 45dBA is recommended for open plan offices but cellular offices can reduce this to 40dBA.

Acoustic comfort improves worker satisfaction, reduces stress and increases productivity.

Noise reduction in the workplace can increase productivity by 27.8% (Oseland and Burton, 2012).
VIEWS AND BIOPHILIA

ELEMENTS

Biophilia considerations include site location, orientation, building form, materials, interior layout, and landscape design.

ENVIRONMENT

Biophilia can be enabled through direct access to natural spaces, visual connection, natural elements or symbols, and place-based design.

EXPERIENCE

Nature views allow eye re-focusing, which reduces fatigue, headaches and eye strain. Biophilia lowers stress, improves cognitive function and enhances creativity.

ECONOMICS

Workers were found to process calls 7-12% faster if provided with an improved external view (Heschong Mahone Group, 2003)
COMMUNITY

ELEMENTS
The relationship of the building users with the local community has wellbeing implications.

ENVIRONMENT
Engaging with the local community to understand and respond to their needs can deliver mutual benefits to the community and building users.

EXPERIENCE
Beneficial health and wellbeing outcomes are associated with acts of generosity and charity.

ECONOMICS
Community engagement and provision of community activities increased footfall by 5% and retailer sales by 10% (Milton, 2014)
**INTERIOR AND LAYOUT**

**ELEMENTS**
- Interior layout considerations that influence health and wellbeing include legibility, density, flexibility, types of working spaces, provision of social spaces.

**ENVIRONMENT**
- Interior planning that considers legibility, density, workspace diversity, flexible working, and social spaces has beneficial wellbeing outcomes.

**EXPERIENCE**
- Optimising interior layout reduced absenteeism at one organisation from 12.7% to 3.5% (Beauregard, 2011)

**ECONOMICS**
- Improved workplace cohesion led to a drastic reduction in employee turnover from 40% to 12% (Waber, 2013)
**AMENITIES**

**ELEMENTS**
- Agglomeration, transport and related facilities, the provision of open space, exercise facilities and the quality of the public realm impact health and wellbeing.

**ENVIRONMENT**
- Occupant health and wellbeing can be increased by providing access to reliable public transport, facilities for cyclists, high quality public realm, access to recreation, and social space.

**EXPERIENCE**
- Improving amenities access can reduce stress, improve physical and mental health, and increase convenience for occupants thereby improving productivity.

**ECONOMICS**
- Making places more walkable can boost footfall and trading by up to 40% and raise retail rents by 20% (Designed to Move: Active Cities, 2015)
**LOOK AND FEEL**

**ELEMENTS**
Colour treatment, texture, shapes, artwork, ergonomics, proportion, and contours impact occupant wellbeing.

**ENVIRONMENT**
Appropriate use of colour, textural variety, generous proportions, ergonomically designed furniture, and inclusion of artwork can improve occupant wellbeing.

**EXPERIENCE**
Textural variety can improve cognitive ability to access knowledge, helping the brain to stay alert and engaged. (Helen Hamlyn Centre for Design, 2005)

**ECONOMICS**
Research shows the visual appeal of the workplace is a major factor in employee recruitment and retention and therefore an organisation's economic profitability. (American Society of Interior Designers, 1999)
ACTIVE / INCLUSIVE DESIGN

ELEMENTS

Placement and treatment of vertical circulation, facade and massing, workstation design and provision of facilities for exercise impact occupant health.

ENVIRONMENT

Active design features such as accessible, appealing, prominent staircases stimulate movement to improve health and wellbeing.

EXPERIENCE

Consistent stair use is linked to 12-20% reduction in all-cause mortality including cardiovascular disease. (Designed to Move: Active Cities, 2015)

ECONOMICS

Encouraging physical activity improves health and reduces economic costs associated with inactivity.

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DESIGNING FOR HEALTH, HAPPINESS AND PRODUCTIVITY

1. BUILD HEALTH, HAPPINESS & PRODUCTIVITY IN FROM THE START

2. USE RESEARCH TO INFORM A BUSINESS CASE

3. BUILD AN INTEGRATED DESIGN TEAM

4. CHALLENGE THE STANDARDS

5. USE THE POWER OF PARAMETRIC DESIGN

6. TRANSFORM EVERY PLACE INTO LIVING RESEARCH
MORE INFORMATION

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Do occupants matter?

Kevin Couling
Regional Director
Do occupants matter?
Obviously, they do - if there were no users, we wouldn’t need buildings, so...
They only mess with things they don’t understand - we can control buildings automatically thank you very much, so...
Ah, yes..hang on, um, crikey...
Let’s assume both of these answers can be right

...depends?
Large variation in consumption

energy costs

£/m²

Building

x 2.5*

Services

x 2.5

Occupants

x 2.5

Environmental performance

x 16
maximum range
of performance

[Graph showing energy costs and consumption across different categories]
EBC Annex 66 is attempting to standardise the way in which occupant behaviour is modelled.
How does industry deal with occupant behaviour at the moment?

It doesn’t…

…mostly.
As an industry, we’re just starting to really apply ourselves to performance modelling.
Currently detailed modelling can't really help industry … yet.
At the moment it is more like this.

24/07/2016 AECOM POWERPOINT TEMPLATE FOOTER 17
Do clients care?

Bothered?
Design performance gap

✓ • Met Part L
✓ • Achieved BREEAM
✓ • Building open on time
✓ • Project within budget
✓ • Occupants are satisfied
**Occupant satisfaction can be readily designed for**

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...depends?
Let's think about different types of building…

Laboratories
Schools
Offices
Datacentres
“How much are you willing to risk energy performance for occupant satisfaction?”
Occupants extremely satisfied with their new space
Occupants like natural ventilation

...but can leave night vents open in winter
The issue may well be that the more control you afford the occupants the more potential there is for “wasted” energy.
How much occupants matter depends on building type

- Laboratories
- Schools
- Offices
- Datacentres
But also the type of space...
Prompts can be used to encourage the “appropriate” use of controls

**Timeliness**
- appears at the moment the action needs to be taken

**Specificity**
- indicates precisely and unambiguously what operation is required

**Salience**
- stands out visually
Please turn off the lights when you leave
Thanks
For young engineers and architects, behaviour is the next big challenge...
It might be something simple
Or something more complex
Summary

Occupant behaviour matters in terms of carbon emissions in some buildings more than others and in some spaces more than others.

Modelling occupant behaviour and its impact isn’t yet reliable.

There appears to be a link between occupant satisfaction and energy consumption through building controls.

Design in this area should be guided by an assessment of risk.