

The New Built Environment: Materials, Spaces, and the Human Condition

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Nothing to disclose.

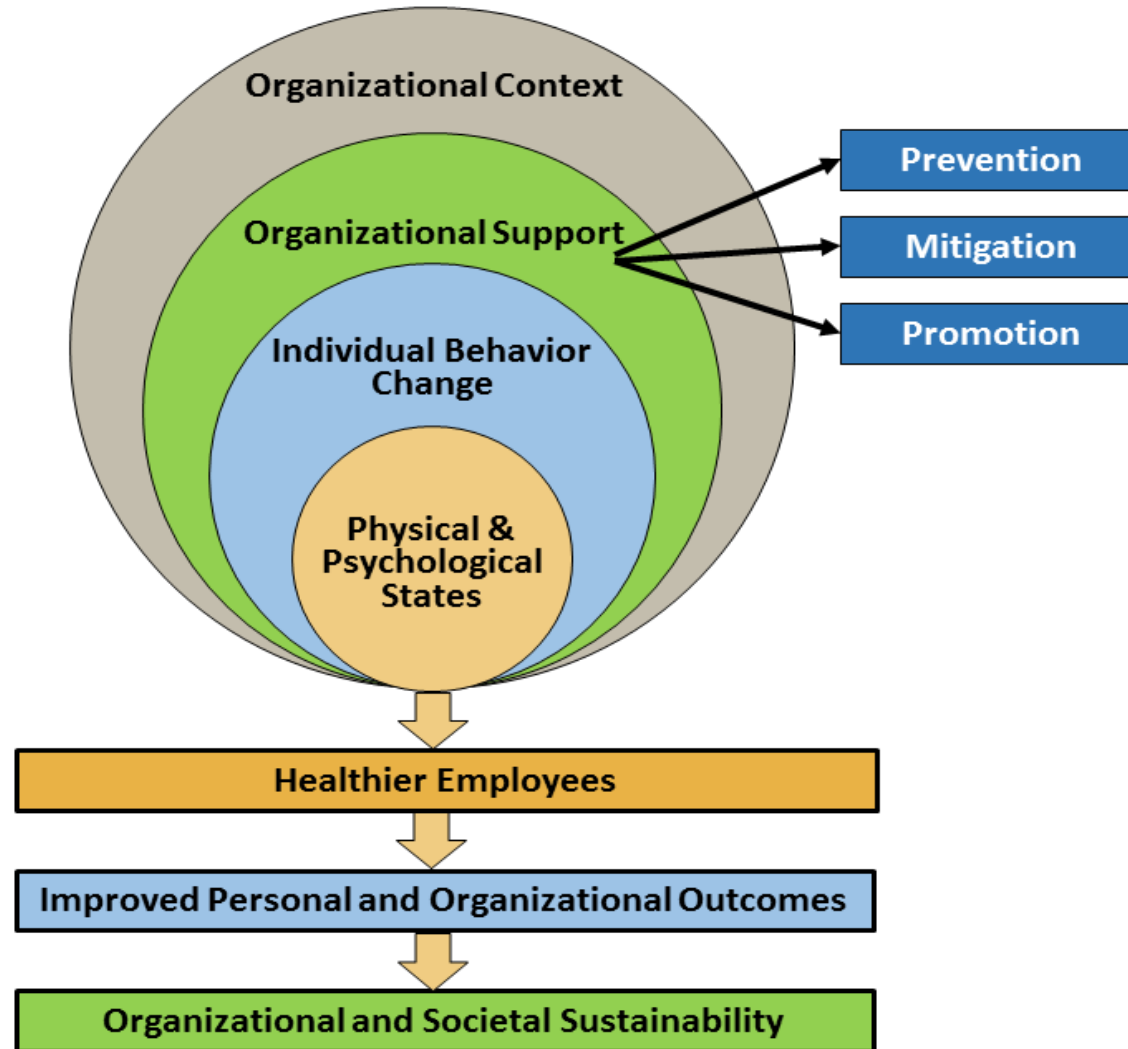
Definition: “Built Environment”

- Man-made structures, features, and facilities viewed collectively as an environment in which people live and work.
- Buildings: the shell and everything inside the shell that a person perceives as part of their work environment
- Note: emphasis is on what is “baked-in” rather than “discretionary”
 - A floor plan that encourages physical movement vs. an in-house gym

Setting the Stage

- The impact of physical and psychological environments on health and well-being is inseparable.
- Both the physical and psychosocial aspects of work are addressed here.
- Presentation theme: *Health and well-being are more than removing bad things—it is also increasing good things.*
- Scope of our attention is the entire organization and how all the parts work together to support worker health and well-being.

Interdisciplinary Center for Healthy Workplaces (ICHW) Model of Worker Health and Well-Being



Implications

- A wide range of built environment elements can be examined and improved.
- Need to design and operate workplaces that remove the “bad factors” and increase the “good factors.”
- The environments workers experience are interconnected and simultaneously affect worker health and well-being.
- “One and done” is a fantasy.
- Model applies to all work types including gig work and remote working.

Bottomline: What do we need to address?

Physical Bad Factors

- Toxic chemicals
- Airborne pathogens
- Muscular strain
- Repetitive motion
- Prolonged lack of movement
- Excessive noise
- Noxious smells
- Poor lighting
- Physical hazards
- Physical discomfort
- Toxic/contaminating people

What do we need to address?

Psychological Bad Factors

- Overwork
- Lack of control
- Unfairness
- Unpredictability
- Precarity
- Distraction
- Stagnation
- Isolation
- Tedium
- Impediments
- Incivility
- Values conflicts
- Invisibility

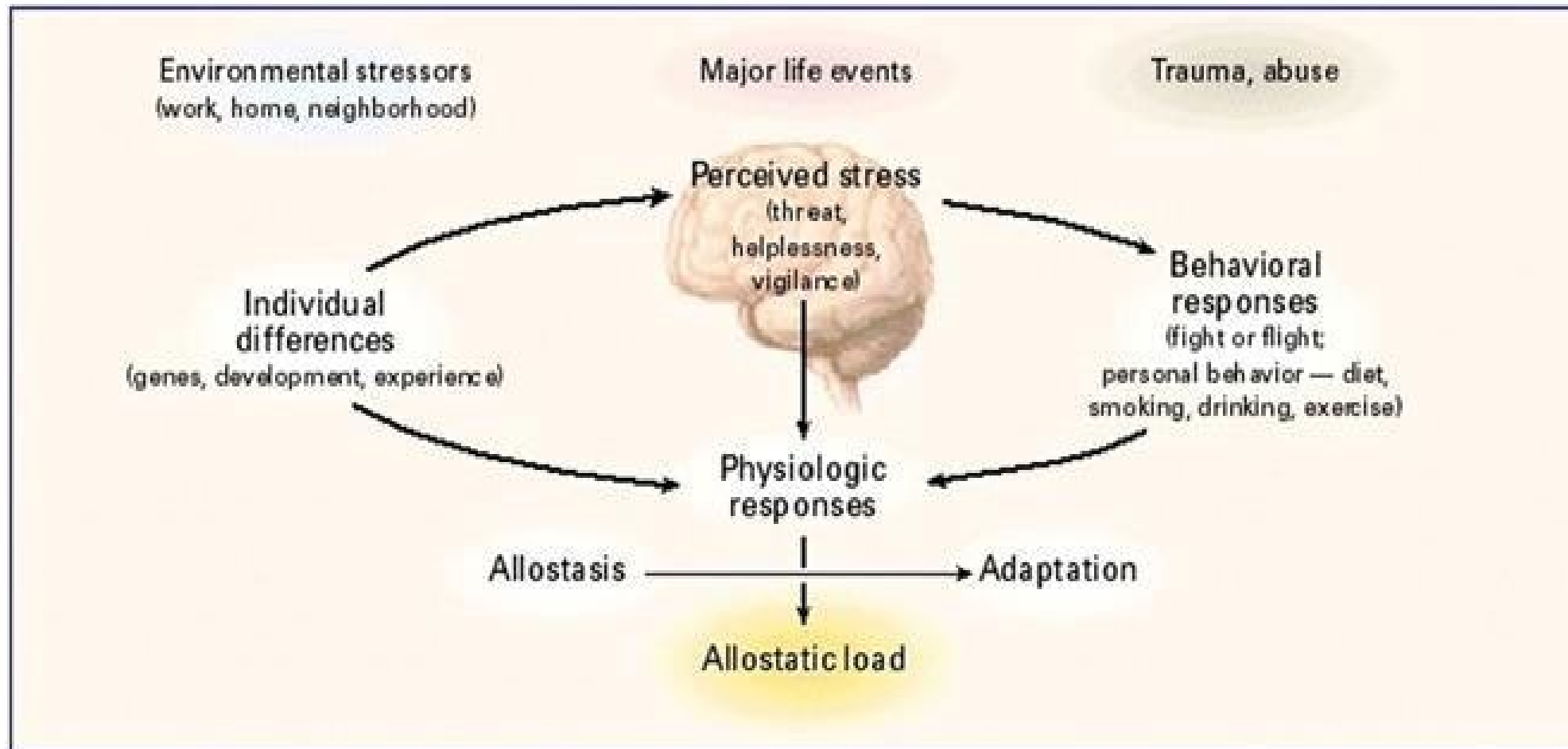
Good Factors

- Autonomy
- Belonging
- Competence/Accomplishment
- Fairness
- Meaning/Purpose
- Physical and psychological Safety
- Positive emotions

“Less Bad, More Good”

Outcome	Regulatory Factors	Target
Sleep	Light hitting receptors on the retina, releasing glutamate in the brain	Melatonin
Sensorimotor & cognitive processing	Stimulation of sensorimotor and cognitive areas of the cortex	Acetylcholine
Pleasure, desire, social engagement	Experience of positive valence factors which stimulate rewarding and reinforcing behaviors	Dopamine
Memory, judgment, decision-making	Stimulation of the hippocampus, amygdala, neocortex, and prefrontal cortex	Acetylcholine, Glutamate, Epinephrine, Opioid peptides
Affiliation, attachment, & communication	Stimulation of the hypothalamus which increases eye contact, trust, social support, and interpretation of facial expressions	Oxytocin
<i>Fear, anxiety, frustration, & loss</i>	<i>Experience of negative valence factors which trigger sympathetic nervous system resulting in stress responses, mood disorders, immune dysfunction, dementia risk</i>	<i>Cortisol Epinephrine</i>

Allostasis



The Built Environment Targets: Physical Elements

- Indoor environmental quality (IEQ)
- Lighting
- Colors
- Windows, Views
- Workspace layout/Floor plans
- Furnishings
- Biophilia

IEQ

Ventilation

- Maximum exchange between inside and outside air.
- UV germicidal irradiation (UVGI) using LEDs for disinfection within the ventilation

Humidity

- Moisture and relative humidity held to 30-60% to reduce spread of molds and biological contaminants

Temperature

- Automatic temperature adjustment as occupancy changes in building locations.
- Individual local control of temperature wherever possible.

Noise

- Soundproofing material on ceilings, walls, partitions
- Internal walls finished to the ceiling and floor
- Noise cancelling devices (soundwave disruptors)
- Layered sound (white noise, nature sounds)

IEQ

Air Quality

- New materials with low chemical and biological emissions (PFAs, PFCs, VOCs)
- Green Building construction guidelines regarding air filtration, radon-resistant construction, enhanced ventilation systems, and low-emitting products
- Scents for purpose: lemon (cognitive performance), rosemary & sage (memory), cinnamon (creative thinking)

Acoustic and Visual Privacy

- Enclosed booths (Orange Box)
- Glass barrier change (opaque, darken)
- Yurts, huts, treehouses
- Private offices
- Smart Buildings
 - Digital infrastructure to collect and aggregate operational data, connectivity to analyze/learn/share data, optimize for building occupants
 - Application of artificial intelligence and machine learning through surveillance and optimization

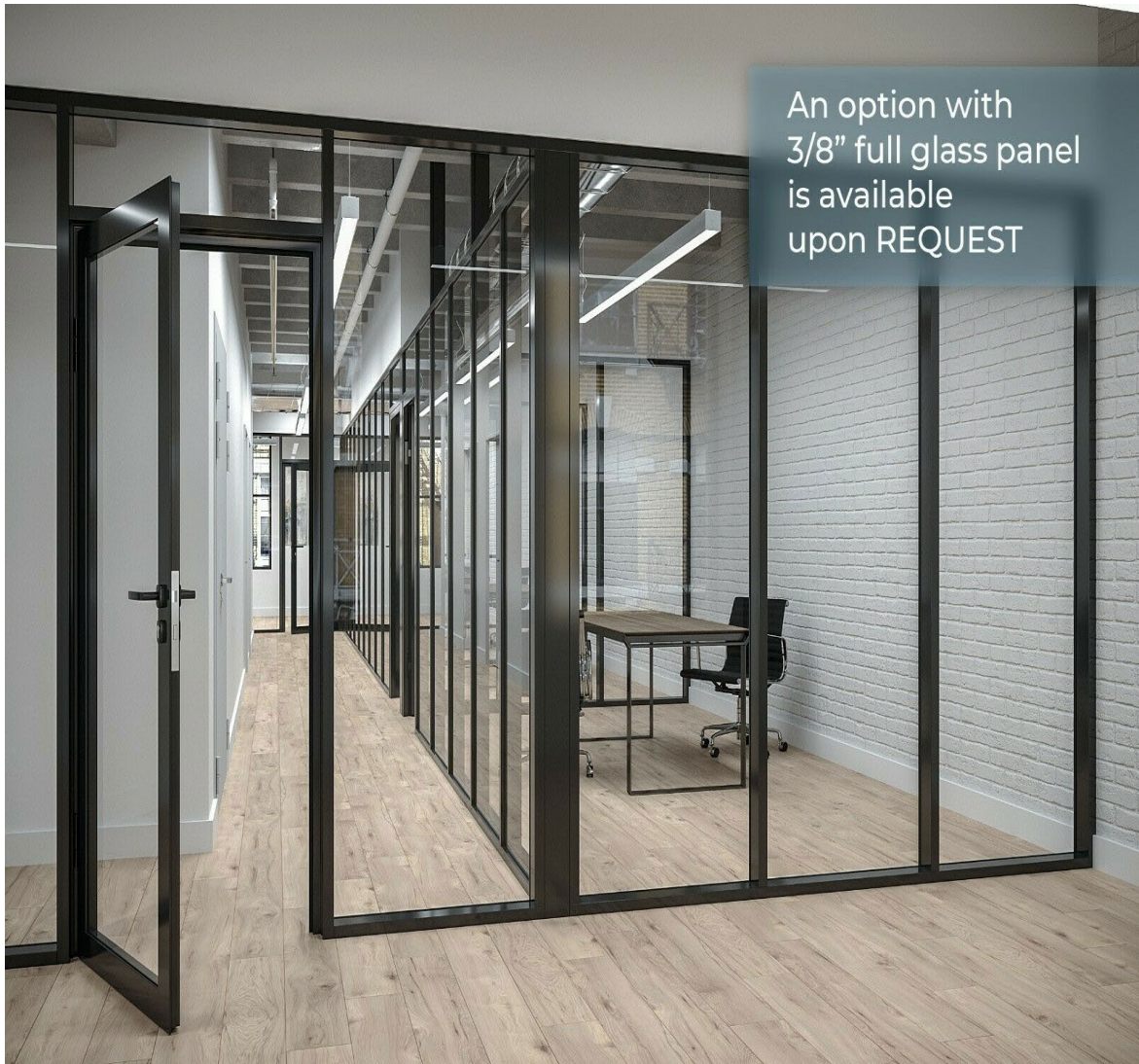
Acoustic and Visual Privacy



Focus Room



Phone Booth



Private Offices



Phone Booth





Microsoft Has Built Treehouses For Its Employees Where They Can Conduct Meetings

[OCTOBER 16, 2017](#) [OFFICECHAI TEAM](#) (OFFICECHAI.COM)

Acoustic Privacy

Moodsonic

<https://www.moodsonic.com/features>



Water Feature

Circadian System Lighting

- Daylighting preferred
- Indoor (artificial) lighting
 - Mimic the cycle of the solar day (full spectrum) to maintain circadian entrainment
 - Dynamic spectra or change in light output
 - Daytime: High amounts of Circadian Stimulus (CS) during the morning (high short-wavelength content— “cooler” light toward blue range)
 - Afternoon: Incrementally decreasing amount of CS as day progresses (lower longer-wavelength content— “warmer” light toward yellow/orange range)
 - Evening: Little or no amount of CS (lights dimmed to minimum or out)
 - CoeLux (simulated daylight from “skylight”)

Daylighting Simulation: CoeLux

<https://www.coelux.com/en/p/coelux-45-lc-en-8499>



Colors

- Match colors with desired emotion & purpose
- Saturation: how true color is to original color
 - Add opposite colors to lower saturation
 - Low saturation has grey tone
- Brightness: how light the color is
 - Add white to make brighter
 - High brightness has a lot of white mixed in
- Hue: broad names of colors associated with wavelengths

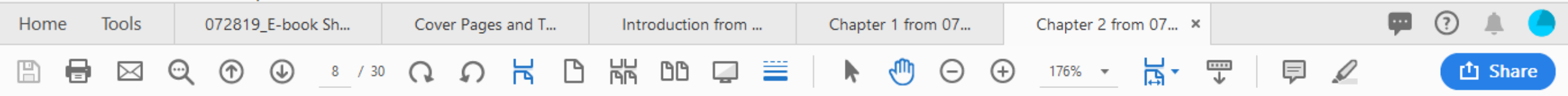
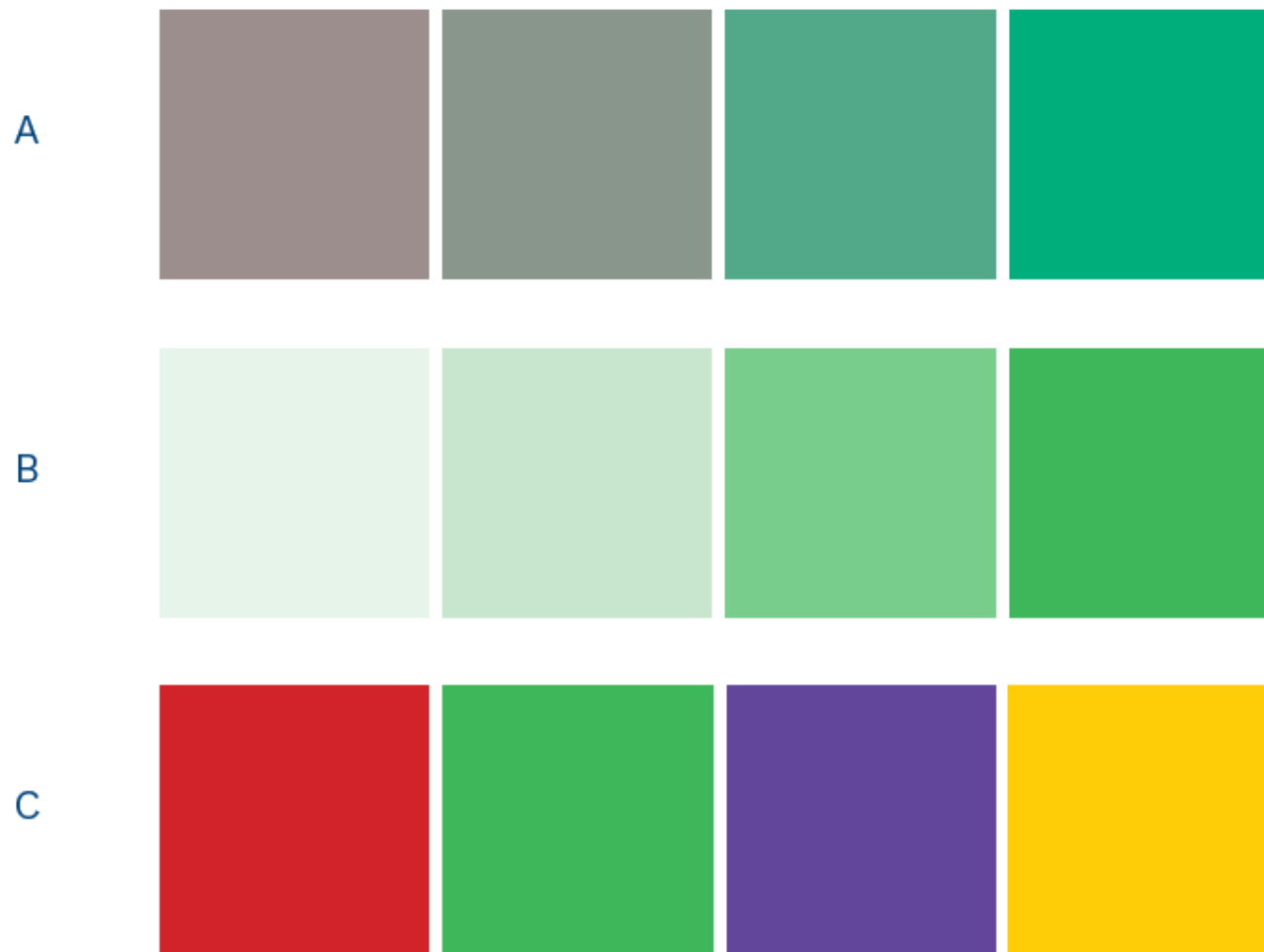


Figure 3.2 Row A demonstrates saturation increasing from left to right. Row B demonstrates brightness decreasing from left to right. Row C demonstrates different hues.



Applications

- Calm, relaxing effect
 - Light sage green
 - Bedrooms, offices, waiting rooms, doctor offices
- Concentration, knowledge work
 - Light sage green, light smoky-blue
 - Offices, work spaces
- Cognitive performance generally, creativity
 - Greens in general, light sage green best
 - Studios, R&D
- Socializing
 - Light orange, smoky-orange
 - Break rooms, lunch rooms, coffee bars
- Optimism (women)
 - Pink
 - Breast cancer treatment centers
- Danger awareness
 - Red
 - Emergency equipment, danger zones
- Examinations
 - Light dove grey
 - Exam rooms

Windows, Views



Workspace layout/Floor plans

- Density change (high to low, low to medium)
- Seating close to amenities
- One-way traffic flows
- Foot traffic in periphery (not through neighborhoods)
- Workstations facing periphery
- Multiple environment options
- Moveable walls, furniture, art, meeting spaces
- Bathrooms, lockers, mailroom, breakroom, conversation areas away from quiet spaces
- Open, appealing stairways



Multiple workspace types

Furnishings

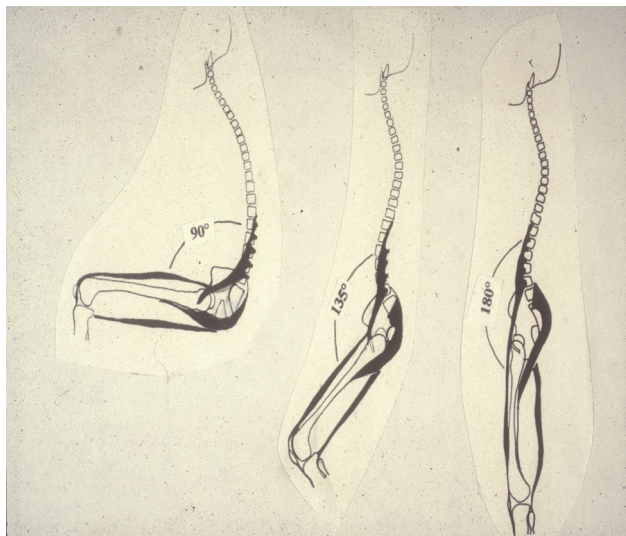
- Increase postural variation and movement
- Activity-based design
- Personalization
- Workstation aligns with work activity needs
 - Privacy
 - Ergonomic fit
 - Changes in posture
 - Physical movement
 - Sitting in anatomically correct and comfortable position for short periods

Postures for office work



Courtesy of Dr. Galen Cranz

The Perch





Capisco chair



Bike-assisted exercise
workstation



Focal Upright



limber

https://www.youtube.com/watch?v=7tegWdGQdAA&feature=emb_title

Biophilia

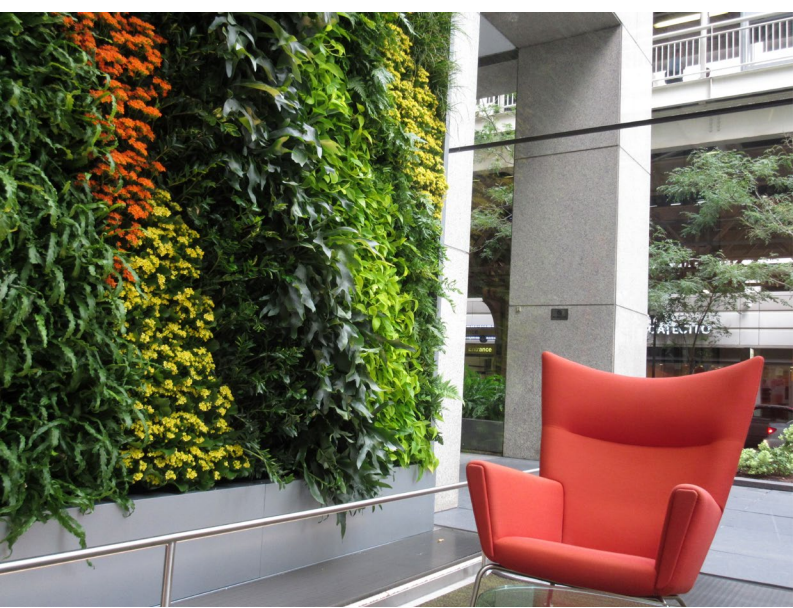
- Definition: Introduction into buildings design elements that were present in natural environments where humans felt comfortable early in our history.
- Biophilic design: Full range of sensory experience, gentle movement, natural materials and plants, natural shapes and forms, natural colors, animal motifs, water, curved pathways, views and vistas, spaciousness, warm light, prospect and refuge

Salesforce Lobby, San Francisco CA

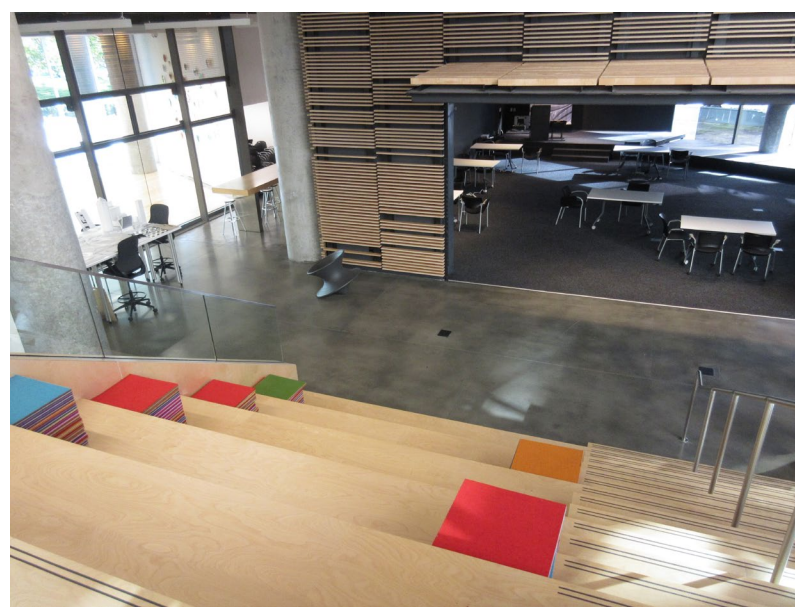


Example Displays at 50 Fremont

<https://snadisplay.com/projects/salesforce-headquarters/>



Living Wall



Open stairway

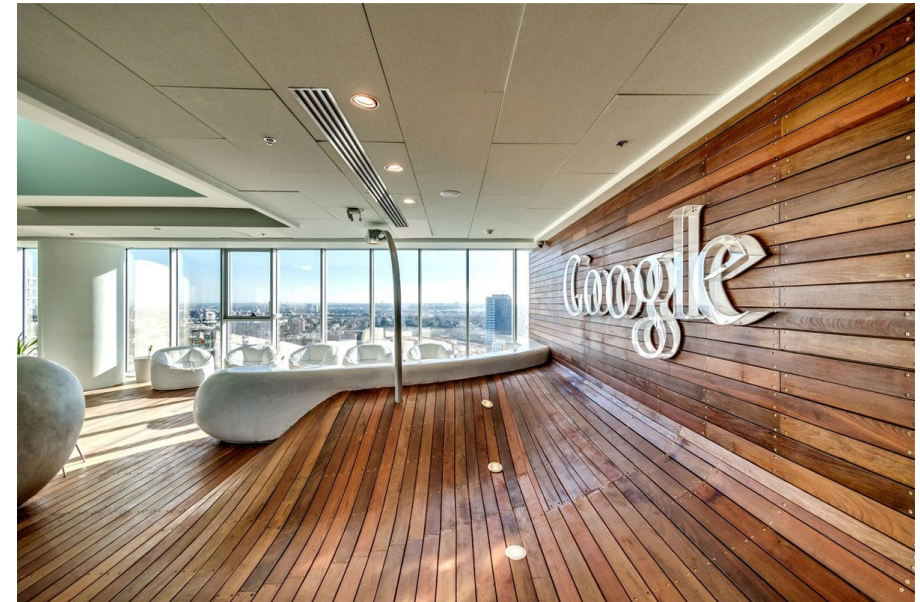


Prospect and Refuge



Oliver Health
Design

Google, Tel Aviv



The Built Environment Targets: Psychosocial Elements

- Work demand
- Control over work demand
- Recognition & rewards
- Compensation
- Social connection
- Fair treatment
- Work/Family balance
- Benefits: Leaves, Health insurance
- Management support
- Organizational culture
- Resources

Potential Remedies

- Work demand/Control
 - Remove impediments, control noise/disruptions, increase comfort, provide work location autonomy/choice, create restorative place, increase opportunities for positive emotions
 - Organizational policies: work/emails/meetings end times, full access to equipment/tools, reliable technology, paid sick and family leaves, advocacy for employee health & well-being
- Recognition & rewards
 - Visible displays of recognitions, multiple reward opportunities based on behavior and accomplishment, video displays of employees who demonstrate valued contributions
- Compensation
 - Policy and regulatory actions to promote fair pay
- Social connection
 - Structured social hours, workstation configurations to promote social interaction with employees from different units, physical gathering places for breaks, gardens outside for gathering, portrait wall of employees, physical space for gathering to generate ideas for solving organization-related problems

Potential Remedies

- Fair treatment
 - Visual displays of equity in access to and distribution of resources, absence of preferential treatment or bias in use of spaces
- Work/Family balance
 - Policy to support extra-organizational employee issues
- Benefits
 - Policy of paid sick leave, paid family leave, health insurance provided to all
- Management support
 - Policy of support for employee health and well-being
 - Manager performance evaluation in part based on employee health and well-being support
- Organizational culture
 - Messaging displayed encouraging actions to support health and well-being
 - Occupational medicine professional on staff to respond to employee needs
- Resources
 - Single-point of contact for sourcing whatever is needed to support health, well-being and productivity, open access to resources

Burnout (Maslach & Leiter)

- The co-occurrence of cynicism, emotional exhaustion, and inefficacy
- Six burnout predictors/risk factors:
 - Workload
 - Control
 - Reward
 - Community
 - Fairness
 - Values
- Built environment interventions:
 - Identify opportunities to expand autonomy and choice.
 - Create work environment that supports tasks-at-hand.
 - Create spaces and actively support cognitive refreshment.
 - Use relaxing colors (green), warm light, and biophilic design to support emotional refreshment and positive emotions.
 - Use daylight (or artificial daylight) to provide the physiological effects that support physiological systems.
 - Design floor plans that maximize efficiency to lower workload but also encourage movement.
 - Create designs to foster social communities through spatial layouts, and provide opportunities for positive tactile experiences.

How a Virus Triage Tent Became a Serene Oasis for Health Care Workers

A former Covid-19 triage tent outside a Manhattan hospital offers health care workers a chance to de-stress, using music and aromatherapy.

By Danielle Elliot, June 12, 2020



Brittany Newman for The New York Times





It takes a village to create a healthy workplace.



Question 1

Which of the following is NOT an element of the built environment?

- a. Air quality
- b. Furnishings
- c. Biophilia
- d. Mindfulness training

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- a. Air quality
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Question 2

Which of the following sitting postures is considered the most harmful to the body?

- a. Sitting in a lounge chair
- b. Sitting upright in a regular chair with legs at 90° angle.
- c. Sitting upright in a regular chair with legs at 90° angle and extended and elevated.
- d. Perching in a chair at a 135° angle.

Question 2

Which of the following sitting postures is considered the most harmful to the body?

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- b. Sitting upright in a regular chair with legs at 90° angle.
- c. **Sitting upright in a regular chair with legs at 90° angle and extended and elevated.**
- d. Perching in a chair at a 135° angle.

Question 3

What color should you paint your home office if you wanted to maintain calm and feel relaxed?

- a. Red
- b. Bright yellow
- c. Light sage green
- d. White

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What color should you paint your home office if you wanted to maintain calm and feel restored?

- a. Red
- b. Bright yellow
- c. **Light sage green**
- d. White

Thank you.

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www.healthyworkplaces.berkeley.edu



Built to Thrive: How to Build the Best Workplaces for Health, Well-Being, and Productivity. ICHW, September 2019.

<https://berkeleycoeh.catalog.instructure.com/browse/ichw/courses/built-to-thrive-book-and-community>