

Preparing for specialized practice in design and wellness: A model curriculum

by

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Abstract

With people spending nearly 90% of their time indoors and because buildings can contribute both positively and negatively to user's health (International Well Building Institute [IWBI], 2015), it is imperative that these spaces are designed with the wellbeing of the occupant in mind. The International Well Building Institute is devoted to improving human sustainability through the built environment. They have recently developed the WELL Building Standard, which acts as a guideline and tool for buildings to positively impact human health. This certification system is based on the idea of quantifying and monitoring the performance of the building through their many features. Similar to LEED, which measures the building's impact on the environment, WELL will become a growing trend in the design and building industry. Although this information is available and the certification program exists, WELL is lacking the educational material needed to teach this information to both professionals and design students. The purpose of this thesis is to provide a complete curriculum model, including a syllabus, schedule, lectures, assignments, projects, rubrics, and exams that can be adapted for either a university design lecture, studio, or a professional continuing education course. This is important because once people are educated on how buildings contribute to occupant health, this knowledge can be used to positively impact the design of the built environment to improve the quality of people's lives.

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Finally, I need to recognize some of my family members – of which there are many. To my parents and stepparents, Lucky Levinson, Lisa Levinson, and Henry Barnett, I cannot thank you enough for your continued support and all that you do for me. I have to give a special big thank you to my mother, Rachel Barnett, who is my best proofreader and editor, answers all five of my phone calls each day, and supports me in my decisions, no matter how crazy they may seem. Your constant encouragement and guidance has made all of this possible.

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List of Abbreviations

ACSM	American College of Sports Medicine
AP	Accredited Professional
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CIDA	Council for Interior Design Accreditation
CDC	Centers for Disease Control and Prevention
EPA	Environmental Protection Agency
GBES	Green Building Education Services
IAQ	Indoor Air Quality
IWBI	International WELL Building Institute
LEED	Leadership in Energy and Environmental Design
SBS	Sick building syndrome
USGBC	U.S. Green Building Council
WELL	Not an acronym; Refers to building certification from IWBI
WHO	World Health Organization

CHAPTER 1. INTRODUCTION

Background and Problem Statement

The built environment includes any physical parts of where we live and provides the setting for human activity to take place (Center for Disease Control [CDC], 2015). Recent studies have discovered the impact the built environment has on people's health and wellness. The International WELL Building Institute's [IWBI] program, WELL, sets standards for buildings to obtain in order to create a healthy environment for occupants. Although this information is now available and buildings can be certified with WELL and people can be a WELL Accredited Professional [WELL AP], this information has yet to be turned into a complete educational course. This course material is important to grow the awareness of buildings and occupant health and to teach people about the ways we can make our environments better for the people that live in them.

The WELL AP credential works seamlessly with other credentials such as the LEED Accredited Professional [LEED AP]. There is overlap of features seen in WELL and LEED, as well as WELL and the Living Building Challenge (IWBI, 2017). The LEED v4 similarities can be found in Appendix E of the WELL Building Standard (IWBI, 2017, p. 212). The Living Building Challenge similarities can be found in Appendix F of the WELL Building Standard (IWBI, 2017, p. 215). It is important for design professionals – even those who already have credentials such as LEED AP, Evidence-Based Design Accreditation and Certification [EDAC], and American Academy of Healthcare Interior Designers [AAHID] – to pursue the WELL AP credential because it addresses a new trend in the industry. Other credentials have focused on similar topics, such as sustainability, research, and designing healthcare facilities, but by

studying for and obtaining a WELL AP credential, a designer gains the knowledge they need to design all types of spaces with occupant wellbeing at the forefront.

The following information in this document is a complete set of material for a design studio, lecture, mini-mester, or continuing education development course designed to teach students how the built environment can contribute to occupant's health and wellness, using the International WELL Building Institute's WELL Building Standard. The WELL Building Standard is owned by IWBI, but the course materials in this curriculum are original and created by the thesis author based on the standard. Statements are made from facts provided in the WELL Building Standard and individual citations are not included, unless it is from a source other than the WELL Building Standard. Included in this packet are a course syllabus, various course schedules, projects, assignments, rubrics, lectures, notes, and assessments. The big project is set-up as the main studio component – a semester long design project where students will apply WELL concepts to a wellness retreat based in Colorado. The studio project may be omitted if the course is offered in a lecture format or as a continuing education development course. The assignments will be used throughout the course to increase students' understanding of the material, as well as to apply what they are learning to real world situations. Rubrics have been provided for both the large project and the smaller assignments. The lectures in this packet make up the majority of the course content and are based on the WELL Building Standard. Lectures are divided into an introduction to WELL and the seven features: air quality, water, light, nourishment, fitness, comfort, and mind. Finally, there are several mini quizzes included in this course packet to be used to assess students understanding of the material and other resources are suggested to help prepare for the WELL AP exam.

COURSE ####: Wellness Trends in Interior Design

Developed in the Department of Consumer & Design Sciences, College of Human Sciences, Auburn University

INSTRUCTOR INFORMATION:

First Name; Last Name

Office Location

Office Hour Times

COURSE DESCRIPTION: 4 credit hours

This course will introduce students to the WELL Building Standard and other topics of wellness in design.

CHANGE AND COPYRIGHT:

The instructor may make reasonable changes to this syllabus and course content, with advance warning.

Copyright 2015 Emily Levinson as to this syllabus and all course content, including but not limited to assignments, projects, rubrics, lectures, and presentations.

COURSE PREREQUISITES: Junior, senior, or graduate level in the Interior Design or Architecture program, or with instructor approval

COURSE OBJECTIVES:

- Recognize the financial, societal, and environmental benefits of wellness and the WELL certification
- Identify the role of the WELL Building Institute
- Articulate the structure of the WELL Building Standard
- Explain the 7 concepts of the WELL building standard, strategies to achieve them, and the health impacts they have
- Summarize the certification of the WELL Building Standard
- Understand the importance of wellness in the built environment

REQUIRED MATERIALS:

- WELL Building Standard, downloaded from <http://www.wellcertified.com/well>
- Students may be required to read additional articles, provided by the instructor
- All general department tools, texts, and materials will be required for this course.

EVALUATION:

- Canvas Quizzes: 25%
- Lecture Presentation: 10%
- Studio Project: 30%
- Evaluation of Spaces: 10%
- Final Exam: 15%
- Participation: 10%

GRADING:

A	90 - 100
B	80 - 90
C	70 - 80
D	60 - 70
F	0 - 60

DESCRIPTIONS OF COURSE REQUIREMENTS:

See course schedule for tentative due dates

1. **Canvas Quizzes:** 10-point quizzes will be given via Canvas based on information in the text and in the lectures. Students are required to complete these by the start of class on the day they're due.
2. **Lecture Presentation:** Students will be assigned groups and topics and will present the information pertaining to their topic on the assigned due date. An assignment sheet will be provided.
3. **Studio Project:** The studio project will have three phases and will be completed individually inside and outside of studio. The students will be given a project sheet and rubric.
4. **Evaluation of Spaces:** Students will be assigned a building on campus in pairs to evaluate based on the WELL scorecard.
5. **Final Exam:** Students will be required to complete a final exam during the university's assigned exam time for this course, UNLESS they have taken *and* passed the WELL AP exam prior to the exam time and can provide proof.
6. **Participation:** Participation in this course includes, but is not limited to: active engagement, asking questions, attendance in class and on field trips, listening to speakers, etc.

COURSE POLICIES:

You are expected to follow the University guidelines for classroom behavior. *YOU* are responsible for how well you do in this course.

1. **Communication:** Canvas and email will be the official forms of communication for this class. The instructor will post assignments, lecture notes, handouts, course grades, etc. to Canvas. Students are responsible for checking Canvas regularly. Please keep in mind that the instructor cannot discuss grades over Canvas or email and an appointment will need to be made if a student has a question about a grade.
2. **Attendance:** You are expected to attend every class meeting, prepared and on time, except in the case of an excused and documented absence. Excused absences include Auburn field trips, religious holidays, subpoena for court appearance, your illness, or the serious illness or death of an immediate family member. Documentation must be provided the first class meeting following your return. Keep in mind that missing lecture is 1 absence and missing studio is 1 absence; therefore, if you miss both lecture and studio, that will count as 2 absences. More than 4 unexcused absences will result in a 5% final grade deduction. Every unexcused absence over 5 will result in an additional 5% off your final grade.
3. **Missed Work & Make-Up Policy:** For any absence (both excused and unexcused), you are responsible for obtaining course information, handouts, missed lecture material, etc. from a classmate as soon as you return. Make-ups are not automatically granted and you are responsible for arranging a meeting with your instructor on the day you return to discuss a make-up. For unexcused absences, missed in-class work, homework, or due dates earn zero points.
4. **Academic Honesty:** Auburn University expects students to pursue their academic work with honesty and integrity. All work submitted for a grade in this course must comply with intellectual property guidelines. You may show your work to other students and exchange feedback with other students. You may NOT submit any work that is not substantially your own and you may NOT submit work that duplicates any portion of the work of another person without express, written permission, and appropriate attribution. All portions of the Auburn University Honesty Code apply to this course and your instructor will pursue violations to the fullest extent provided by University guidelines.
5. **Disability Accommodations:** If you require special accommodations, please contact the Director of the Program for Students with Disabilities. You are responsible for making an appointment with your instructor to discuss your accommodations memo as soon as reasonably possible.

6. **Diversity:** Auburn University recognizes and values the considerable educational beliefs emanating from diversity as we prepare our students for life and leadership in a multicultural world. Students who interact with and learn about people from a variety of backgrounds are more apt to understand, appreciate, and excel in the community they inhabit. In this context, diversity is aligned with Auburn University's land grant mission of providing its students with a superior education in service to the needs of Alabama, the nation, and the world. Based on this statement of diversity, discriminatory or harassing behavior within the classroom will result in the harassing student's immediate removal from the classroom and the appropriate academic prosecution. Diversity at Auburn encompasses the whole of human experience and includes qualities such as race, gender, ethnicity, physical ability, nationality, age, religion, sexual orientation, economic status, and veteran status.

CIDA STANDARDS:

The following CIDA Professional Standards 2017 may relate to the course.

- **Standard 4. Global Context:** Student work demonstrates how environmental responsibility informs the practice of interior design.
- **Standard 5. Collaboration:** Students have awareness of the nature and value of integrated design practices and the terminology and language necessary to communicate effectively with members of allied disciplines. Student work demonstrates the ability to effectively collaborate with multiple disciplines in developing design solutions.
- **Standard 6. Business Practices and Professionalism:** Students have awareness of the breadth and depth of interior design's impact and values.
- **Standard 7. Human-Centered Design:** Interior designers apply knowledge of human experience and behavior to designing the built environment. Student work demonstrates understanding of: the impact of the built environment on human experience, behavior, and performance; the relationship between the natural and built environment as it relates to the human experience, behavior, and performance; and methods for gathering human-centered evidence. Student work demonstrates the ability to: analyze and synthesize human perception and behavior patterns to inform design solutions; apply human factors, ergonomics, and universal design principles to design solutions; apply wayfinding techniques to design solutions.
- **Standard 8. Design Process:** Student work demonstrates the ability to apply space-planning techniques throughout the design process. Student work demonstrates the ability to apply knowledge and skills learned to: solve progressively complex design problems; identify and define issues relevant to the design problem; execute the design process: pre-design, schematic design, and design development; synthesize information to generate evidence-based design solutions; explore and iterate multiple ideas; design original and creative solutions. Students understand the importance of evaluating the relevance and reliability of information and research impacting design solutions.
- **Standard 12. Light and Color.** Students are aware of the environmental impact of illumination strategies and decisions. Students understand how light and color in the interior environment impact health, safety, and wellbeing.
- **Standard 13. Products and Materials.** Students are aware of the influence of furnishings, objects, materials, and finishes on human wellbeing. Student work demonstrates understanding of appropriate design or specification of products and materials in relation to project criteria and human wellbeing. Students select and apply products and materials on the basis of their properties and performance criteria, including ergonomics, environmental attributes, life safety, and life cycle cost.
- **Standard 14. Environmental Systems and Comfort.** Students are aware that design decisions relating to acoustics, thermal comfort, and indoor air quality have an environmental impact. Students understand the principles of acoustical design, thermal design, and indoor air quality.

Sample Studio Schedule

WEEK	DAY	LECTURE	STUDIO
1	Monday	Course Introduction Read syllabus, class get to know you, intro lecture, watch Module 1: Why WELL HW: Print & bind text	Introduction to Project Go over project description, begin looking up precedent images and start Pinterest board HW: Work on Phase 1
	Wednesday	WELL AP Structure Watch Module 2: Structure of WELL, go over organization, go over body systems HW: Watch Module 3: Seven Concepts of WELL; Read pages 7-11 on Body Systems	Phase 1: Programming Work on programming in class HW: Work on Phase 1
2	Monday	Air Part 1 Lecture on background and air HW: Begin reading air section	Phase 1: Programming Work on programming in class HW: Work on Phase 1
	Wednesday	Air Part 2 Lecture on air HW: Read air section	Phase 1: DESK CRIT Meet with students to go over programming and offer direction HW: Work on Phase 1 (implement corrections)
3	Monday	Air Part 3 Finish air lecture HW: Finish reading air section	Phase 1: Programming Work on programming in class HW: Phase 1 due next class
	Wednesday	Water Part 1 Lecture on background and water HW: Read water section; Canvas Quiz #1 Air & Water due Tuesday	Phase 1: DUE; Begin Phase 2 Turn in phase 1, go over phase 2 IN STUDIO FIELD TRIP: Campus Rec Center HW: Bring in printed 1/8" floor plan, trash, and markers

4	Monday	Nourishment Part 1 Lecture on background and nourishment HW: Read nourishment section	Phase 2: SD & DD Diagramming and zoning HW: Work on Phase 2
	Wednesday	Guest Lecture: Nutrition Professor HW: Finish reading nourishment section; Canvas Quiz #2: Nourishment due Tuesday	Phase 2: SD & DD Space planning HW: Work on Phase 2
5	Monday	Light Part 1 Lecture on background and light HW: Read light section	Phase 2: SD & DD Space planning HW: Finish space planning
	Wednesday	Light Part 2 Campus lighting and fenestration tour HW: Finish reading light section	Phase 2: DESK CRIT 1 Meet with students to go over space planning and offer direction HW: Implement space planning changes
6	Monday	Fitness Part 1 Lecture on background and fitness HW: Read fitness section	Phase 2: SD & DD Create look and feel boards HW: Bring in printed look & feel boards
	Wednesday	Guest Lecture: Kinesiology Professor HW: Finish reading fitness section; Canvas Quiz #3: Light & Fitness due Tuesday	Phase 2: SD & DD FF&E Specifications HW: Work on Phase 2

7	Monday	Comfort Part 1 Lecture on background and comfort HW: Read comfort section	Phase 2: SD & DD FF&E and Renderings HW: Work on Phase 2
	Wednesday	Mind Part 1 Lecture on background and mind HW: Read mind section	Phase 2: DESK CRIT 2 Meet with students to go over specifications and materials HW: Implement changes
8	Monday	Mind Part 2 Lecture on mind HW: Read mind section	Phase 2: SD & DD Work on renderings HW: Work on Phase 2
	Wednesday	Guest Lecturer: Psychology Professor HW: Finish reading mind section; Canvas Quiz #4: Comfort & Mind due Tuesday	Phase 2: SD & DD Work on renderings HW: Work on phase 2
9	Monday	Activity: Yoga on Campus	Phase 2: SD & DD Put together presentation HW: Finish Phase 2
	Wednesday	Semester Break	

10	Monday	No Lecture	Final Presentations Meet for formal presentations; invite guest speakers and others
	Wednesday	No Lecture	Final Presentations Meet for formal presentations; invite guest speakers and others
11	Monday	Class Discussion How is the course going? Likes/dislikes, room for improvement	WELL Consulting; Begin Phase 3 Have students evaluate their own projects using the WELL scorecard, go over phase 3
	Wednesday	CLASS FIELD TRIP: GREENBUILD OR SIMILAR CONFERENCE	
12	Monday	Student Presentation: Wellness in Retail	Phase 3: CDs Work on construction documents in class HW: Work on phase 3
	Wednesday	Student Presentation: Wellness in Multifamily Residential	Phase 3 DESK CRIT Meet with students to go over construction documents and answer questions HW: Implement changes

13	Monday	Student Presentation: Wellness in Education	Phase 3: CDs Work on construction documents in class HW: Work on phase 3
	Wednesday	Student Presentation: Wellness in Restaurants + Commercial Kitchens	Phase 3: DUE Turn in bound construction documents
14	Monday	WELL Review Part 1 Review air, water, nourishment	Building Evaluations Students visit on campus buildings in pairs to evaluate them on their WELL scorecard
	Wednesday	WELL Review Part 2 Review light, fitness, comfort, mind	Building Evaluations Students finish campus building visits to evaluate them on their WELL scorecard

Sample Lecture Schedule

WEEK	DAY	LECTURE
1	Tuesday	<p>Course Introduction Read syllabus, class get to know you, intro lecture, watch Module 1: Why WELL</p> <p>HW: Print & bind text</p>
	Thursday	<p>WELL AP Structure Watch Module 2: Structure of WELL, go over organization, go over body systems</p> <p>HW: Watch Module 3: Seven Concepts of WELL; Read pages 7-11 on Body Systems</p>
2	Tuesday	<p>Air Part 1 Lecture on background and air</p> <p>HW: Begin reading air section</p>
	Thursday	<p>Air Part 2 Lecture on air</p> <p>HW: Read air section</p>
3	Tuesday	<p>Air Part 3 Finish air lecture</p> <p>HW: Finish reading air section</p>
	Thursday	<p>Water Part 1 Lecture on background and water</p> <p>HW: Read water section; Canvas Quiz #1 Air & Water due Tuesday</p>
4	Tuesday	<p>Nourishment Part 1 Lecture on background and nourishment</p> <p>HW: Read nourishment section</p>
	Thursday	<p>Guest Lecture: Nutrition Professor</p> <p>HW: Finish reading nourishment section; Canvas Quiz #2: Nourishment due Tuesday</p>
5	Tuesday	<p>Light Part 1 Lecture on background and light</p> <p>HW: Read light section</p>
	Thursday	<p>Light Part 2 Campus lighting and fenestration tour</p> <p>HW: Finish reading light section</p>

6	Tuesday	Fitness Part 1 Lecture on background and fitness HW: Read fitness section
	Thursday	Guest Lecture: Kinesiology Professor HW: Finish reading fitness section; Canvas Quiz #3: Light & Fitness due Tuesday
7	Tuesday	Comfort Part 1 Lecture on background and comfort HW: Read comfort section
	Thursday	Mind Part 1 Lecture on background and mind HW: Read mind section
8	Tuesday	Mind Part 2 Lecture on mind HW: Read mind section
	Thursday	Guest Lecturer: Psychology Professor HW: Finish reading mind section; Canvas Quiz #4: Comfort & Mind due Tuesday
9	Tuesday	Activity: Yoga on Campus
	Thursday	UNIVERSITY HOLIDAY BREAK
10	Tuesday	WELL Scorecard Assignment Students visit buildings during class to work on assignment
	Thursday	WELL Scorecard Assignment Students visit buildings during class to work on assignment
11	Tuesday	Class Discussion How is the course going? Likes/dislikes, room for improvement
	Thursday	Class Field Trip to Greenbuild or Similar Conference

12	Tuesday	Student Presentation: Wellness in Retail
	Thursday	Student Presentation: Wellness in Multifamily Residential
13	Tuesday	Student Presentation: Wellness in Education
	Thursday	Student Presentation: Wellness in Restaurants and Commercial Kitchen
14	Tuesday	WELL Review Part 1 Review air, water, nourishment
	Thursday	WELL Review Part 2 Review light, fitness, comfort, mind

Sample Mini-Mester Schedule

WEEK	DAY	MINI-MESTER LECTURE
1	Tuesday	<p>Course Introduction Read syllabus, class get to know you, intro lecture, watch Module 1: Why WELL</p> <p>WELL AP Structure Watch Module 2: Structure of WELL, go over organization, go over body systems</p> <p>HW: Print & bind text; Watch Module 3: Seven Concepts of WELL; Read pages 7-11 on Body Systems</p>
	Thursday	<p>Air Lectures</p> <p>HW: Canvas Quiz #1: Air in class Tuesday</p>
2	Tuesday	<p>Water Lecture</p> <p>HW: Canvas Quiz #2: Water in class Thursday</p>
	Thursday	<p>Nourishment Lecture + Guest Speaker, Nutrition Professor</p> <p>HW: Canvas Quiz #3: Nourishment in class Tuesday</p>
3	Tuesday	<p>Light Lecture + Activity, Campus Lighting Tour</p> <p>HW: Canvas Quiz #4: Light in class Thursday</p>
	Thursday	<p>Fitness Lecture + Activity, In Class Fitness Routine</p> <p>HW: Canvas Quiz #5: Fitness in class Tuesday</p>
4	Tuesday	<p>Comfort Lecture</p> <p>HW: Canvas Quiz #6: Comfort in class Thursday</p>
	Thursday	<p>Mind Lecture + Guest Speaker, Psychology Professor</p> <p>HW: Canvas Quiz #7: Mind in class Tuesday</p>
5	Tuesday	<p>WELL Exam Review Day 1 Study Techniques and Review Game</p> <p>HW: Study</p>
	Thursday	<p>WELL Exam Review Day 2 In Class Practice Exam</p> <p>HW: Study</p>

Sample Continuing Education Workshop Schedule

WORKSHOP DAY	WELL TOPICS COVERED
DAY 1 OF WORKSHOP	<ul style="list-style-type: none"> • Introduction to WELL Building Standard and International WELL Building Institute • Air Quality Lectures + Practice Quiz • Water Lecture + Practice Quiz
DAY 2 OF WORKSHOP	<ul style="list-style-type: none"> • Nourishment Lecture + Practice Quiz • Light Lecture + Practice Quiz • Fitness Lecture + Practice Quiz
DAY 3 OF WORKSHOP	<ul style="list-style-type: none"> • Comfort Lecture + Practice Quiz • Mind Lecture + Practice Quiz • One complete in class practice exam
TO DO AT HOME	<ul style="list-style-type: none"> • GBES Practice Exams • Review Outlines provided during workshop • Review WELL Building Standard Appendices • Schedule WELL AP Exam

Definition of Terms

Building Occupant – a person that occupies a space in the built environment.

Cardiovascular System – consists of blood, heart, and vessels. Supplies nutrients to the body and removes waste from the body tissues.

Circadian Rhythm – “internal clock that keeps the body’s hormones and bodily processes on a roughly 24-hour cycle, even in continuous darkness” (IWBI, 2017, p.157).

Digestive System – consists of the stomach, esophagus, mouth, large intestine, small intestine, liver, and pancreas. The main function is nutrient breakdown and absorption.

Endocrine System – consists of hormone-secreting glands that are responsible for growth, immunity, reproduction, mood, metabolism, and digestion.

Fenestration – “an opening in a surface” (IWBI, 2017, p. 157).

Free Address – “ability for occupants to choose their own workspace within the office or workplace” (IWBI, 2017, p. 157).

Glazing – “glasswork, which must be carefully designed in order to avoid excessive glare and heat gain” (IWBI, 2017, p. 157).

Health – “a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity” (World Health Organization [WHO], 1948).

Heart Disease – “ a class of disease that affects the heart, arteries, capillaries, or veins” (IWBI, 2017, p. 157).

Heating, Ventilating, and Air Conditioning System (HVAC) – “equipment, distribution systems, and terminals that provide the processes of heating, ventilating, or air conditioning” (IWBI, 2017, p. 157).

Immune System – consists of protein, tissues, organs, and cells that help the body fight off disease.

Indoor Air Quality – the quality of air within a building and how it contributes to certain health conditions.

Integumentary System – consists of hair, skin, and nails to protect the body's internal organs from impact. Also helps regulate body temperature and prevents water loss.

Lux – “unit of illuminance, one lux being equivalent to one lumen per square meter” (IWBI, 2017, p. 162).

Muscular System – comprised of muscle that supports posture, blood circulation, digestion, movement, and generates heat.

Nervous System – includes both the central nervous system and peripheral nervous system. The central nervous system is made up of the brain and spinal cord, while the peripheral nervous system is made up of nerves. This system is responsible for nearly all bodily functions, including cognition and maintenance of organs.

Obesity – “a medical condition in which the accumulation of excess adipose tissue poses an adverse effect on health” (IWBI, 2017, p. 158) and is characterized by a Body Mass Index [BMI] of 30.0 or higher (CDC, 2015).

Reproductive System – consists of hormone secreting glands in both the brain and reproductive organs. These organs are different for males and females and serve different functions.

Respiratory System – consists of the mouth, nose, diaphragm, trachea, and the airways into the lungs. This system is responsible for providing oxygen and removing carbon dioxide from the body.

Sick Building Syndrome (SBS) – “a set of symptoms, such as headache, fatigue, eye irritation, and breathing difficulties, that typically affect workers in modern airtight office buildings, and that are believed to be caused by indoor pollutants and poor environmental control” (IWBI, 2017, p. 158).

Skeletal System – consists of 206 bones and tendons, ligaments, and cartilage that connect the bones. This system provides support for body movement and protects organs against impact.

Toxin – “a poisonous substance produced by a living organism” (IWBI, 2017, p. 161).

Urinary System – consists of the urethra, bladder, ureters, and kidneys and is responsible for the filtration of toxins, balance of the body’s pH system, and removing waste through urine.

Universal Design (UD) – “designing objects and spaces that are aesthetically pleasing while maximizing accessibility, usability, and operability regardless of the user’s age, ability, and other factors” (IWBI, 2017, p. 158).

Volatile Organic Compound (VOC) – “organic, and therefore carbon and hydrogen containing, materials which evaporate and diffuse easily at ambient temperature” that come from many building materials (IWBI, 2017, p. 161).

Wayfinding – “act of spatial problem solving” (IWBI, 2017, p. 158).

CHAPTER 2. COURSE CONTENT

Introduction

The course content included in this chapter is divided into concepts based on The WELL Building Standard: overall introduction, building structure, air quality, water, nourishment, fitness, comfort, and mind. Each section will include an introduction, notes that outline that concept, and Powerpoint lecture slides. The notes can be used by an instructor who is teaching the course, as supplemental material, or even as a study guide for someone looking to become a WELL AP. The Powerpoint lectures are each approximately twenty slides, but formatted as handouts with six slides per page. They follow the structure of The WELL Building Standard – i.e. there are slides at the beginning, which give an overview of the “background” section for each concept and then one slide per WELL feature in that concept. The content provided in this curriculum gives a thorough overview of The WELL Building Standard and all of the information is from The WELL Building Standard.

The Powerpoints begin with two separate lectures providing an overview of WELL and how it is structured. These lectures can be used in conjunction with the information provided on the WELL website at www.wellcertified.com.

WELL

Introduction

Emily Levinson | October 2015

LEARNING OBJECTIVES

- Identify the role of the WELL Building Institute (IWBI) and understand their mission and message.
- Examine *why* we should use WELL and articulate what WELL does at its most basic level.
- Summarize how the environment can influence people.

OUTLINE

- IWBI
- Why WELL?
- Influence of the Environment
- Basic WELL Information



“The time has come to **elevate human health** and comfort to the forefront of building practices and **reinvent buildings** that are not only better for the planet – but also for people”

-International Well Building Institute

INTERNATIONAL WELL BUILDING INSTITUTE

- IWBI launched by Delos in 2013
- Clinton Global Initiative
- Believes buildings should be designed with humans at the center
- Administers WELL



“To improve **human health** and **wellbeing** through the **built environment.**”

-International Well Building Institute's Mission



WHY WELL?

- Stat: We spend over 90% of our time indoors. We know it affects our health, but there is little information on how and what we can do.
- Healthier building = healthier and happier building occupants



Create healthy environments.

OUR ENVIRONMENT CAN...

- Help shape our choices
- Effect our mood
- Regulate our sleeping cycles
- Passively influence our health



WHAT DOES WELL DO?

- Focuses on people
 - Children in developmental stage
- Model for design + construction
- Best practices
- Performance-based system for certifying features of the built environment that impact health & wellbeing
- Works seamlessly with LEED



WELL BY THE NUMBERS

More than 47% of owners report **healthcare cost reductions** – ranging anywhere from less than 1% to over 5%.

Almost 66% of owners report **improvements** with over 30% at a **high** level of improvement

Design, construction, and maintenance are only 8% of **total building costs**. Personnel are 92% of total building costs (on a 30 year cost analysis).

WELL **donates** 51% of their profit to **charitable** organizations that focus on wellness and the built environment.

WELL

Building Structure

Emily Levinson | October 2015

Objectives

- Articulate the structure of the WELL Building Standard, including typologies, building types, and certification levels.
- Be able to list and briefly describe the 7 concepts of the WELL Building Standard
- Have a basic understanding of the 10 body systems that are influenced by the built environment

Outline

- WELL Version 1.0
- Typologies
- Levels of Certification
- 7 Concepts
- 10 Body Systems
- Case Study



WELL v1.0

- Commercial
- Institutional
- Pilot programs available
 - Multi-family residential
 - Retail
 - Athletic facilities
 - Arenas
 - Healthcare
 - Education



Typologies

- New and Existing Buildings
- New and Existing Interiors
- WELL Core and Shell Compliance
 - NOT a certification
 - Only one level



Levels of Certification

- Silver
- Gold
- Platinum
- Similar to LEED
 - Must meet preconditions, but can earn more points with optimization
- Performance-based





7 Concepts

- Organized into two types of features
 - Preconditions
 - Optimizations

AIR
WATER
NOURISHMENT
LIGHT
FITNESS
COMFORT
MIND

1. Air

establishes requirements to create optimal indoor air quality

2. Water

promotes safe and clean water through proper filtration and other quality methods

3. Nourishment

requires the availability of fresh, wholesome foods, limits unhealthy ingredients, and encourages better eating habits and food culture

4. Lighting

provides illumination guidelines that aim to minimize disruption to the body's daily system and enhance productivity; requires specialized lighting systems designed to increase alertness, enhance occupant experience, and promote sleep

5. Fitness

allows for the seamless integration of exercise and fitness into everyday life by providing the physical features and components to support an active and healthy lifestyle



6. Comfort

establishes requirements designed to create a distraction-free, productive, and comfortable indoor environment

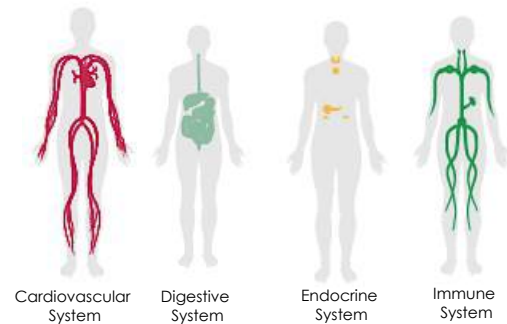


7. Mind

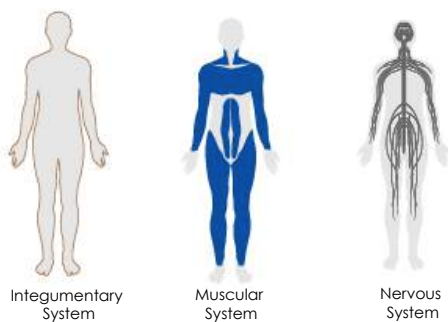
requires design, technology, and treatment strategies designed to provide physical environment that optimize cognitive and emotional health



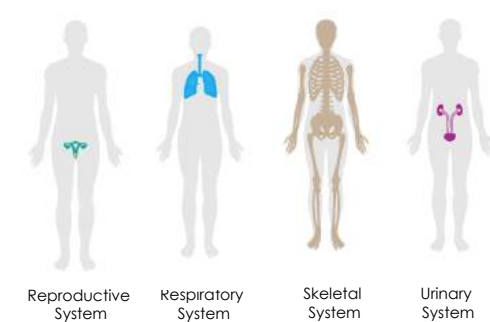
10 Body Systems



10 Body Systems



10 Body Systems



Air Quality Introduction

Air quality is incredibly important because breathing clean air is necessary to sustain life. The WELL Building Standard recognizes the importance of clean air and suggests strategies for proper ventilation, air filtration, and pollution source avoidance to maintain high air quality. WELL expands on requirements from the American Society of Heating, Refrigerating, and Air-Conditioning [ASHRAE], the Environmental Protection Agency [EPA], and Leadership in Energy and Environmental Design [LEED]. They present 29 features – some requirements to achieve the basic level of WELL accreditation and some optimizations – that focus on air quality. In this section, the Air Quality concept has been outlined based on the WELL Building Standard and turned into a Powerpoint presentation that can be used as teaching material.

Air Quality Outline

- Background:
 - *Stat: Air pollution is the #1 environmental cause of premature death – 50,000/year in US and 7 million (1/8) worldwide*
 - Clean air is naturally deteriorating from traffic construction, agriculture, etc. even if the source is far away. IAQ is also deteriorating because of off gassing from building materials, indoor combustion sources, water leaks, etc. Poor ventilation is a huge issue (exposes us to VOCs, PAHs, pathogens). Surfaces also accumulate airborne germs. These can all lead to asthma, allergies, respiratory infections, etc. They can also lead to sick building syndrome (SBS) where no cause is identified leading to productivity issues.
 - *Stat: We breathe 15,000 liters of air/day.*
 - Best ways to get high IAQ: proper ventilation, air filtration, pollution source avoidance
 - Six major air pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide
 - WELL expands on the requirements from the EPA National Ambient Air Quality Standards and incorporates standards from other agencies, like WHO
 - WELL's approach combines the installation of appropriate materials with the implementation of effective protocols to regularly disinfect targeted areas
 - WELL incorporates best practices from industry organizations who have evidence-based and professional guidelines (ex. ASHRAE and LEED)
- Air Quality Standards
 - Pollutants generated inside can cause problems (ex. VOCs and byproducts can cause nausea and headaches). Outdoor air is usually better quality, but natural ventilation can diminish IAQ if external air quality is poor.
 - Specifics:
 - Formaldehyde levels less than 27 ppb
 - Total VOC less than 500 ug/m³
 - CO less than 9 ppm
 - PM_{2.5} less than 15 ug/m³
 - Pm₁₀ less than 50 uh/m³
 - Ozone less than 51 ppb
 - Radon less than 4 pCi/L
 - Body Systems it affects: cardiovascular, endocrine, immune, nervous, respiratory
- Smoking Ban
 - Over 42 million adults in the US and 1 billion worldwide smokes. In the US, tobacco is related to 400,000 premature deaths each year. Smokers live 10 years less than non-smokers. Cigarettes contain tons of bad chemicals when smoked including carcinogens and secondhand smoking exposes other people to these.
 - Specifics:
 - Smoking prohibited inside
 - Smoking prohibited at least 25' from any building openings.
 - Posting hazards of smoking signage in areas where you can smoke.

- Body Systems: cardiovascular, digestive, endocrine, immune, integumentary, muscular, nervous, reproductive, respiratory, skeletal, urinary
- Ventilation Effectiveness
 - Routine indoor activities can degrade air quality by releasing pollutants that can have harmful effects. WELL sets a foundation for ventilation rates that can be adjusted according to measured concentrations of carbon dioxide.
 - Specifics:
 - Ventilation rates comply with ASHRAE 62.1-2013
 - Ambient air quality within 1 mi of the building is compliant with US EPA's NAAQS or passes Well's standards
 - For spaces 500+ sq ft with occupant density greater than 25 people per 1,000 sq ft, there needs either a demand controlled ventilation system that keeps CO₂ levels below 800 ppm OR that the natural ventilation keeps CO₂ below 800 ppm
 - Testing after HVAC system is installed
 - Body Systems: cardiovascular, nervous, respiratory
- VOC Reduction
 - VOCs come from paint, finishes, cleaning products, etc. and off-gas benzene, formaldehyde, etc. These can lead to respiratory problems and leukemia. VOC levels can be 5x higher indoors than outdoors.
 - Specifics:
 - Paints and coatings must meet either the CARB 2007, SCM for Architectural Coatings, or SCAQMD Rule 1113 OR 90% meets CDPH Standard Method v1.1-2010 OR national VOC regulations in compliance with ASTM D2359-10, ISO 11890 part 1, ASTM D6886-03, or ISO 11890-2.
 - Adhesives and sealants must meet SCAQMD Rule 1168 (100%), CDPH (90%), or national VOC regulations in compliance with the same ones above.
 - Flooring must meet CDPH
 - Insulation meets CDPH
 - 95% furniture meets ANSI/BIFMA e3-2011 Furniture Sustainability Standard sections 7.6.1 and 7.6.2 tested in accordance with ANSI/BIFMA Standards Method M7.1-2011
 - Body Systems: cardiovascular, endocrine, immune, integumentary, nervous, respiratory
- Air Filtration
 - Air quality can be messed up due to weather, dust, traffic, or localized pollutants (ex. pollen). Filtration is necessary – carbon filters for large particles and media filters for smaller particles.
 - Specifics:
 - If re-circulated air is used, there must be rack space and fan capacity for future carbon filters that is able to accommodate additional filters.
 - At least MERV 13 filter used to filter outdoor air OR project shows that for 95% of calendar year, ambient outdoor PM₁₀ and PM_{2.5} within 1 mi of the building meet Well standards.
 - Records of air filtration maintenance are required.

- Building Systems: cardiovascular, endocrine, immune, integumentary, nervous, respiratory
- Microbe and Mold Control
 - Mold often grows on cooling coils in HVAC systems or within wall assemblies from moisture. Mold can trigger asthma, headaches, allergies, etc. WELL requires the use of ultraviolet germicidal irradiation (UVGI) devices to manage mold.
 - Specifics:
 - Ultraviolet lamps are on cooling coils and drain pans OR all cooling coils are inspected on a quarterly basis for mold growth and cleaned (photos submitted annually).
 - Mold inspections: no water damage, pooling, discoloration, or mold.
 - Body Systems: immune, integumentary, respiratory
- Construction Pollution Management
 - Care must be taken during construction to clear the space of dust, chemical vapors, etc. Pollutants from construction can enter the space and become dangerous for health. This feature removes pollutants before occupancy.
 - Specifics:
 - All ducts are either sealed or vacuumed out prior to installing registers, grills, and diffusers.
 - If ventilation system is in use during construction, filters must be replaced before occupancy.
 - During construction, a separate area for absorptive materials (carpet, fabric, etc.) is designated.
 - All active areas of work are isolated from other spaces, walk off mats are used at entryways, and tools must use dust guards.
 - Body Systems: doesn't mention
- Healthy Entrance
 - People track harmful contaminants inside so WELL requires methods to help prevent pollutants from entering the building.
 - Specifics:
 - Walk-off system at an entryway. Can either be grilles/grates/slots, rollout mat, or manufactured entryway walk-off system. All must be the width of the entrance and at least 10' long.
 - Entryway has to be sealed either with two normally closed doorways, revolving entrance doors, or at least three normally shut doors that separate occupied space from the outdoors.
 - Body Systems: cardiovascular, immune, respiratory
- Cleaning Protocol
 - Regular cleaning is important, but numerous chemicals and improper cleaning techniques can undermine IAQ. Harmful ingredients in the products can lead to serious health issues. This feature requires the development of a written protocol including frequency, supplies, equipment, procedures, and training to improve cleaning.
 - Specifics:
 - A cleaning plan is created using Table A4 Appendix C and presented during staff trainings.

- Must include a list of high-touch and low-touch surfaces, a schedule about how surfaces must be cleaned, cleaning protocol and dated cleaning logs that are maintained and available, and a list of approved products.
- Pesticide Management
 - Approximately one billion pounds of pesticides are used each year in the US. They contaminate rivers, seep into groundwater, and can lead to serious health issues. Atrazine can lead to endocrine issues and cardiovascular problems. Glyphosate can lead to kidney problems and reproductive difficulties. This feature requires a pest management system that reduces pesticide and herbicide use to eliminate toxic chemicals. Only approved products can be used.
 - Specifics:
 - Creation of the plan using Chapter 3 of the San Francisco Environment Code Integrated Pest Management program
 - Only pesticides with hazard tier ranking of 3. Refer to Table A2 Appendix C.
 - Body Systems: cardiovascular, digestive, endocrine, immune, nervous, reproductive, respiratory
- Fundamental Material Safety
 - Some building materials that are already banned in the US are in older buildings (ex. asbestos, polychlorinated biphenyls [PCBs], and lead). These can lead to cancer, mesothelioma, neurotoxic effects, or negative effects on memory, IQ, learning, and behavior. This feature restricts the presence of added lead and asbestos and limits occupant exposure where they may already exist.
 - Specifics:
 - New buildings - no asbestos and no more than 100 ppm added lead
 - Buildings already with lead – on-site investigation of the space using US EPA 40 CFR Part 745.65 for residential or child-occupied places; commercial spaces must adhere to US EPA 40 CFR Part 745.227; use EPA rules for renovations with lead
 - Buildings already with asbestos – inspection every three years using AHERA’s Asbestos MAP, NESHAP, state consultant, or US EPA accredited company; development and maintenance of asbestos management plan; post-abatement clearance
 - Buildings with PCBs (constructed or renovated between 1950 and when PCB was restricted) – evaluation and abatement using EPA Steps to Safe PCB Activities; conduct removal and disposal of PCB containing lights with EPA guidelines
 - Mercury limitation: do not install mercury containing thermometers, switches, or electrical relays; upgrade current mercury containing lamps to low-mercury or no mercury; exit signs only use LED or LEC lamps; no mercury vapor halide discharge lamps in use
 - Body Systems: cardiovascular, nervous, respiratory
- Moisture Management
 - Moisture can enter buildings in four ways: bulk water, capillary water, air-transported moisture, and vapor diffusion. It’s good to prevent moisture and promote dryness to maintain IAQ. A good reference is the US EPA’s Moisture Control Guidance for

Building Design, Construction, and Maintenance. This requires designers to describe how the building is created to manage moisture.

- Specifics:
 - Point by point narrative that describes how liquid water from outside is addressed based on project's site/climate. Includes the following concerns: site drainage, local water table, building penetrations, porous building materials
 - Narrative describing how liquid water from interior sources is addressed. Includes the following: plumbing leaks, hard-piped plumbing appliances, porous building materials, new building materials with high moisture content
 - Narrative describing how condensation is addressed including: high interior relative humidity levels (ex. bathroom), air leakage, cooler surfaces (ex. basement), oversize AC units
 - Narrative describing moisture tolerant materials including: exposed entryways and glazing, porous cladding material, finished floors in potentially damp areas, interior sheathing in damp rooms, sealing and storing of absorptive materials during construction
- Body Systems: immune, integumentary, and respiratory
- Air Flush
 - An air flush or building flush is a technique whereby air is forced through a building after construction and prior to occupancy to remove pollutants and improve IAQ. This feature requires an air flush at the completion of construction.
 - Specifics:
 - Must be performed while keeping an indoor temp of at least 59 degrees F and humidity below 60% at a volume of either:
 - Total air volume of 4,500 m³ of outdoor air per square meter of floor area before occupancy (14,000 cubic feet per square foot of floor area)
 - Total air volume of 1,066 cubic meters of floor area followed by a second flush of 3,200 cubic meters of outdoor air per square meter post-occupancy (3,500 cubic feet and 10,500 feet respectively). During the second flush, a ventilation system provides at least 0.1 cubic meters of outdoor air per square meter of floor area
 - Body Systems: cardiovascular, respiratory
- Air Infiltration Management
 - IAQ and thermal comfort can be compromised by leaks and gaps that break the building's air barrier, which can lead to loss of energy, mold, and infiltration of polluted air. This requires testing to check for air leakages in the building envelope.
 - Specifics:
 - Performed after substantial completion but before occupancy
 - Purpose: to ensure the building is airtight
 - Envelope commissioning using ASHRAE Guideline 0-2005 and NIBS Guideline 3-2012
 - Plan of action required
 - Body Systems: not listed
- Increased Ventilation

- ASHRAE provides good standards that are required by WELL, but you can get optimization points for exceeding them because that'll be even better than the standard.
- Specifics:
 - Exceeds ASHRAE outdoor air supply rates by 30%
 - Reference WELL Ventilation Effectiveness and exceed that
- Body Systems: cardiovascular, immune, respiratory
- Humidity Control
 - Extremely low humidity can lead to dryness and irritation of the skin, eyes, throat, and mucous membranes. High humidity can lead to the growth of pathogens and VOCs that can lead to respiratory irritation and allergies. This requires buildings to provide humidification when relative humidity is low and dehumidification when relative humidity is high. An increase in relative humidity of 35% can increase the emissions of formaldehyde by 1.8 – 2.6
 - Specifics:
 - Dependent on local climate conditions and humidity
 - Either ventilation system that can keep humidity between 30% - 50% OR modeled humidity levels are within 30% - 50% for at least 95% of business hours of the year
 - Body Systems: immune, integumentary, respiratory
- Direct Source Ventilation
 - Air pollution can be created from indoor environments. Examples:
 - Chemical storage closets → VOCs → cancer, organ, central nervous system damage
 - Copy rooms → ozone → asthma, respiratory issues
 - Bathrooms → mold and mildew → asthma and allergies
 - Requires the isolation of indoor pollution sources in separate rooms or exhausted cabinets to minimize their effect on IAQ.
 - Specifics:
 - Applies to cleaning, chemical storage units, bathrooms, printers/copiers
 - Closed from adjacent spaces with self-closing doors
 - Air is exhausted (expelled not re-circulated)
 - Printers/copiers that meet low-emission criteria are exempt
 - Building Systems: not listed
- Air Quality Monitoring and Feedback
 - Requires real-time measurement, recording, and transmission of key IAQ metrics and ambient outdoor air quality. This data will let people know if something isn't working properly so they can fix it.
 - Specifics:
 - Monitors measure 2 of the following (particle count, carbon dioxide, ozone) in a common space (min one per floor) at intervals (no longer than once an hour) and send results to IWBI
 - Written policy specifying: detailed enforcement strategies for parts of the Air Quality Standards Feature; records kept at least 3 years; detailed plan for action to fix issues

- Real time display for temp, humidity, and CO₂ concentration are made available per 10,000 square feet of regularly occupied space on a screen at least 15 cm x 13 cm
 - Body Systems: cardiovascular, integumentary, nervous, respiratory
 - Operable Windows
 - Achieving natural ventilation can be good for occupants, but makes it difficult to maintain IAQ control. However, if the outdoor air quality is high, WELL says natural ventilation should be used. Opening windows can provide fresh air, lower levels of CO₂ and VOCs. This requires local OAQ conditions be analyzed before adding operable windows into the design.
 - Specifics:
 - Every regularly occupied space should have an operable window
 - Ozone (PM₁₀), temp, and humidity is monitored with a data-gathering station located within 1 mile of the building
 - If the ozone, temp, or humidity isn't at the ideal levels, occupants are discouraged from opening windows either with software on their computers/phones or indicator lights at the windows (specific levels page 48)
 - Body Systems: cardiovascular, respiratory
 - Outdoor Air Systems
 - Dedicated outdoor air systems (DOAS) remove the issues with linking heating and cooling with ventilation. Thermal comfort and space conditions improve using DOAS, but ASHRAE doesn't have a published standard for them. DOAS can save energy and provide good ventilation. This sets requirements for projects using DOAS systems.
 - Specifics:
 - System complies with local codes about DOAS or
 - A detailed design review of the proposed system is done by an independent professional mechanical engineer (includes thermal comfort, ventilation rates, reliability)
 - Building Systems: respiratory
 - Displacement Ventilation
 - The height placement of air ventilation can make it more effective. Displacement ventilation supplies air at very low velocity levels at/near the floor, which then rises to the ceiling. This also helps push pollutants to the ceiling, out of the breathing zone, where they can be easily removed. This supports a thermally comfortable indoor environment using a displacement ventilation system.
 - Specifics:
 - Use a displacement ventilation system where either:
 - System Performance Evaluation and ASHRAE Guidelines RP-949 used: low side wall air distribution where the air supply temp is slightly cooler or warmer than the desired space temp OR
 - ASHRAE's UFAD Guide: under floor air distribution with air supply temp cooler or warmer than desired space temp and under floor is raised so it can be clear annually
 - Computation Fluid Dynamics (CFD) analysis conducted

- System meets ASHRAE 55-2013 Thermal Environmental Conditions for Human Occupancy at least 75% comfort of regularly occupied space
 - Body Systems: cardiovascular, immune
 - Pest Control
 - Unhygienic conditions can lead to pests and dust mites, which can bring in indoor allergens that can trigger asthma and reactions. *Up to 60% of individuals with asthma who live in urban environments also have a sensitivity to cockroach allergens.* This requires that pest inspections be conducted regularly and food be sealed.
 - Specifics
 - All non-refrigerated food is stored in sealed containers
 - Indoor trashcans less than 30 gallons have lids and are hands free OR enclosed by cabinetry under the counter (exempt: paper recycling bin)
 - Indoor trashcans greater than 30 gal have lid
 - Inspections to show that pests aren't present (including cockroaches and termites)
 - Body Systems: immune, respiratory
 - Advanced Air Purification
 - Sometimes certain circumstances need better air purification, such as proximity to highly traveled roads, manufacturing plants, climates with high humidity levels, etc. These circumstances can have greater pollutants in the air (ozone, VOCs, etc.) or cause the growth of mold. This requires the use of carbon filters to remove VOCs and ozone, and ultraviolet sanitizers to irradiate any bacteria, viruses, and mold spores present in the air.
 - Specifics:
 - Buildings that recirculate air have either:
 - Activated carbon filters in main air ducts to filter re-circulated air (and filter replacement) OR
 - Standalone air purifier with carbon filter in regularly occupied spaces (sized appropriately and with filter replacement)
 - Spaces with 10+ regular occupants in buildings that recirculate air use either ultraviolet germicidal irradiation OR photocatalytic oxidation to treat that air. Can be either in the central system or standalone.
 - Provide IWBI with maintenance records annually
 - Body Systems: cardiovascular, immune, respiratory
 - Combustion Minimization
 - Wood and gas fireplaces look nice, but can be bad for IAQ if not sealed off properly. They can contribute to harmful combustion byproducts, such as CO. This prohibits combustion in occupied spaces and requires any combustion equipment meet strict clean-burning standards and discourages vehicles from idling near the building.
 - *CO has 210 times the binding affinity for hemoglobin compared to oxygen, and thus prevents oxygen from being delivered to the body, leading to hypoxia (lack of oxygen delivered to body tissues that can cause nausea, loss of consciousness, and death). CO leads to app. 170 fatal poisonings in the US annually.*
 - Specifics:
 - Combustion-based fireplaces, stoves, space-heaters, ranges, and ovens are forbidden in occupied spaces

- All combustion equipment used for heating/cooling must meet California’s South Coast Air Quality Management District rules for pollution (including internal combustion engines, furnaces, boilers, steam generators, process heaters, and water heaters)
 - Visible signage in pick-up, drop-off, and parking areas say that idling with vehicle engines on for more than 30 seconds is prohibited
 - Reduce particulate matter from diesel fueled vehicles and construction equipment with the following
 - Non-road diesel engine vehicles comply with US EPA Tier 4 PM emissions standard or local (or retrofitted)
 - On-road diesel engines meet US EPA model year 2007 on road standards for PM (or retrofitted)
 - All equipment, vehicles, loading/unloading are located away from air intakes and operable openings of adjacent buildings
 - Body Systems: cardiovascular, respiratory, urinary
- Toxic Material Reduction
 - Chemicals are still used in the manufacture of buildings materials even though we know they’re bad for our health. Polybrominated diphenyl ethers (PBDEs) are used to increase fire resistance of materials, but are associated with potential neurobehavioral, carcinogenic, and immune effects. These can bioaccumulate in fat and cause food chain contamination (ex. human milk). This identifies this potentially harmful chemical compounds and suggests avoiding them. (see Table A3 in Appendix C).
 - Specifics:
 - No perfluorinated compounds (PFCs) are present at 100+ ppm in things that constitute at least 5% by weight of a furnishing
 - Halogenated flame retardants are limited to the following to 0.01% (100 ppm) that is allowable by local code
 - Window and waterproofing parts, doors, window frames, siding, flooring, ceiling tiles, wall covering, piping, electrical cables, conduits, junction boxes, sound and thermal insulation, upholstered furniture and textiles
 - Plasticizers are limited (DEHP, DBP, BBP, DINP, DIDP, or DNOP often in PVC) to 0.01%
 - Flooring, wall coverings, window blinds, shower curtains, furniture, plumbing pipes, moisture barriers
 - No isocyanate-based polyurethane products in interior finishes
 - Urea-formaldehyde limited to 100 ppm in
 - Furniture, composite wood products, laminating adhesives, resins, thermal insulation
 - Body Systems: endocrine, reproductive
- Enhanced Material Safety
 - Some chemicals haven’t been tested for safety, which could lead to SBS or respiratory, neurotoxic, and dermatologic symptoms. As a precautionary approach, it’s better to substitute potentially dangerous materials with safe ones. This promotes the use of products that have been independently verified to be free of suspected hazards.

- Specifics: At least one of the following
 - Project has all “Imperatives in the Materials Petal” in Living Building Challenge
 - At least 25% of products by cost are Cradle to Cradle, Material Health Certified V2 gold/platinum or V3 bronze/silver/gold/platinum
 - At least 25% of products by cost have no GreenScreen Benchmark 1, List Translator 1, or List Translator Possible 1 substance over 1,000 ppm (verified by PhD toxicologist or certified industrial hygienist)
 - At least 25% of products meet some combo of the last two bullets
- Body Systems: cardiovascular, digestive, endocrine, immune, integumentary, muscular, nervous, respiratory
- Antimicrobial Activity for Surfaces
 - Antimicrobial activity on surfaces can accelerate the natural rate of microbial cell death. Cleaning processes that use short-wavelength UV light can reduce the bacterial load. This employs the use of materials or procedures that clean surfaces by reacting to or disruption microbes. It suppresses microbe build-up on surfaces while minimizing the use of cleaning materials.
 - Specifics:
 - Countertops, fixtures (bathrooms/kitchen), handles/knobs/switches/buttons have either
 - Coated with a material that is abrasion-resistant, non-leaching and meets EPA testing requirements for antimicrobial activity
 - Cleaned with a UV cleaning device with output of at least 4 mW/cm²
 - Body Systems: digestive, endocrine, immune, integumentary, reproductive, respiratory, urinary
- Cleanable Environment
 - Surfaces that are constantly exposed to human touch can harbor microbes/toxins, but can be kept sanitary if the material facilitates easy cleaning. This will reduce the need of chemical cleaning products. This requires high touch surfaces are smooth, corrosion-resistant, and easily sanitized to maintain cleanliness.
 - Specifics:
 - High touch/non-porous surfaces (refer to Table A1 in App C) meet:
 - Smooth and free of defects
 - Finished to maintain smooth joints
 - Free of sharp angles/corners
 - No permanent wall to wall carpeting (carpet tiles or rugs allowed)
 - Building has storage for movable items to be stored during cleaning
 - Right angles between walls and windows/floors are sealed
 - Body Systems: digestive, endocrine, immune, integumentary, reproductive, urinary
- Cleaning Equipment
 - High performance cleaning equipment increases the effectiveness of the cleaning and avoids repetitive work/a lot of chemical contact. This specifies cleaning equipment designed to achieve efficient disinfection of surfaces, reduce cross-contamination, and decrease exposure to toxic cleaning chemicals.
 - Specifics:
 - All cleaning equipment

- Mops/rags/dusters have microfiber with denier no higher than 1.0
 - Mops are not wrung by hand
 - Vacuum cleaning have HEPA filters
 - Bleach and ammonia products kept in separate bins and are obviously labeled and not to be mixed
- Body Systems: digestive, endocrine, immune, reproductive, urinary

WELL

Air Part One

Emily Levinson | August 2016



BACKGROUND

- Clean air deteriorates because of:
 - Traffic
 - Construction
 - Agriculture
 - Materials off-gassing
- Poor ventilation exposes us to pathogens
- Surfaces accumulate germs
- Health issues: asthma, allergies, respiratory infections, sick building syndrome (SBS)

BACKGROUND

- Best way to get high IAQ: proper ventilation, air filtration, pollution source avoidance
- Six major pollutants:
 - carbon monoxide
 - lead
 - nitrogen dioxide
 - ozone
 - particulate matter
 - sulfur dioxide

WELL'S APPROACH

- EPA National Ambient Air Quality Standards
 - World Health Organization
- Combines installation of materials with implementation of effective protocols
- Incorporates best practices from evidence-based professional organizations
 - ASHRAE



AIR QUALITY STANDARDS

- Pollutants generated inside can cause problems (VOCs)
- Outdoor air is usually better
- Natural ventilation can diminish IAQ if outdoor air is bad
- Certain harmful substances are below a specific level



SMOKING BAN

- Tobacco is related to 400,000 premature deaths each year
- 42 million adults in US smoke; 1 billion worldwide
- Cigarettes contain tons of bad chemicals
- Smoking prohibited inside and within 25' of buildings; hazard signage in smoking areas



VENTILATION EFFECTIVENESS

- Air quality can be degraded by indoor activities
- WELL sets ventilation rates that can be adjusted (according to CO₂)
 - Compliant with ASHRAE 62.1-2013
 - Meets certain CO₂ levels
 - Test HVAC system



VOC REDUCTION

- VOCs come from paint, finishes, cleaning products, etc.
- VOCs off-gas benzene, formaldehyde, etc. → respiratory problems
- All finishes, adhesives, flooring, insulation, and furniture are compliant with codes



AIR FILTRATION

- IAQ diminishes due to weather, dust, traffic, pollutants
- Filtration is necessary
 - Carbon filters = large particles
 - Media filters = small particles
- Recirculated air needs space for future carbon filters
- At least MERV 13 filters or outdoor air if sufficient
- Records of air filtration



MICROBE AND MOLD CONTROL

- Mold grows on cooling coils in HVAC systems or in walls
- Mold can trigger asthma, headaches, allergies
- Use of ultraviolet germicidal irradiation devices OR cooling coils inspected on quarterly basis and cleaned
- Mold inspections



CONSTRUCTION POLLUTION MANAGEMENT

- Pollutants from construction can enter and can be dangerous
- Care is taken to clear the space of dust, chemical vapors, etc.
- Remove pollutants before occupancy
- Seal ducts before registers, grills, and diffusers are installed
- Replace ventilation filters used during construction
- Separate area for absorptive materials
- Walk-off mats used



HEALTHY ENTRANCE

- People bring harmful stuff inside buildings
- Walk-off systems at entryway
- Entryway sealed either with two doors usually closed, revolving entrance doors, or three doors that separate occupied space from outdoors



CLEANING PROTOCOL

- Cleaning is important, but it introduces chemicals that can be bad for IAQ
- Harmful chemicals can lead to serious health issues
- WELL requires development of a written protocol (frequency, supplies, equipment, procedures, and training)



PESTICIDE MANAGEMENT

- Pesticides/herbicides contaminate rivers, seep into groundwater, and can lead to health issues
- Atrazine and glyphosate
- Requires pest management system to reduce herbicides and pesticides



FUNDAMENTAL MATERIAL SAFETY

- Some banned building materials are already in old buildings
- Ex. Asbestos, PCBs, lead that can lead to cancer, mesothelioma, neurotoxic affects, etc.
- Restrict the presence of added lead and asbestos and limits occupant exposure
- Investigations of the space where it exists



MOISTURE MANAGEMENT

- Moisture enters buildings in 4 ways: bulk water, capillary water, air transported moisture, vapor diffusion
- Good to prevent moisture and promote dryness
- US EPA's Moisture Control Guidance for Building Design, Construction, and Maintenance
- Requires designers to describe how the building will manage moisture



AIR FLUSH

- Air flush: air is forced through a building after construction and before occupancy to remove pollutants
- Requires air flush at completion of construction



AIR INFILTRATION MANAGEMENT

- IAQ and thermal comfort can get messed up by leaks that break the building's air barrier
- Leaks → loss of energy, mold, infiltration of polluted air
- Requires testing to check for air leakages in the building shell



INCREASED VENTILATION

- AHRAE sets standards for ventilation (that WELL uses)
- It's better to exceed them
- Optimization points
- Exceed ASHRAE rates by 30%



HUMIDITY CONTROL

- Low humidity → dryness, irritation of skin, eyes, and throat
- High humidity → growth of pathogens and VOCs that lead to respiratory irritation
- Requires buildings to keep humidity at good levels (30% - 50%)



DIRECT SOURCE VENTILATION

- Air pollution can be created from indoor environments (chemical storage closets, copy rooms, bathrooms)
- Requires the isolation of these sources in separate rooms with exhausted air



AIR QUALITY MONITORING AND FEEDBACK

- Requires real-time management, recording, and transmission of IAQ metrics and outdoor air quality
- This lets people know if something isn't working so they can fix it



WELL

Air Part Two

Emily Levinson | August 2016

"We breath 15,000 liters of air every day."

-International Well-Building Institute

OPERABLE WINDOWS

- Natural ventilation is good, but makes it difficult to control IAQ
- If outdoor air quality is good, it should be used
- Requires OAQ conditions be analyzed before adding operable windows into the design



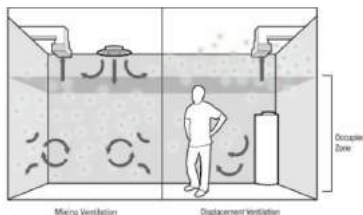
OUTDOOR AIR SYSTEMS

- Dedicated outdoor air systems (DOAS) remove issues with linking heating and cooling
- Thermal comfort and space conditions are better with DOAS
- DOAS can save energy and provide good ventilation
- DOAS sets requirements for projects using DOAS



DISPLACEMENT VENTILATION

- Height placement of ventilation can make it more effective
- Push pollutants to the ceiling out of breathing zone
- Supports thermally comfortable indoor environment with displacement ventilation system



PEST CONTROL

- Unhygienic conditions → pests → indoor allergens → asthma and reactions
- Requires pest inspections
- Requires food to be sealed



ADVANCED AIR PURIFICATION

- Sometimes we need better air purification
 - Near busy roads
 - Near manufacturing plants
 - Climates with high humidity
- Requires use of carbon filters to remove pollutants
- Requires UV sanitizers to get rid of bacteria and mold in the air



COMBUSTION MINIMIZATION

- Fireplaces look nice, but can be bad for IAQ if not sealed properly
- Combustion byproducts (CO)
- Prohibits combustion in occupied spaces
- Requires combustion equipment meet strict clean-burning
- Discourages vehicles from idling near building



TOXIC MATERIAL REDUCTION

- Chemicals are used in building materials even though we know they're bad (ex. PBDEs to increase fire resistance)
- Limit PFCs
- Limit halogenated flame retardants
- Limit plasticizers
- No isocyanate-based polyurethane
- Limit urea-formaldehyde



ENHANCED MATERIAL SAFETY

- Some chemicals haven't been tested for safety and could lead to health problems
- Precautionary approach
- Better to use products that have been verified as safe
- Meets standards of Living Building Challenge, Cradle to Cradle, or GreenScreen (or some combo)



ANTIMICROBIAL ACTIVITY FOR SURFACES

- Antimicrobial activity on surfaces accelerates natural rate of microbial cell death
- Uses materials that clean surfaces by reacting to microbes
- Suppresses microbe build-up on surfaces while minimizing use of cleaning materials
- Countertops, fixtures, handles, knobs are coated with material that is antimicrobial OR
- Cleaned with UV cleaning device



CLEANABLE ENVIRONMENT

- Surfaces that are constantly exposed to human touch can harbor microbes
- Easy cleaning will keep them sanitary
- Smooth, free of defects; finished to have smooth joints; free of sharp angles; no permanent carpeting; sealed angles between walls



CLEANING EQUIPMENT

- High performance cleaning increases effectiveness and avoids repetitive work
- Specifies cleaning equipment that
 - Achieves efficient disinfection of surfaces, reduces cross-contamination, decreases exposure to toxic cleaning chemicals



Water Introduction

The water section in the WELL Building Standard indicates that quality drinking water is necessary for a person's health. They recognize that many people around the world deal with unsafe drinking water and that contamination can often lead back to different industry processes. Due to this, WELL offers strategies in this concept to keep water contaminants to a safe level, suggests water quality testing, and promotes drinking water throughout the day. In this section, there is an outline of the water concept along with a Powerpoint presentation that includes information on the background section and each feature of the water concept.

Water Outline

- Background
 - Clean drinking water is a prerequisite for optimal health.
 - *More than 2/3 of the human body is comprised of water. It's a major component of cells and transports waste and nutrients through the body. Water also helps regulate body temperature and serves as a shock absorber for the brain and spinal cord.*
 - *IOM (Institute of Medicine) says women should drink 2.7 liters and men should drink 3.7 liters of water per day.*
 - Drinking water contamination is a huge health issue and many people receive water that has been exposed to potentially harmful levels of biological, chemical, and mineral contaminants. *WHO reports almost 1 billion people lack access to safe drinking water around the world and 2 million deaths per year are due to unsafe water, sanitation, and hygiene.*
 - Water contamination can often lead back to industry processes. Lead, arsenic, glyphosate, atrazine, and microbes that naturally occur or accidentally get introduced into water can have serious health threats. Treatment and distribution systems meant to keep drinking water safe can also inadvertently contaminate water (ex. chlorine and chloramine used to kill pathogenic organisms, but can have byproducts that can lead to cancer when the levels are too high). Even pharmaceuticals, personal care products, and other contaminants are finding their way into our water with unknown effects.
 - Quality of US surface water relies on The Clean Water Act of 1974. EPA works to implement this act and others and publishes concentration standards for water contaminants. The limits are set based on potential health risks. Even with these limitations, water contamination is still a problem.
 - Quote from EPA: warned that threats to drinking water are increasing.
 - A lot of people prefer bottled water, but they have problems too. Not only are they bad for the environment, but the quality of the water is subject to degradation (European study of levels of antimony in bottled water found that it increased by 90% after 6 months of storage).
 - Same standard for quality is applied to all potable water, but this is wasteful because different uses don't all require that quality of water. WELL seeks to preserve water while enhancing its quality for human health in different uses. They require an initial test to evaluate the quality and then will decide which filters to use.
- Fundamental Water Quality
 - Two properties of water – turbidity and total coliforms – serve as indicators for the presence of contaminants. High turbidity can provide a good home for germs and can indicate that a building's filtration system is not working properly (removing turbidity can remove bad pathogens). Coliform bacteria are naturally present in the environment and usually harmless, but their presence in water suggests that water may contain more dangerous pathogens. Exposure to these pathogens can lead to bad gastrointestinal effects, diarrhea, vomiting, nausea, and cramps. This feature requires performance tests.
 - Specifics:
 - All water on the site for human contact has turbidity less than 1.0 NTU

- All water on the site for human contact has NO total coliforms (including E. coli).
 - Body Systems: digestive, immune, nervous, urinary
- Inorganic Contaminants
 - Many metals are necessary for your health, but high levels of these can be very bad for you and even chronically toxic (ex. lead and mercury in drinking water has been linked to developmental delays, learning deficits, high blood pressure, and kidney problems). These contamination levels vary by geographic location, which means localized testing is needed. WELL sets maximum safety limits for inorganic contaminants in drinking water (reverse osmosis system or Kinetic Degradation Fluxion filters can remove dissolved metals).
 - Specifics:
 - All water for human consumption meets the following:
 - Lead less than 0.01 mg/L
 - Arsenic less than 0.01 mg/L
 - Antimony less than 0.006 mg/L
 - Mercury less than 0.002 mg/L
 - Nickel less than 0.012 mg/L
 - Copper less than 1.0 mg/L
 - Body Systems: cardiovascular, digestive, nervous, reproductive, urinary
- Organic Contaminants
 - Organic contaminants are generally found in small amounts in ground water and can pose serious threats. They usually come from industrial activities and chemical runoff into surface waters. Exposure to these, such as PCBs and vinyl chloride, can lead to cancer, immune deficiencies, and nervous system difficulties. This sets maximum limits for organic contaminants (and uses activated carbon filters to remove them).
 - Specifics:
 - All water for human consumption meets the following:
 - Styrene less than 0.0005 mg/L
 - Benzene less than 0.001 mg/L
 - Ethylbenzene less than 0.3 mg/L
 - PCBs less than .0005 mg/L
 - Vinyl chloride less than .002 mg/L
 - Toluene less than .15 mg/L
 - Xylenes less than .5 mg/L
 - Tetrachloroethylene less than .005 mg/L
 - Body Systems: digestive, endocrine, immune, nervous, reproductive, urinary
- Agricultural Contaminants
 - A US geological survey done in the 90's found pesticide compound in nearly every stream in agricultural, urban, and mixed-use areas and in 30-60% of groundwater. They enter the water supply through agricultural and storm water runoff and have been linked to kidney, thyroid, gastrointestinal, and reproductive effects (ex. atrazine, a pesticide, is thought to disrupt the endocrine system and is associated with heart problems; ex. glyphosate, an herbicide, may lead to kidney problems and reproductive difficulties). This calls for the responsible management of herbicide,

- pesticide, and fertilizer usage to help limit leaching into water sources. Also sets max safety limits for common pesticides and herbicides detected in indoor drinking water, which can be removed with carbon filters.
- Specifics:
 - All water for human consumption meets the following:
 - Atrazine less than 0.001 mg/L
 - Simazine less than 0.002 mg/L
 - Glyphosate less than 0.70 mg/L
 - 2,4-dichlorophenoxyacetic acid less than 0.07 mg/L
 - Nitrate (a fertilizer) less than 10 mg/L nitrogen
 - Body Systems: cardiovascular, digestive, endocrine, nervous, reproductive, urinary
 - Public Water Additives
 - Chemicals are sometimes intentionally added to water (ex. chlorine or chloramine for disinfectants or fluoride to prevent tooth decay), which is sometimes good for your health. However, too much exposure can lead to adverse effects (ex. fluorosis – the aesthetic mottling of the teeth, stomach discomfort, eye irritation, skin irritation, cancer, kidney damage). This feature requires projects to maintain the concentrations of disinfectants, disinfectant byproducts, and fluoride present in water under set limits.
 - Specifics:
 - All water for human consumption
 - Disinfectants: residual chlorine less than 0.6 mg/L and residual chloramine less than 4 mg/L
 - Disinfectant byproducts: total trihalomethanes less than 0.08 mg/L and total haloacetic acids less than 0.06 mg/L
 - Fluoride less than 4.0 mg/L
 - Body Systems: digestive, integumentary, reproductive, respiratory
 - Periodic Water Quality Testing
 - Industrial practices and temperature/weather may affect the leaching rate of inorganic metals into drinking water sources. Routine testing can help to detect chemicals in water and alert building occupants. Quarterly testing for inorganic metals ensures water quality year round. This requires detailed records are kept of all tests and a remediation plan is set if water quality is low.
 - Specifics:
 - Water for human consumption is tested quarterly and reports are sent to IWBI for lead, arsenic, mercury, and copper
 - Written policy specifying enforcement strategies for monitoring and record keeping of water quality, records kept for minimum of three years, detailed plan for remediation of unacceptable conditions
 - Body Systems: digestive, immune, nervous, urinary
 - Water Treatment
 - Sampling alone cannot guarantee the elimination of all pollutant risks. Unexpected events like droughts, flooding, construction, infrastructure changes, and other disruption to water supply can temporarily affect water quality. It's important to maintain water filters. WELL prescribes technologies designed to maintain high

water quality regardless of the water supply using precautionary filtration and sterilization processes (options: carbon filters, sediment filters, and UV sanitization).

- Specifics:
 - All water for the projects for human consumption or showers/baths is treated with an activated carbon filter (organic chemical removal), treated with a filter rated to remove suspended solids with pore size 1.5 or less (sediment filter), and treated with either UVGI water sanitation OR filter rated by the NSF to remove microbial cysts (microbial elimination).
 - Provide IWBI with record keeping for at least 3 years that show the filter and/or sanitizer has been maintained
 - Point by point narrative about how the building addresses Legionella includes:
 - Formation of a team for legionella management
 - Water system inventory and flow diagrams
 - Hazard analysis of water assets
 - ID of critical control points
 - Maintenance and control measures
 - Documentations of procedure
- Body Systems: not listed
- Drinking Water Promotion
 - Access to clear, delicious water promotes proper hydration, which is essential for your health. By improving the taste and appearance, it encourages consumption of tap water and discourages reliance on bottled water. Many healthy people suffer from dehydration that can result in cramps, dry skin, and headaches. This sets limits for dissolved minerals that can compromise the taste and appearance of water and requires that drinking water is easily accessible in a building.
 - Specifics:
 - Water for human consumption has
 - Aluminum less than 0.2 mg/L
 - Chloride less than 250 mg/L
 - Manganese less than 0.05 mg/L
 - Sodium less than 270 mg/L
 - Sulfate less than 250 mg/L
 - Iron less than 0.3 mg/L
 - Zinc less than 5 mg/L
 - Total dissolved solids less than 500 mg/L
 - To encourage water consumption, at least one dispenser is located within 100 feet (min 1/floor)
 - Water dispensers are cleaned daily (for mouthpieces, protective guards, collective basins) and quarterly for outlet screens and aerators
 - Body Systems: digestive, endocrine, urinary


WELL

Water

Emily Levinson | August 2016


BACKGROUND

- Clean drinking water is a pre-req for health
- Water: component of cells and transports waste and nutrients through body
- Regulates body temp and serves as shock absorber for brain and spinal cord
- Water contamination = huge health problem
- Can often lead back to industry processes




BACKGROUND

- Lead, arsenic, glyphosate, atrazine, and microbes occur naturally or accidentally get put in water → health threats
- Treatment and distribution centers meant to keep water safe can contaminate water (ex. chlorine and chloramine)



BACKGROUND

- EPA Clean Water Act of 1974: publishes water standards
- Same standard for quality is applied to all potable water, but this is wasteful
- Not all uses of water require such high quality




“Threats to drinking water are increasing. We can no longer take our drinking water for granted.” -EPA

FUNDAMENTAL WATER QUALITY

- Two properties of water serve as indicators of contaminants
 - Turbidity (good home for germs and indicate a bad filtration system)
 - Total coliforms (naturally present in environment, but in water can lead to GI problems)
- WELL sets limits for levels of these

Water Samples:



250 100 50 25 10

INORGANIC CONTAMINANTS

- Metals are necessary for your health, but can be bad for you in high levels (ex. Lead and Mercury)
- Contaminants vary by location → localized testing
- WELL sets limits for inorganic contaminants



ORGANIC CONTAMINANTS

- Organic contaminants usually found in small amounts in ground water → serious threats
- Usually from industrial activities and chemical runoff (ex. PCBs and vinyl chloride)
- WELL sets limits for organic compounds



AGRICULTURAL CONTAMINANTS

- Pesticides have been found in nearly every stream and in 30-60% of groundwater
- Enter water supply through runoff
- Leads to kidney, thyroid, GI, and reproductive problems
- WELL sets limits for pesticides and herbicides in water



PUBLIC WATER ADDITIVES

- Chemicals sometimes intentionally added (ex. Chlorine & chloramine for disinfectants; fluoride for tooth decay)
- Too much can lead to adverse effects
- WELL sets limits for disinfectants and fluoride in water



PERIODIC WATER QUALITY TESTING

- Industrial practices and temp may affect leaching rates of metals into water
- WELL requires quarterly routine testing to detect chemicals in water and records kept



WATER TREATMENT

- Sampling alone cannot guarantee the elimination of all risks
- Unexpected events (natural disasters, construction, etc.) can temporarily affect water quality
- WELL suggests using precautionary filtration and sterilization processes (carbon filters, sediment filters, UV sanitization)



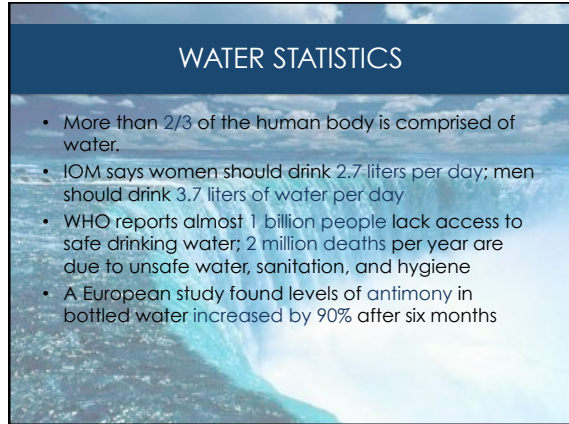
DRINKING WATER PROMOTION

- Access to clear delicious water promotes proper hydration → essential for health
- Improving taste and appearance of tap water encourages consumption
- WELL sets limits for dissolved materials and requires water is accessible in buildings



WATER STATISTICS

- More than 2/3 of the human body is comprised of water.
- IOM says women should drink 2.7 liters per day; men should drink 3.7 liters of water per day
- WHO reports almost 1 billion people lack access to safe drinking water; 2 million deaths per year are due to unsafe water, sanitation, and hygiene
- A European study found levels of antimony in bottled water increased by 90% after six months



Nourishment Introduction

The nourishment concept of the WELL Building Standard consists of fifteen features that promote a healthy diet and safe food handling techniques. Nutrition is vital in maintaining your health and to prevent chronic disease. Poor diet and nutrition can lead to obesity, which can then lead to an increased risk of chronic diseases, such as cardiovascular disease, diabetes, and cancer. WELL recognizes all of these and suggests strategies to maintain a healthy diet through proper nutrition and awareness of nourishment. This section includes an outline of the nourishment concept and a Powerpoint presentation that presents an overview of the nourishment concept.

Nourishment Outline

- Background
 - Nutrition plays a big role in health maintenance, weight management, and chronic disease prevention
 - Poor diet → US overweight and obesity epidemic → increased risk of cardiovascular disease, diabetes, and cancer
 - 2/3 (69%) of America adults (20+) are overweight
 - 1/3 (35%) are obese according to BMI
 - 1.9 billion (39%) adults worldwide overweight
 - 600 million (13%) adults worldwide are obese
 - Cultural food practices and unhealthy behaviors are a problem
 - Busy lives and workdays lead to on the go eating, sitting in front of the TV/computer while eating, snacking, eating large meals
 - High-fat, high-sugar snack foods of low-nutritional quality are being engineered to be tasty – these are often associated with advertisements
 - *Stat: More than \$1.6 billion is spent in the US each year to market cereal, fast-food, and soft drinks to kids*
 - *Stat: Half the US population consumes sugar-sweetened beverages each day; ¼ of population consuming over 200 calories from these daily*
 - *Stat: Average dietary intake in 2010 was nearly 2,600 calories per person per day which is a 25% increase since 1970*
 - Specific Foods
 - High consumption of SSBs → diabetes, metabolic syndrome, obesity, hypertension, dental caries, depression
 - High consumption of red and processed meat → heart failure, hypertension, coronary heart disease, colorectal and breast cancers
 - Low fruit and veggie consumption → higher rate of type 2 diabetes, cardiovascular mortality, breast and GI cancers
 - WHO reports that 2.7 million deaths worldwide due to insufficient fruit and veggie intake making it one of the top 10 factors contributing to global mortality
 - Dietary behaviors affected by social, economic, physiological, and environmental factors, but also built environment
 - Distance and access to grocery stores
 - Access to farmer's markets
 - Behavioral economics in cafeterias
 - Increased availability of healthy foods and reduced marketing and availability of unhealthy foods
 - Labels and caloric information
- Fruits and Vegetables
 - Regular consumption of fruits and veggies is the “cornerstone” of a healthy diet → lower risk of cancer, diabetes, heart disease, obesity
 - Dietary guidelines recommend average of 4 servings of fruit and 5 servings of veggies each day; only 8% of US population reach fruit and only 6% achieve veggie intake.

- WELL requires that a variety of fruits and veggies be available where food is provided (not applicable to projects that don't provide food service/vending).
- Specifics:
 - Either at least 2 types of fruit and 2 types of non-fried veggies offered OR at least 50% available options are fruits/non-fried veggies
 - Cafeterias include a salad bar with 360 access; fruits and veggies are visually apparent; vegetables are placed at the beginning of food service line; fruits are placed near checkout
- Body Systems: cardiovascular, digestive, endocrine, immune
- Processed Foods
 - Foods that contain highly processed ingredients are high in sugar, calories, added fats → little nutritional value → weight gain, obesity, type 2 diabetes, kidney disease, hypertension, etc. Average daily consumption of added sugars is 22 teaspoons per day and recommended is 6-9 teaspoons. WELL prohibits or limits the main components of highly processed foods.
 - Specifics:
 - No beverages or individually sold food item with more than 30 g of sugar per container sold/distributed (catering, vending, pantries)
 - Vending machines and menus must have at least 50% products with 15 g sugar or less per serving
 - If grain flour is primary ingredient, whole grain must be used
 - No partially hydrogenated oil in any food or beverage
 - Body Systems: cardiovascular, digestive, endocrine, reproductive, urinary
- Food Allergies
 - About 8% of children and 4% of adults in the US have food allergies and each year, about 30,000 people require emergency treatment, 2,000 are hospitalized, and 150 people die because of allergic reactions to food. There is no cure so it's important to clearly label ingredients. FDA requires all packaged foods label common allergens and some places have required allergen labeling for prepared foods in restaurants. WELL requires that all foods, beverages, snacks, etc. are labeled with 8 most common food allergens and gluten. This applies to prepared and packaged foods.
 - Specifics:
 - Label for: peanuts, tree nuts, fish, shellfish, soy, milk/dairy, egg, wheat, and gluten
 - Gluten uses definition from FDA in 21 CFR 101.91
 - Body Systems: digestive, endocrine, immune, integumentary, respiratory
- Hand Washing
 - Hand washing is essential in reducing the transmission of pathogens through food. It's responsible for app 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths in the US each year. Foodborne illness is preventable. Rinsing with soap, water, and drying with a paper towel (rather than air dryer) is best to avoid spread of germs. This requires that hand washing is accessible in appropriate environments.
 - Specifics:
 - All sinks have fragrance free, non-antibacterial soap in dispensers with disposable and sealed soap cartridges and disposable paper towels

- Bathroom and kitchen sinks have a sink column of water at least 10 inches (25 cm) in length and hand washing basin is at least 9 inches (23 cm) in width and length
 - Body Systems: digestive, endocrine, immune, integumentary, reproductive
 - Food Contamination
 - Raw meat (meat, fish, poultry) pose increased risk of being contaminated with bacteria and can be transmitted to other items via cutting boards, surfaces, and equipment. This can lead to GI problems (food poisoning). To keep this from happening, foods must be prepared at high temps and use good sanitation. WELL requires the separation of raw foods from prepared foods in prep and storage areas to reduce risk of cross-contamination. Labeling is also vital.
 - Specifics:
 - Cold storage spaces with raw meat required to have at least one removable/cleanable drawer designated for raw meat
 - Visual display of holding temp to ensure accurate temp
 - Body Systems: digestive and immune
 - Artificial Ingredients
 - Artificial ingredients (with no nutritional value) are added to food to improve taste and increase shelf life. Some people may be sensitive to them (ex. sulfites can lead to breathing problems if you have asthma). WELL requires clear labeling of all artificial colors, sweeteners, and preservatives present in foods to let consumers make more informed decisions.
 - Specifics:
 - Labeled if they contain: artificial colors, artificial flavors, artificial sweeteners, brominated vegetable oils, potassium bromate, BHA, BHT, MSG, HVP, sodium nitrate/nitrite, and sulfites
 - Body Systems: digestive, nervous, urinary
 - Nutritional Information
 - People make more informed decisions about food if they have access to nutritional info. FDA sets requirements for nutrition labeling in packaged foods (and some places require it with prepared foods). WELL requires that food sold and distributed on premises (packaged and prepared) are labeled.
 - Specifics:
 - Labels have total calories, macronutrient content (protein, fat, carbs), micronutrient content (vitamins A, C, calcium, and iron) and total sugar
 - Body Systems: cardiovascular, digestive, muscular, skeletal
 - Food Advertising
 - See Background section for stats on advertising. Advertising unhealthy foods leads to obesogenic (obesity-promoting) environment. WELL eliminates the advertising of unhealthy foods, while promoting the advertising of better food choices to help individuals learn about and develop better eating habits.
 - Specifics:
 - Ads that don't conform to requirements in Processed Foods feature not displayed
 - At least 3 prominent displays encouraging consumption of whole, natural foods or discouraging consumption of sugary, processed foods

- Body Systems: cardiovascular, digestive, endocrine, immune, integumentary, skeletal
- Safe Food Preparation Materials
 - Food prep equipment can be a source of bad contaminants. Porous surfaces can harbor bad toxins and chemicals used in equipment can leach during use (ex. chemicals you use to make something non-stick). Example is BPA that's in plastic and can be released when BPA is exposed to heat → negative health effects. WELL suggests safer options for food prep equipment and limits material uses.
 - Specifics:
 - Pots, pans, and other cooking tools made from either: ceramics (without lead), cast iron, stainless steel, glass, coated aluminum, or solid untreated wood
 - Cutting boards made from either: marble, plastic, glass, pyroceramic, solid untreated wood
 - Body Systems: digestive, endocrine, immune, integumentary, reproductive, urinary
- Serving Sizes
 - Easy access to big meals → excess caloric intake → weight gain and obesity. Studies show that people eat more when provided with larger plates/bowls. Larger portions of energy-dense foods promote overconsumption. WELL reduces unintended overconsumption without imposing restrictions on consumer choice.
 - Specifics:
 - At least half of food sold/distributed each day has the option on the menu of a portion that is 650 calories or less and is cheaper than the regular version
 - For self-serve food services, circular plate diameter is no larger than 9.5", non-circular plate does not exceed 70", bowls are no larger than 10 oz, and cups no larger than 8 oz
 - Body Systems: cardiovascular, digestive, endocrine, immune
- Special Diets
 - People with food allergies or restrictions sometimes have trouble finding meal options. Clear labeling can help these people eat foods that are safe for them. WELL requires food places provide/sell food to include a variety of meal options to those with common allergies and dietary restrictions.
 - Specifics:
 - At least one option is provided for each of the following: peanut-free, gluten-free, lactose-free, egg-free, vegan, vegetarian
 - Body Systems: digestive, immune, integumentary
- Responsible Food Production
 - Although research on the health effects of eating organic vs. nonorganic is still inconclusive, studies have found higher levels of antioxidants and lower levels of pesticide residues and bacteria in organic food. Organic/sustainable farming practices are meant to reduce environmental pollution and increase quality of life of the livestock we need for our food. This feature requires the adoption of organic and free-range products.
 - Specifics:
 - Produce meets Federally Certified Organic labeling
 - Meat, eggs, and dairy meets Humane Certified labeling and Federally Certified Organic
 - Body Systems: cardiovascular and immune

- Food Storage
 - Most refrigerators are not actually designed to keep fruits and veggies fresh because they need higher temps (think: crisper drawers, but those are too small for everyone to use). This requires refrigerators and food storage equipment to provide sufficient storage space for produce that includes temperature control capabilities.
 - Specifics:
 - Cold storage has a total volume of at least 20 L per occupant (.7 cubic feet)
 - Body Systems: digestive and immune
- Food Production
 - Gardening and cultivating produce/herbs increases access to these healthy foods and allows people to be more engaged with the food production process. Studies show that gardening leads to better eating habits, more positive perceptions of health, and lower risk of obesity. WELL's optimization feature provides occupants with space and tools to grow vegetables.
 - Specifics:
 - A space of at least 1 ft² per occupant is allocated within .5 mi of the project for either/or garden or greenhouse
 - Supplies provided: planting medium, irrigation, lighting (interior only), plants, gardening tools
 - Body Systems: cardiovascular, digestive, immune, muscular, skeletal
- Mindful Eating
 - Busy workdays and no communal eating spaces lead people to eat in isolation during their meal breaks. Distracted eating (doing work, reading, watching TV, computer, etc.) can lead to eating more. Focusing on your eating may lead to better control of food intake. WELL provides building occupants with dedicated spaces for eating and socializing. Time spent in these areas can lead to better eating habits, better social interaction, and help reduce stress.
 - Specifics:
 - Eating spaces for employees has tables and chairs that accommodate at least 25% of employees and is located within 200 ft of at least 90% of all occupants
 - Eating spaces for employees has refrigerator, microwave/toaster oven, and sink; dish washing space; at least one storage unit; and eating utensils
 - Body Systems: digestive, nervous

WELL

Nourishment

Emily Levinson | August 2016

BACKGROUND

- Nutrition plays huge role in health maintenance, weight management, and chronic disease prevention
- Poor diet → US overweight and obesity epidemic → increased risk of cardiovascular disease, diabetes, and cancer
 - Ex. High consumption of sugary sweet beverages (SSBs) → diabetes, metabolic syndrome, obesity, hypertension, dental caries, depression



BACKGROUND

- Cultural food practices lead to unhealthy behaviors
 - Busy lives lead to on the go eating, sitting in front of the TV, working while you eat, snacking, eating large portions
- High fat, high sugar snack foods (low nutritional quality) are being engineered to be tasty
 - Associated with advertisements



BACKGROUND

- Dietary behaviors are affected by social, economic, physiological, and environmental factors
 - Ex. Advertising, Caloric Information, Labels
- Built environment factors
 - Distance and access to grocery stores
 - Access to farmer's markets
 - Behavioral economics in cafeterias



“Threats to drinking water are increasing. We can no longer take our drinking water for granted.” -EPA

FRUITS AND VEGETABLES

- Regular consumption of fruits and veggies is “cornerstone” of healthy diet → lower risk of cancer, diabetes, heart disease, obesity
- People don't eat enough fruits and veggies
- WELL requires a variety of fruits and veggies be available where food is provided
 - At least 2 types of each or 50% of food served



PROCESSED FOODS

- Highly processed foods are high in sugar, calories, added fats → little nutritional value → weight gain, obesity, type 2 diabetes, kidney disease, hypertension, etc.
- People eat too many added sugars
- WELL sets limits on what processed food is served
 - Ex. Nothing with more than 30 g of sugar



FOOD ALLERGIES

- Many people have food allergies that can be dangerous or fatal
- No cure for allergies so you must clearly label ingredients
- FDA requires all packaged foods to label common allergens
- WELL requires all packaged and prepared foods are labeled with common allergens



HAND WASHING

- Hand washing is essential in reducing transmission of pathogens through food
- Foodborne illness and death rates are high, but preventable
- WELL requires that hand washing is accessible in appropriate environments



FOOD CONTAMINATION

- Raw meat, fish, and poultry are at a higher risk of being contaminated with bacteria and transmitting that to other items
- Can lead to GI problems
- Food must be prepared at high temps and use good sanitation
- WELL requires that raw foods are separated from prepared foods in storage and prep areas



ARTIFICIAL INGREDIENTS

- Artificial ingredients with no nutritional value are often added to foods to improve taste and shelf life
- Some people are sensitive to them
- WELL requires clear labeling of all artificial colors, sweeteners, and preservatives



NUTRITIONAL INFORMATION

- People make more informed decisions about food if they have access to nutritional information
- FDA sets req's for nutrition labeling in packaged foods
- WELL requires that packaged and prepared foods are labeled
 - Total calories, macronutrient content, micronutrient content, and total sugar

Nutrition Facts	
Serving Size 1/2 cup (115g)	
Servings Per Container About 4	
Amount Per Serving	Calories from Fat 130
Calories 250	
% Daily Value*	
Total Fat 14g	22%
Saturated Fat 9g	45%
Cholesterol 55mg	18%
Sodium 75mg	3%
Total Carbohydrate 26g	9%
Dietary Fiber 0g	0%
Sugars 26g	
Protein 4g	
Vitamin A 10%	Vitamin C 0%
Calcium 10%	Iron 0%

* Percent Daily Values are based on a diet of 2,000 calories.

FOOD ADVERTISING

- US spends \$1.6 billion each year to market cereal, fast-food, and soft drinks to kids
- Advertising unhealthy foods → obesogenic environment
- WELL eliminates advertising of unhealthy foods and promotes the advertising of better food choices



SAFE FOOD PREPARATION MATERIALS

- Food prep equipment can be a source of bad contaminants
- Can harbor toxins
- Added chemicals can leach (ex. BPA)
- WELL suggests safer material options for food prep equipment



SERVING SIZES

- Easy access to big meals → excess caloric intake → weight gain and obesity
- Studies show people eat more when provided with larger plates/bowls
- WELL reduces unintended overconsumption by having limits on portion size and serving utensils



SPECIAL DIETS

- People with food allergies and restrictions sometimes have a hard time finding options
- Clear labeling can help these people eat foods that are safe for them
- WELL requires food places provide a variety of meal options to those with common allergies and food restrictions



RESPONSIBLE FOOD PRODUCTION

- WELL recognizes that research on organic foods is inconclusive
- Organic food has higher levels of antioxidants and lower levels of pesticide residue
- Organic and sustainable farming is meant to reduce environmental impact and increase animal's quality of life
- WELL requires adoption of organic products



FOOD STORAGE

- Refrigerators are not designed to keep fruits and veggies fresh
- They need higher temperatures (crisper drawers)
- WELL requires refrigerators have sufficient storage space for produce with temp controls



FOOD PRODUCTION

- Gardening increases access to healthy foods
- Allows people to be more engaged with food production habits
- Has been shown that it leads to better eating habits
- WELL provides occupants with space and tools to grow veggies



MINDFUL EATING

- Busy workdays and no common eating areas lead people to eating in isolation or doing other things while eating
- Focusing on your food gives you better control of food intake
- WELL provides building occupants with dedicated space for eating and socializing



NOURISHMENT STATISTICS

- 2/3 (69%) of America adults are overweight
- 1/3 (35%) of American adults are obese
- 1.9 billion (39%) adults worldwide overweight
- 600 million (13%) adults worldwide are obese
- More than \$1.6 billion is spent in the US each year to market cereal, fast-food, and soft drinks to kids
- Half the US population consumes SSBs each day; 1/4 of population consuming over 200 calories from these daily
- Average dietary intake in 2010 was nearly 2,600 calories per person per day which is a 25% increase since 1970

Light Introduction

The WELL Building Standard includes light as a concept with eleven features that aim to make the lighting in a space the best it can be for occupants through strategies, such as minimizing unwanted glare and increasing natural light in a space. The background section of the light concept explains what light is and how it works in conjunction with the human eye. WELL recognizes that light can affect our eyes, but also can influence our body in non-visual ways, such as through our circadian rhythm. This section includes an outline of the light concept and a Powerpoint presentation.

Light Outline

- Background
 - Light is a visible form of electromagnetic radiation between UV radiation at smaller wavelengths and infrared at larger wavelengths
 - Lighting codes and guidelines based on how much light people need to do activities are set by technical groups like IES (Illuminating Engineering Society). Light intensity for visual acuity is measured in lux (or fc), which is a measure of the way the eye responds to light weighted to the response of the cone cells.
 - Eyes:
 - Light enters the eye and hits photoreceptors on the retina (rods, cones, and intrinsically photosensitive retinal ganglion cells [ipRGCs])
 - These cells absorb the light and send it as info to the brain
 - Rods control peripheral vision + vision in dim light; has a peak sensitivity to green-blue light (498 nm)
 - Cones control daytime vision and color; peak sensitivity to green-yellow light (555 nm)
 - ipRGCs send info to the brain (suprachiasmatic nucleus) to trigger reactions; peak sensitivity to teal-blue light (app. 480 nm)
 - Light influences the body in non-visual ways
 - Circadian rhythm: internal clock that synchronizes physiological functions
 - Body responds to zeitgebers: external cues that align physiological function to solar day and keep internal clock synchronized (process “circadian photoentrainment”)
 - Physiological processes (ex. alertness, digestion, sleep) regulated by hormones involved in circadian photoentrainment
 - Sleep
 - Light exposure plays a huge role in sleep
 - Institute of Medicine: app 50-70 million US adults have chronic sleep or wakefulness disorder → increased risk of diabetes, obesity, depression, heart attack, hypertension, stroke
 - People spend so much of their time inside and insufficient illumination or improper lighting design can lead to problems in circadian phase
 - People are sensitive to light – light exposure in late night/early morning shifts rhythm forward (*phase advance*) and exposure in late afternoon/early night shifts rhythm back (*phase delay*)
 - Body requires periods of brightness and darkness
- Visual Lighting Design
 - We need adequate levels of light for different activities. Brightness contributes to feeling of spaciousness and overall visual appeal. Ambient light of 300 lux is enough for most tasks, but workspaces may need targeted task lighting. This establishes light levels for basic visual performance and promotes the pairing of adjustable direct task lighting and indirect ambient light.
 - Specifics:
 - At workstations or desks

- Ambient lighting maintains average of 20 fc+ measured on horizontal plane 30 inches AFF (but can be dimmed if there is daylight)
 - Ambient lighting system zoned in independently controlled banks no larger than 500 sq. ft or 20% of open floor area
 - If ambient light is less than 300 lux, task lighting provides 300-500 lux at the work surface
 - Provide narrative about maintaining luminance balance with at least 2 of the following:
 - Brightness contrast between main room and ancillary spaces
 - Brightness contrast between task surfaces and adjacent surfaces
 - Brightness contrast between task surfaces and remote, non-adjacent surfaces (in same room)
 - The way brightness is distributed across ceilings
 - Body Systems: endocrine, muscular, nervous
- Circadian Lighting Design
 - Light drives the circadian system (starts in the brain and regulates physiological rhythms throughout the body's tissues and organs; affects hormone levels and sleep/wake cycle). This feature promotes lighting environments for circadian health (biological effects of light on people can be measured in EML [equivalent melanopic lux] – see Tables L1 and L2 in Appendix C for calculation instructions).
 - Specifics: At least one of the following is met
 - Light models or calculations show that at least 250 EML is present at 75%+ workstations measured on the vertical plane facing forward; 4 feet AFF; present at least 4 hours per day
 - Electric lights provide maintained illuminance on vertical plane of EML greater or equal to the lux recs in the Vertical Targets for the 25-65 category in Table B1 of IES-ANSI-RP-1-12 for all workstations
 - Body Systems: cardiovascular, digestive, endocrine, immune, muscular, nervous
- Electric Light Glare Control
 - Non-diffuse, bright indoor lights create uneven levels of brightness in the visual field – results in glare (excessive brightness of the light-source, excessive brightness-contrasts and excessive quantity of light). Glare causes discomfort glare, fatigue, visual impairment, and disability glare (injury) either from direct or reflected glare. WELL sets limits on glare based on measures of luminous intensity, or luminance per area of light source (amount given in cd/m²). Light fixtures with intense luminous output require a shielding angle to reduce glare.
 - Specifics:
 - Lamps with certain luminance are shielded by at least the angle listed below:
 - Less than 20,000 cd/m² : no shielding required
 - 20,000 – 50,000 : 15 degrees
 - 50,000 – 500,000 : 20 degrees
 - 500,000+ : 30 degrees
 - At workstations, desk, seating surfaces, bare lamps more than 53 degrees above the center of view have luminances less than 8,000 cd/m²
 - Body Systems: muscular, nervous, skeletal
- Solar Glare Control

- Bright light during the day is good for health, but uneven levels of brightness can cause glare. Glare is caused by light scattering within the eye (intraocular scattering), which creates a veil of luminance that reduces the contrast as received by the retina. This feature prescribes different solutions for effectively managing disruptive glare emanating from windows.
- Specifics:
 - At least one of the following for all glazing less than 7' AFF:
 - Interior window shading controllable by occupant or automatic
 - External shading system set to prevent glare
 - Variable opacity glazing that reduces transmissivity by 90%+
 - At least one for all glazing more than 7' AFF
 - Interior window shading set by occupant or automatic
 - Exterior shading system set to prevent glare
 - Interior light shelves to reflect sunlight toward the ceiling
 - Film of micro-mirrors on the window that reflects sunlight toward ceiling
 - Variable opacity glazing that reduces transmissivity by 90%+
- Body Systems: muscular, nervous, skeletal
- Low-Glare Workstation Design
 - Glare generated when high-intensity electric or natural light reflects off glossy surfaces can be uncomfortable. Adjusting the angle at which the light hits the surface can help direct light away from the eye and avoid glare. This seeks to minimize glare and high luminance contrast between computer screens and surrounding background through consideration of the spatial orientation of occupant spaces.
 - Specifics:
 - All computer screens at desks located within 15' of view windows can be oriented within a 20 degree angle perpendicular to the window plane to avoid glare
 - Overhead lights are not aimed directly at computer screens
 - Body Systems: muscular, nervous, skeletal
- Color Quality
 - Color quality is a function of the spectral output of a light source, the spectral absorbance/reflectance of an object, and the sensitivity of the eye's cone photoreceptors to different wavelengths of light (how we perceive color). Color quality impacts visual appeal and occupant comfort. Poor color quality can reduce visual acuity. This feature relies on the use of the CRI (color rendering index – how we measure color)
 - Specifics:
 - Electric lights (except decorative fixtures, emergency lights, other special-purpose lighting) has CRI (R1 – R8) or 80+ and R9 is 50+
 - Body Systems: nervous
- Surface Design
 - Light exposure mainly occurs 2 ways: 1. Directly from luminous sources 2. Indirectly from reflected surfaces. Most light encountered within a building is reflective and the surface greatly affects the amount of light that reaches your eye. This sets parameters for the reflective quality of surfaces to control the overall light intensity within a

- space. Surfaces with low LRVs absorb light from the source and have a low light intensity. Higher LRVs mean the surface reflects more light from the source and a higher light intensity, which promotes alertness and activity so it's good to select surfaces with a high LRV (good amount of light reaches light without increasing energy consumption or glare).
- Specifics:
 - Ceilings have average LRV of 80%+ for at least 80% of surface area
 - Walls have average LRV of 70%+ for at least 50% of surface area
 - Furniture systems have average LRV of 50% of surface area
 - Body Systems: endocrine, muscular, nervous
 - Automated Shading and Dimming Controls
 - Adjustable window shades and lights with dimmers are great, but have to be managed to be effective. Automated controls can help to ensure that they are operating and the occupants are getting the benefits (like glare avoidance and energy reduction and comfort without disruption). This requires automated control systems to ensure window shades are effectively used.
 - Specifics:
 - Windows larger than 6 sq. ft. have shading devices that automatically engage when they sense that sunlight could cause glare
 - All lighting (except decorative fixtures) uses occupancy sensors to dim to 20% of less (or turn off) when zone is unoccupied and is programmed to dim in response to daylight
 - Body Systems: endocrine, immune, muscular, nervous, reproductive, skeletal
 - Right to Light
 - Exposure to adequate levels of sunlight is critical for health and visual comfort, psychological, neurological, and physiological benefits. Proximity to windows, outdoor views, and daylight is sought after by occupants so buildings should utilize the daylight as a main source of lighting as much as possible. This feature sets minimum distances from windows to regularly occupied spaces.
 - Specific:
 - 75% of the area is within 25' of view windows
 - 75% of all workstations are within 25' of atrium/window with an exterior view
 - 95% of all workstations are within 41' of atrium/window with exterior view
 - Body Systems: cardiovascular, digestive, endocrine, immune, muscular, nervous, reproductive
 - Daylight Modeling
 - Exposure to daylight is good for health and circadian rhythm and reduces dependency on electricity, but too much sunlight can cause glare and unwanted visual contact. This is important throughout the day and throughout the year because of seasonal changes. This requires that people in a building receive ample exposure to natural sunlight and allows designers versatility for a variety of layout and daylighting designs.
 - Specifics:
 - Lighting simulations to demonstrate that spatial daylight autonomy is achieved for at least 55% of regularly occupied space (i.e. at least 55% of the

- space receives at least 300 lux of sunlight for at least 50% of operating hours each year)
 - Annual sunlight exposure is achieved for no more than 10% of occupied space (i.e. no more than 10% of the area can receive more than 1,000 lux for 250 hours each year)
 - Body Systems: cardiovascular, digestive, endocrine, immune, muscular, nervous, reproductive
- Daylighting Fenestration
 - Natural light can improve occupant mood, alertness, and overall health. Windows are a key variable in ensuring that occupants receive enough light for the good stuff, but not too much that it's distracting and uncomfortable. Balancing energy performance, thermal comfort, and access to quality daylight is essential. This outlines design parameters for windows to optimize the quantity and quality of daylight while minimizing unwanted glare and thermal heat gain.
 - Specifics:
 - On facades: window-wall ratio measured on external elevations is between 20% - 60% (40%+ requires external shading or adjustable opacity glazing; 40% - 60% of window area is at least 7 feet above the floor)
 - All glazing higher than 7 feet from the floor has visible transmittance (VT) of 60% or more and glazing located 7 feet or lower from the floor has VT of 50% or more
 - The visible light transmittance of wavelengths between 400-650 nm does not vary by more than a factor of 2
 - Body Systems: cardiovascular, digestive, endocrine, immune, muscular, nervous, reproductive

WELL

Light

Emily Levinson | August 2016

BACKGROUND

- Light: visible form of electromagnetic radiation between UV radiation and infrared wavelengths
- Light codes based on how much light people need to do activities set by groups (ex. IES)
- Light intensity measured in lux (or fc)
 - Lux: measure of the way the eye responds to light weighted to the response of the cone cells

EYES

- Light enters the eye → hits photoreceptors on the retina and intrinsically photosensitive retinal ganglion cells → these cells absorb the light and send info to the brain
- Retina:
 - Rods: control peripheral vision and vision in dim light; has peak sensitivity to green-blue light
 - Cones: control daytime vision and color; peak sensitivity to green-yellow light
 - ipRGCs: send info to the brain to trigger reactions; peak sensitivity to teal-blue light

Fig. 1.1. A drawing of a section through the human eye with a schematic enlargement of the retina.

CIRCADIAN PHASE

- Circadian rhythm: internal clock that synchronizes physiological functions
 - Light exposure late night/early morning – phase advance
 - Light exposure late afternoon/early night – phase delay
- Circadian phototainment: process where your body responds to zeitgebers
 - Zeitgebers: external cues that align physiological function to day and keep clock synchronized
 - Hormones involved in this process regulate physiological process (alertness, digestion, sleep)
- People are sensitive to light and insufficient illumination can lead to problems in this phase, esp. since people spend so much of their time inside
- Body needs brightness and darkness

SLEEP

- Light exposure plays a huge role in sleep
- IOM estimates 50-70 million US adults have chronic sleep or wakefulness disorder → increased risk of diabetes, obesity, depression, heart attack, hypertension, stroke

GLARE

- Glare: excessive brightness of the light source, excessive brightness-contrasts, and excessive quantity of light
- Caused by light scattering within the eye (intraocular scattering) creates a veil of luminance that reduces contrast received by the retina
- Causes discomfort glare, fatigue, visual impairment, and disability glare
- Direct vs. Reflected Glare

VISUAL LIGHTING DESIGN

- Need adequate levels of light for activities
- Brightness → feeling of spaciousness and visual appeal
- Ambient light of 300 lux is usually enough; workstations may need more task lighting
- Establishes basic light levels (in lux/fc) and promotes pairing of adjustable task + ambient light
- Required narrative about luminance maintenance



CIRCADIAN LIGHTING DESIGN

- Light drives circadian system
- Promotes lighting environment for circadian health
 - Biological effects of light on people measured in EML
 - Use light models/calculations to show EML levels



ELECTRIC LIGHT GLARE CONTROL

- WELL sets limits on glare
- Based on measure of luminous intensity (cd/m^2)
- Light fixtures with intense luminous output require a shielding angle to reduce glare
- Certain luminance must have shields at certain angles



SOLAR GLARE CONTROL

- Bright light during the day is good for health, but can cause glare
- WELL offers different solutions for managing glare from windows
- (ex. Shades, light shelves, glazing)



LOW-GLARE WORKSTATION DESIGN

- Glare can come from reflections off glossy surfaces
- Adjust the angle at which light hits the surface
- WELL considers spatial orientation to minimize glare on computer screens



COLOR QUALITY

- Color quality
 - function of the spectral output of a light source
 - spectral absorbance/reflectance of an object
 - Sensitivity of eye's cone photoreceptors to different wavelengths of light
- Impacts visual appeal and comfort
- Poor color quality can reduce visual acuity
- WELL sets standards for CRI



SURFACE DESIGN

- Light exposure 2 ways:
 - Directly from luminous sources
 - Indirectly from reflected surfaces
- Sets parameters of reflective quality of surfaces (ceilings, walls, furniture systems) to control overall light intensity
- Low LRV = lower light intensity
- High LRV = higher light intensity → alertness and productivity



AUTOMATED SHADING AND DIMMING CONTROLS

- Adjustable windows and lights are great, but ineffective if not managed
- Automated controls help to ensure they're operating and getting the benefits (glare avoidance, energy reduction, comfort)
- Requires automated control systems for window shades and lighting



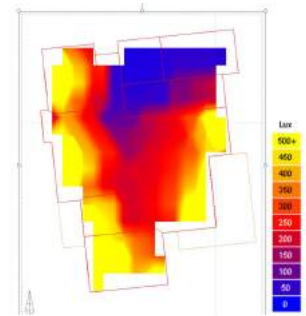
RIGHT TO LIGHT

- Sunlight is critical for health (visual comfort, psychological, neurological, physiological)
- Proximity to windows, views, daylight is sought after
- Building should utilize daylight as main source of light as much as possible
- Sets minimum distances from windows to spaces



DAYLIGHT MODELING

- Too much sunlight is also an issue
- Important throughout day and year
- Requires lighting simulations to demonstrate that people are receiving adequate daylight



DAYLIGHTING FENESTRATION

- Natural light: improves mood, alertness, overall health
- Windows are important so occupants receive the benefits, but not the distractions
- Balancing energy performance, thermal comfort, and access to daylight is important
- WELL sets parameters for windows to optimize quality and quantity of daylight (sets ratios and visible transmittance)



Fitness Introduction

Along with quality nutrition, doing physical activity is important for optimal health. WELL uses the Center for Disease Control's [CDC] definition of fitness and the American College of Sports Medicine's [ACSM] recommendations for physical activity. WELL recognizes that people are more sedentary than they used to be and that the built environment can contribute to this both positively and negatively. According to WELL, neighborhood walkability, access and use of mass transit, active transportation, availability of physical activity facilities, stair accessibility, and active furnishings are all components of the built environment that contribute to physical activity issues. WELL presents eight features in the fitness concept to address these issues. This section includes an outline of the concept and a Powerpoint presentation of the nourishment concept.

Fitness Outline

- Background
 - CDC defines fitness as “the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure time pursuits and respond to emergencies”.
 - People need regular physical activity to have good health (weight management, chronic disease prevention, and fitness maintenance). Physical inactivity is one of the biggest threats to public health and an independent risk factor for chronic disease including:
 - 30% ischemic heart disease
 - 27% of type 2 diabetes
 - 21-25% breast and colon cancer
 - Increase odds of having stroke by 20-30%
 - Shave off 3-5 years of life
 - Physical inactivity is 4th leading risk factor for mortality (6-9% deaths worldwide each year)
 - American College of Sports Medicine: all adults have at least 30 minutes of moderate-intensity aerobic activity 5 days/week and muscle-strengthening 2 days/week
 - In US, fewer than 50% of elementary school students, 10% adolescents, and 5% of adults obtain 30 mins of physical activity
 - Over 60% people worldwide don't get the recommended physical activity
 - Average adult only gets 6-10 physical activity each day
 - Most people today are physically inactive (due to cars, sedentary jobs, etc.) The issue is multi-faceted, but the built environment is a known cause. Included in this are
 - Neighborhood walkability
 - Access and use of mass transit
 - Active transportation
 - Availability of physical activity facilities
 - Stair accessibility
 - Active furnishings
- Interior Fitness Circulation
 - Small amounts of physical activity can be provided with use of interior pathways and stairs to decrease sedentary ways. Using stairs burns calories and improves cardiorespiratory fitness and lowers the risk of stroke. WELL uses prominent designs and appealing aesthetics to promote the use of stairs and walking paths and decrease reliance on elevators.
 - Specifics
 - At least one staircase is accessible to occupants during regular business hours and signage is by elevators to encourage use of stairs
 - For projects with 2-4 floors, at least one staircase is located within 25' of the entrance to the building/lobby, is clearly visible from entrance, and has a width of min 56" between handrails
 - Common stairs and paths of travel has two of the following: artwork, music, daylighting, view windows, light levels of at least 20 fc

- Body systems: cardiovascular, muscular, skeletal
- Activity Incentive Programs
 - Health benefits of physical activity: reduced risk of chronic disease (cancer, cardiovascular disease, and diabetes), better mental health, and increased quality of life. Even just 2.5 hours of moderate activity per week can reduce overall mortality risk by 20%. Small incentives can make people more willing to do physical activities. WELL uses existing federal programs and parts of corporate wellness plans to enable workers to adopt more physically active lifestyles.
 - Specifics:
 - A least two of the following:
 - Tax-exempt payroll deductions (relating to bicycle commuting and mass transit – ex. Transportation Fringe Benefits in Section 132(f) of US IRC) or a subsidy
 - \$200+ reimbursement or incentive payments when a worker goes to the gym at least 50 times in a 6 month period
 - \$240+ subsidy per year for employees interested in participating in races, group fit activities, and sports teams
 - Subsidy of at least \$240 for employees to cover cost of fitness or training in gyms/studios
 - \$50+ subsidy for bike share memberships
 - Fitness program in which is demonstrated that at least 30% occupants utilize free access to gym/classes
 - Body systems: muscular and skeletal
- Structured Fitness Opportunities
 - People can learn new fitness techniques and how to achieve their goals if they have access to professional advice and training programs (especially people with special considerations/disabilities). Training programs have the potential to increase aerobic fitness and muscle endurance, assist in weight loss, lower blood pressure, and decrease worker absenteeism. This requires access to personalized fitness advice and group classes (to make a step towards a healthier life).
 - Specifics:
 - Onsite fitness or training programs on-site at least once a month
 - Classes from a professional at least once every 3 months (about different modes of exercise, safe fitness techniques, or comprehensive exercise regimens)
 - Body systems: cardiovascular and digestive
- Exterior Active Design
 - Lower rates of obesity and higher physical activity levels have been linked with a greater land-use mix. People are more likely to walk and use public transit if retail shops, bus stops, and offices are within walking distances from residences. Having a cyclist and pedestrian friendly environment and using active design can encourage physical activity. Occupant activity can be supported through benches, drinking fountains, and water bottle refilling stations along walking routes. WELL requires exterior design details and amenities to promote more active living (esp. in isolated buildings).
 - Specifics:

- Sites in which the building takes up less than 75% of total lot size has at least one: bench, movable chairs/tables, drinking fountain/water station AND at least two of the following (to promote pedestrian activity): water feature, plaza, garden, public art
 - AND at least one (to encourage neighborhood connectivity): WalkScore 70+ or eligible for at least 3 points of LEED “Surrounding density and diverse uses” credit
 - Body systems: cardiovascular, muscular, nervous, respiratory, and skeletal
- Physical Activity Spaces
 - Indoor and outdoor physical activity facilities within a census-block is associated with an increase in likelihood in performing 5x more physical activity per week. This leads to a lower risk of being overweight. Buildings with interior fitness space encourage workers to engage in different types of exercise. WELL requires proper space allocation or arrangements to support exercise and promote fitness.
 - Specifics:
 - Spaces with 10+ occupants have dedicated exercise space that is at least 200 square feet plus 1 square foot per occupant up to max of 4,000 square feet
 - One of the following is accessible within 0.5 mile walking distance: park (with playground, workout areas, trails, water) OR complimentary access to gyms, fields, or pool
 - Body systems: cardiovascular, muscular, and skeletal
- Active Transportation Support
 - Active transportation reduces carbon footprint and integrates physical activity into daily routine. Biking or walking to work → lower rates of diabetes, hypertension, overweight, and obesity. WELL requires showers and bicycle storage be provided to support active transportation.
 - Specifics:
 - Basic bicycle maintenance tools (pumps, keys, kits, etc.) AND separate and secure bicycle storage (for at least 5% occupants and 2.5% of visitors) both provided within 650 feet of building
 - One shower and changing facility (for first 100 occupants and one extra for every 150 after) AND one locker for every 5 occupants are provided within 650 feet of building
 - Body systems: cardiovascular and nervous
- Fitness Equipment
 - Access to fitness equipment supports various styles of exercise. Aerobic and muscle strengthening activities → weight control, lower risk of cardiovascular disease, diabetes and cancer, better bone health, cardiorespiratory and muscular fitness, and improved cognitive function. WELL requires provision of exercise equipment in the building that supports cardiorespiratory and muscle-strengthening exercise.
 - Specifics:
 - Some combo of the following for free use of 1% of occupants: treadmills, elliptical machines, rowing machines, stationary bikes
 - Some combo of the following for free use of 1% occupants: multi-station equipment, bench press, full squat rack, pull-up bar
 - Body systems: doesn't list

- Active Furnishings
 - People spend most of their time inside. Prolonged sitting → increased risk of cancer, weight gain, greater fatigue, and back discomfort. Sitting burns 50 less calories than standing and sitting is associated with a 2-year lower life expectancy. Regular exercise does not negate the consequences of prolonged sitting, but creating opportunities to mitigate sitting is necessary. Active furnishings are required to reduce long periods of sitting and encourage small amounts of physical activity throughout the day.
 - Specifics:
 - Some combo of the following for 3%+ of employees: treadmill desks, bicycle desks, portable desk pedal or stepper machine
 - At least 60% of workstations have either adjustable height standing desk or standard desk with desk-top height adjustment stand
 - Body systems: cardiovascular, muscular, skeletal


WELL

Fitness

Emily Levinson | August 2016

BACKGROUND

- CDC defines fitness as “the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure time pursuits and respond to emergencies)
- Benefits of physical activity: reduced risk of chronic disease, better mental health, increased quality of life




BACKGROUND

- Physical inactivity is one of the biggest threats to public health
 - 30% ischemic heart disease
 - 27% of Type 2 diabetes
 - 21-25% of breast and colon cancer
 - Increased odds of having a stroke by 20%
 - Shaves off 3-5 years of life
- Physical inactivity is #4 leading risk factor for mortality




BACKGROUND

- ACSM suggests adults have at least 30 minutes of moderate-intensity aerobic activity 5 days/week and muscle strengthening 2 days/week
 - In US, fewer than 50% of elementary school students, 10% adolescents, and 5% of adults obtain suggested amounts
- Over 60% people worldwide don't get the recommended physical activity
- Average adult only gets 6-10 minutes of physical activity each day



BACKGROUND

- Most people today are physically inactive
 - Jobs, cars, etc.
- Multi-faceted issue
- Built environment
 - neighborhood walkability
 - access and use of mass transit
 - active transportation
 - availability of physical activity facilities
 - stair accessibility
 - active furnishings



“Even just 2.5 hours of moderate activity per week can reduce overall mortality risk by 20%.” –WELL Building Standard

INTERIOR FITNESS CIRCULATION

- Pathways and stairs provide the opportunity for small amounts of physical activity
- Improves cardiorespiratory fitness and lowers risks of stroke
- WELL uses designs and aesthetic appeal to promote the use of stairs and walking paths; decrease reliance on elevators



ACTIVITY INCENTIVE PROGRAMS

- Small incentives can make people more likely to do physical activities
- WELL uses existing federal programs and parts of corporate wellness plans
- Ex. Subsidies for races



STRUCTURED FITNESS OPPORTUNITIES

- Access to professional programs and training programs provides people with techniques on how to achieve their goals (esp. people with special considerations)
- WELL suggests access to fitness advice and group classes on site



EXTERIOR ACTIVE DESIGN

- Greater land-use mix → lower rates of obesity and higher physical activity
- People are more likely to walk if their home is near shops, bus stops, restaurants, etc.
- WELL encourages a cyclist and pedestrian friendly environment
- Inclusion of benches, drinking fountains, water features, plazas, garden, art
- WalkScore of 70+ or meets LEED standards



PHYSICAL ACTIVITY SPACES

- Buildings with interior fitness space encourage people to engage in various types of exercise
- WELL requires a certain space allocation to support exercise and promote fitness and to have playground, trails, gyms, pools, etc. within 0.5 miles of the building



ACTIVE TRANSPORTATION SUPPORT

- Active transportation reduces carbon footprint and integrates physical activity into daily routine
- Biking or walking to work → lower rates of diabetes, hypertension, obesity
- WELL requires showers, lockers, and bicycle storage in buildings to support this lifestyle



FITNESS EQUIPMENT

- Access to fitness equipment supports different types of exercise
- Aerobic and muscle strengthening activities
→ weight control, lower risk of heart disease, diabetes, and cancer, better bone health, and improved cognitive function
- WELL requires various exercise equipment that supports cardiorespiratory and muscle-strengthening exercise



ACTIVE FURNISHINGS

- People spend 90% of their time inside
- Prolonged sitting → increased risk of cancer, weight gain, greater fatigue, back problems and is associated with a 2-year lower life expectancy
- WELL suggests active furnishings to reduce long periods of sitting
 - Sit/stand desk
 - Treadmill desk



Comfort Introduction

The comfort concept of The WELL Building Standard explains that the indoor environment should be a place of comfort. WELL focuses specifically on acoustics, ergonomics, olfactory comfort, and thermal comfort to make a space comfortable and healthy for the occupants. Through their features, WELL aims to reduce common sources of irritation and distraction to prevent stress and injuries and facilitate comfort, productivity, and wellbeing. This section includes an outline and Powerpoint presentation for the comfort concept.

Comfort Outline

- Background
 - Indoor environment should be a place of comfort
 - WELL focuses on reducing the most common sources of physiological disruption, distraction, and irritation
 - WELL focuses on enhancing acoustic, ergonomic, olfactory, and thermal comfort → prevents stress and injury and facilitates comfort, productivity, and well-being
 - WELL aims to shape spaces to get rid of unwanted indoor **noise levels** and reduce exterior noise intrusion to enhance social interaction, learning, satisfaction, and productivity
 - WELL promotes comprehensive **ergonomic** solutions that help prevent stress and injury and facilitate comfort and well-being
 - WELL takes a holistic approach to **thermal comfort** and provides a combination of strategies to address occupant issues
 - Built environments have sounds that are distracting to work and relaxation
 - Surveys show that acoustic problems are a leading source of dissatisfaction
 - Noise is unavoidable, but we can find policies, technologies, etc. to get quieter environments
 - Ergonomics and universal design are important in getting rid of physical and mental stress
 - Most adverse health effects relating to ergonomics: musculoskeletal problems (low back pain, neck pain, osteoarthritis) and nervous system problems
 - *Stat: Low back pain affects 31 million Americans; 380,600 days of work were missed in 2013 because of musculoskeletal disorders (1/3 of the total number of days away from work)*
 - *Stat: In 2010, nearly 7% (more than 169 million) of all disability-adjusted life years resulted from musculoskeletal disorders*
 - Thermal comfort is another important way we experience the indoor environment, but it's also subjective (everyone is comfortable in different conditions)
 - 6 primary personal and environmental variables contribute to an occupant's thermal comfort: air speed, dry bulb temperature, radiant temperature, humidity, metabolic rate, and clothing/other insulation
- ADA Accessible Design Standards
 - We want to make sure individuals with physical disabilities have access and mobility in newly constructed or renovated buildings. WELL requires compliance with ADA regulations, regardless of building age or location.
 - Specifics:
 - Projects comply with current ADA standards
 - Body systems: muscular and skeletal
- Ergonomics: Visual and Physical
 - Overusing the same muscles while trying to adjust to the same furniture over time can cause pain in the body. Even slight discomfort leads to decreased focus. WELL ensures that occupants are free to adopt a variety of comfortable sitting and standing positions.

- Specifics:
 - All computer screens are adjustable (height and distance)
 - At least 30% of workstations can be sit/stand through either: adjustable height sit-stand desks, desk-top height adjustment stands, or fixed-height desks both standing and seated heights
- Body Systems: muscular and skeletal
- Exterior Noise Intrusion
 - Loud or repetitive exterior noise can be a source of stress and risk factor for health problems – esp. in urban environments. Exposure to traffic noise → higher risk for diabetes, stroke, and heart attack. Exposure to road traffic and aircraft noises → higher risk for hypertension. Exposure to noise → reduced reaction time and increased levels of annoyance. It's good to prevent exterior noise from reaching the interior of a building to improve occupant comfort. WELL sets indoor sound level limits for noise coming from outside so it doesn't distract occupants.
 - Specifics:
 - Average sound pressure level from outside does not exceed 50 dBA in regularly occupied spaces when the space and adjacent spaces are unoccupied (but within 1 hour of normal business hours)
 - Body systems: cardiovascular, endocrine, and nervous
- Internally Generated Noise
 - Electronics, HVAC systems, mechanical equipment, and even people can be major sources of indoor noise (especially with open workstations becoming more popular). Office noise → decreased productivity, reduced concentration and mental arithmetic performance, increased distraction. WELL reduces distractions and enables speech privacy without impairing collaboration. They require a limit on the amount of sound emanating from building systems and creating quiet zones for activities that require freedom from distraction.
 - Specifics:
 - An acoustic plan is made that identifies loud and quiet zones and noisy equipment in the space
 - The mechanical equipment system meets the following requirements: open office lobbies have max noise criteria (NC) of 40; enclosed offices have max NC of 35; conference rooms and breakout rooms have max NC of 30 (recommended 25); teleconference rooms with max NC of 20
 - Body systems: cardiovascular, endocrine, and nervous
- Thermal Comfort
 - Thermal comfort in the body is provided through homeothermy.
 - Homeothermy: the balancing of heat gains and losses to maintain the body's core temperature (97-100 degrees F) and regulated by the hypothalamus.
 - Thermal comfort can affect mood, performance, and productivity. Temperature preferences are very personal and differ greatly. Balancing the energy requirements with varied preferences can be difficult. WELL uses best practices to ensure a sufficient level of comfort for the majority of occupants. ASHRAE Standard 55 says thermal comfort can be achieved through: standard comfort zone OR adaptive comfort zone
 - Specifics:

- Spaces that use mechanical ventilation must use ASHRAE Standard 55-2013 Section 5.3 (Standard Comfort Zone Compliance)
 - Spaces that use natural ventilation must meet ASHRAE Standard 55-2013 Section 5.4 (Adaptive Comfort Model)
 - Body Systems: immune, integumentary, nervous, and respiratory
- Olfactory Comfort
 - Excessively strong odors can disrupt physical and psychological comfort and even trigger eye, nose, throat irritation, nausea, and headaches. WELL supports building policies that discourage strong smells from chemicals and fragrances. An odorless interior environment is a simple strategy that can greatly impact occupant comfort and wellbeing.
 - Specifics:
 - Restrooms, janitorial closets, kitchens, cafeterias, and pantries prevent strong odors from getting into workspaces through 1+ of the following separation methods: negative pressurization, interstitial rooms, vestibules, hallways, self-closing doors
 - Body systems: digestive, endocrine, immune, integumentary, nervous, respiratory
- Reverberation Time
 - Reverberation time (RT60): metric that describes the length of time taken for a sound to decay by 60 dB from its original level. Optimal reverberation times vary depending on room volume, intended use of the space, and frequency of transmitted sound. (ex. if a space has a high reverberation time, the sounds of voices, footsteps, etc. take longer to dissipate). The noise that is produced by reverberation can decrease speech intelligibility and can even cause stress. WELL seeks to establish lower reverberation time to help maintain a comfortable sound level. They do this through the use of sound-absorbing material.
 - Specifics:
 - Conference room has max reverberation time of 0.6 seconds and open workspaces of 0.5 seconds
 - Body systems: cardiovascular, endocrine, and nervous
- Sound Masking
 - Overall silence in a space can be just as distracting as a loud environment because it highlights acoustical disturbances and decreases speech privacy (ex. overhearing people's private conversations is a major cause of employee dissatisfaction esp. in open offices). Sound masking systems provide a low level of background noise so workers can have a degree of confidentiality in their communications and can decrease distraction.
 - WELL aims to mitigate uncomfortable acoustic disruptions and increase speech privacy by providing low background noise through sound masks.
 - Specifics:
 - Open workspaces use sound masking systems
 - If you have sound masking systems, sound levels are the following:
 - Open workspaces: 45-48 dBA
 - Enclosed offices: 40-42 dBA
 - Body systems: immune and nervous
- Sound Reducing Surfaces

- Sometimes, good design and construction aren't enough to achieve acoustic comfort in a building because sources (ex. footfall, voices, etc.) are hard to control. Sound reduction treatments that are absorptive can help with reverberation management and improve acoustic comfort.
- WELL requires spaces to use absorptive surfaces in order to reduce unwanted noise reverberation.
- Noise reduction coefficient (NRC): average value that determines the absorptive properties of materials; the larger the NRC value, the better the material is at absorbing sound under standardized conditions
- Specifics:
 - If there are open workspaces, the ceiling has a minimum NRC of 0.9 for the entire surface area of the ceiling; if there are conference and teleconference rooms, there is a minimum NRC of 0.8 on at least 50% of the surface area of the ceiling
 - If there are enclosed offices, conference, and teleconference rooms, the walls have a minimum NRC of 0.8 on at least 25% of their surface area; if there are open workspaces, the walls have a minimum NRC of 0.8 on at least 25%; if there are partitioned office spaces, the partitions reach at least 48 inches and have minimum NRC of 0.8
- Body systems: cardiovascular, endocrine, and nervous
- Sound Barriers
 - Noise from adjacent spaces can be disturbing, but careful detailing and high quality construction materials can help improve the sound reducing abilities of sound barriers and reduce sound transmission between spaces next to each other. WELL aims to increase acoustic comfort by reducing sound transmission from adjacent spaces through construction detailing that exceed standard practice.
 - Specifics:
 - If enclosed offices or conference rooms are used, they have interior partition walls that meet the following NIC (noise isolation class)
 - Enclosed offices: min NIC of 35 (when sound masking system is used) or 40 (when no sound masking system)
 - Conference rooms: min NIC of 53 on adjoining walls
 - Doors connecting to private offices and conference rooms are constructed with either gaskets, sweeps, or non-hollow core
 - All interior walls enclosing regularly occupied spaces are constructed to reduce air gaps and limit sound transmission by properly sealing all acoustically rated partitions on the tracks, staggering all gypsum board seams, and packing/sealing all penetrations through the wall
 - Body systems: immune and nervous
- Individual Thermal Control
 - Thermal comfort preferences are individual and affected by metabolism, body type, and clothing so it's hard to find a temperature that everyone always likes. It's good to provide areas with different thermal gradients and provide individual thermal comfort devices so people can choose areas that best fit their thermal needs (term: "free address").

- WELL requires spaces to vary in temp and gives occupants the flexibility to select a work area they feel most comfortable in. It also provides personalized thermal comfort devices that allow people to adjust the temp in their immediate surroundings.
- Specifics:
 - Projects over 2,150 square feet provide a thermal gradient of at least 5 degrees F across open workspaces and between rooms/floors AND all open office spaces allow for at least 50% free address
 - In spaces with 10+ workstations, employees have access to personal thermal comfort devices (ex. fans)
- Body systems: immune, integumentary, nervous, and respiratory
- Radiant Thermal Comfort
 - Radiant temp systems have become more energy efficient thanks to recent technology. They allow for saved floor space, lower dust transportation, and increased thermal comfort through the separation of temp controls and outdoor air supply systems. Using radiant heat also means radiant temp in a space can be kept fairly low (compared to convective heating), which means slightly higher relative humidity in the winter.
 - WELL enhances thermal comfort through the use of radiant heating and cooling elements independent of ventilation systems.
 - Specifics:
 - Lobbies and common spaces meet ASHRAE 55-2013 for thermal comfort through either hydronic radiant heating/cooling systems OR electric radiant systems
 - At least half of the floor area in all offices and regularly occupied spaces meets ASHRAE 55-2013 for thermal comfort through either hydronic radiant heating/cooling OR electric radiant systems
 - Body systems: immune, integumentary, nervous, and respiratory

WELL

Comfort

Emily Levinson | October 2016

BACKGROUND

- Indoor environments should be a place of comfort
- WELL focuses on
 - reducing the most common sources of physiological disruption, distraction, and irritation
 - enhancing acoustic, ergonomic, olfactory, and thermal comfort
- Prevents stress and injury and facilitates comfort, productivity, and well-being



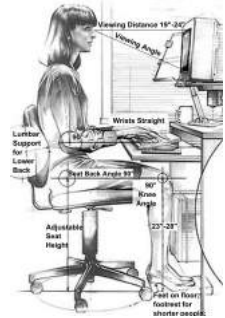
BACKGROUND: ACOUSTICS

- WELL aims to
 - shape spaces to get rid of unwanted indoor noise
 - reduce exterior noise intrusion to enhance social interaction, learning, satisfaction, and productivity
- The built environment has sounds that are distracting
- Surveys show that acoustic problems are a leading source of dissatisfaction
- Noise is unavoidable, but we can do things to address it




BACKGROUND: ERGONOMICS

- WELL promotes ergonomic solutions to prevent stress and injury
- Universal design is important in getting rid of physical and mental stress
- Health effects: musculoskeletal problems and nervous system problems



BACKGROUND: THERMAL COMFORT

- WELL takes a holistic approach to thermal comfort
- Provides a combination of strategies to address the issue
- Thermal comfort is subjective
- 6 variables contributing to an occupant's thermal comfort: air speed, dry bulb temp, radiant temp, humidity, metabolic rate, and clothing/insulation



ADA ACCESSIBLE DESIGN STANDARDS

- Make sure that individuals with physical disabilities have access and mobility in buildings
- WELL requires compliance of ADA regulations
- Note: regardless of building age or location



ERGONOMICS: VISUAL AND PHYSICAL

- Overusing the same muscles can cause pain
- Slight discomfort can lead to decreased focus
- WELL ensures occupants are free to adopt a variety of sitting and standing positions
- Adjustable screens
- 30% workstations have options to be either sit or stand



EXTERIOR NOISE INTRUSION

- Loud or repetitive noise can be source of stress and cause health problems
- Best to prevent outside noise from reaching interior to improve occupant's comfort
- WELL sets indoor sound level limits for noise from outside so it doesn't become distracting
- Measured in decibels



INTERNALLY GENERATED NOISE

- Electronics, HVAC systems, mechanical equipment, and people can be source of indoor noise
- Leads to decrease in productivity and reduced concentration
- WELL requires a limit on the amount of sound emanating from building systems
- Creates acoustic plan



THERMAL COMFORT

- Thermal comfort affects mood, performance, and productivity
- Temperature preferences differ greatly from person to person
- WELL uses best practices to ensure sufficient level of comfort for majority of occupants
- ASHRAE Standard 55
 - Standard comfort zone
 - Adaptive comfort zone



OLFACTORY COMFORT

- Strong odors can disrupt physical and psychological comfort
- Trigger eye, nose, throat irritation and cause nausea and headaches
- WELL strives for an odorless environment
- Requires certain areas to be separated from workspaces



REVERBERATION TIME

- Reverberation time (RT60): metric that describes the length of time taken for a sound to decay by 60 dB from its original level
- Optimal RT60 varies based on room and function
- Noise produced by reverberation can cause stress
- WELL seeks to establish a lower RT60 to help maintain a comfortable sound level
- Use of sound absorptive material



SOUND MASKING

- Overall silence in a space can be just as distracting as a loud environment
- Silence makes it easy to hear other people's conversations
- Sound masking systems provide a low level of background noise
- WELL aims to mitigate acoustical disruptions and increase speech privacy through sound masking systems



SOUND REDUCING SURFACES

- Sometimes design and construction aren't enough to achieve acoustic comfort
- Sound reduction treatments that are absorptive can help with reverberation management and improve acoustic comfort
- WELL requires spaces to use absorptive surfaces to reduce unwanted noise
- Noise Reduction Coefficient (NRC)



SOUND BARRIERS

- Noise from adjacent spaces can be disturbing
- High quality construction can help improve the sound reducing abilities of sound barriers
- WELL aims to increase acoustic comfort by reducing sound transmission from adjacent spaces through construction detailing



INDIVIDUAL THERMAL CONTROL

- Thermal comfort preferences are individualized
- Good to provide areas with different thermal gradients ("free address")
- Good to provide people with individual thermal comfort devices
- WELL requires spaces to vary in temp so people can choose where they work + give people thermal comfort devices



RADIANT THERMAL COMFORT

- Radiant temp systems have become more energy efficient
- They save floor space, lower dust transportation, increase thermal comfort through separation of temp controls and outdoor air supply
- Radiant heat means radiant temp can be kept fairly low



Mind Introduction

The mind concept may seem a bit odd to include in The WELL Building Standard, but a lot of what it suggests are policies that promote wellbeing. Mental health is a serious issue that plagues many people and there are things that can be done to try and alleviate these issues. Many environments can contribute to stress, which can lead to chronic diseases and health issues. WELL has seventeen features in the mind concept to promote a healthy mind including an understanding of health information, occupant surveys, health policies, and incorporating biophilia and beauty into the design. This section also includes an outline of the mind concept and a Powerpoint presentation.

Mind Outline

- Background
 - Mental and physical health are often thought to be separate, but our minds and body are connected.
 - Exercise increases the release of serotonin → elevate mood and regulate sleep cycle
 - Worrying and stress → low mood, depression, and a negative sense of self
 - Mental health is a serious issue
 - In 2010, mental illness and substance use disorders accounted for nearly 184 million disability-adjusted life years (DALYs); 8.6 million years of life was lost to premature mortality; and over 175 million years lived with disability worldwide
 - Life expectancy among people with mental illness is 10 years shorter compared to those without it
 - More than 14% or 8 million deaths each year are attributed to mental disorders
 - Lifetime prevalence of mood disorders in the US (major depressive disorder, dysthymic disorder, bipolar) is estimated at 21%
 - Major depression is most common affecting 16 million adults in the US
 - Mood disorders are linked to illness and associated with bad health outcomes
 - Chronic low level disturbances or mental distress play a big role in most chronic diseases
 - Depression → higher risk of heart disease and immunosuppression
 - Chronic stress and anxiety → stress hormones associated with a variety of physiological outcomes (increased risk of metabolic syndrome, cardiovascular disease, GI disorders, skin conditions like acne and psoriasis)
 - Mind plays a vital role in an individual's overall health and well-being so it's important to have an atmosphere that supports a healthy mental state
 - Mediate stress either directly or indirectly – includes access to therapies, promote relaxation, address mental trauma, instituting policies that improve sleep hygiene and encourage altruism, promote sensor technologies
 - WELL recognizes the features of the built environment and identifies workplace policies that can be implemented to positively impact mood, sleep, stress levels, and psychosocial status in order to promote and enable overall health and wellbeing
- Health and Wellness Awareness
 - Health literacy: “The degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions”. Literacy requires awareness and an ability to understand health literature and options for health services. Accessibility and customizability of health literature are needed to promote increased health awareness. WELL promotes the availability of health and wellness literature and a library.
 - Specifics:
 - Explanatory guides for occupants to learn about the benefits of WELL features in the project are available to all occupants

- Project has features intended for:
 - Human delight
 - Celebration of culture
 - Celebration of spirit
 - Celebration of place
 - Meaningful integration of public art
 - Body systems: nervous
- Biophilia I – Qualitative
 - Biophilia: the idea that humans have an affinity towards the natural world; growing idea that aims to address our psychological need to be around life
 - Exposure to views and images of nature can help speed up healing, boost happy feelings, and reduce negative ones. Environments that are cold and sterile with no life can diminish our mood and happiness.
 - WELL recognizes the importance of creating an interior environment that nurtures the innate human-nature connection. Modeled after Living Building Challenge biophilia requirements.
 - Specifics:
 - Biophilia plan says how nature is incorporated in the project through environmental elements, lighting, and space layout
 - Biophilia plan that says how the project uses nature’s patterns
 - Biophilia plan that provides opportunities for human-nature interactions within the building and within the project boundary
 - Body systems: nervous
- Adaptable Spaces
 - Healthy work environments are supposed to reduce stress and increase productivity. Therefore, they should be adaptable to working, focusing, collaborating, and resting. Research shows that having a variety of workspaces that let people adjust their own environment and choose their degree of socializing is linked to job satisfaction and group cohesiveness.
 - WELL creates a productive work environment free of distracting things and includes spaces designed for focus work and some for short naps.
 - Specifics:
 - Seating and space layout is organized into separate workplace zones and provides different degrees of engagement. Regularly occupied spaces of 2,000 sq. ft.+ provide documentation of methods used to make these zones using the following:
 - Programming plan developed (data from interviews, surveys, focus groups, research) that establishes the organization’s culture, work patterns, processes, how they use the space
 - Annotated floor plan (uses research to establish the zones to support variety of functions)
 - Designated quiet zones (enclosed rooms provided with no more than 3 seats per room)
 - Designated collaboration zones (enclosable with no less than 3 seats and at least one vertical surface to communicate ideas)

- Employees are not required to take a business trip for which the total travel time (including wait and layovers) exceeds both 5 hours and 25% of the total trip duration
 - During long business trips (domestic: 2 weeks+ and international: 4 weeks+), employees are given time off and budget to fly home for at least 48 hours or fly a friend/family to meet them
 - Employees are booked at hotels with free fitness centers or reimbursed for any gym usage during travel
 - Body systems: cardiovascular and nervous
- Building Health Policy
 - Protecting employee health is important because it impacts their work ethic and health. Employees often feel overwhelmed, but that they can't take the rest time they need to recover. Health policies in the workplace support their physical and mental wellbeing, make healthy behaviors easier, and create a company culture that focuses on promoting good health. WELL provides support to improve the overall health and satisfaction of workers and their families.
 - Specifics:
 - Employers provide at least 3 of the following:
 - Health insurance or subsidies (for part and full time employees and spouses and dependents)
 - Flexible spending accounts
 - Health savings accounts
 - On site immunization or time off to get them
 - Policies to encourage ill patients to stay home
 - Body systems; nervous
- Workplace Family Support
 - Work-life balance is important and personal lives are sometimes neglected for work responsibilities. Family care policies make sure that employees can take time off for themselves and to balance work and personal life in a healthy manner. Research shows employees with extensive time-flexible policies report lower stress levels. WELL tries to support the work-life balance.
 - Specifics:
 - Employers provide paid paternity and maternity leave for 6 wks AND an additional 12 wks of leave
 - Employers provide EITHER on-site child care centers OR subsidies for child care
 - Employers provide at least 12 wks leave for care of ill family member AND the option to use paid sick time to care for family
 - Employers provide nursing mothers with 15 min breaks every 3 hours
 - Body systems: digestive, endocrine, immune, respiratory
- Self-Monitoring
 - Self-monitoring devices that observe and quantify changes to the body over time promote awareness of one's health status. This can provide personal insight into the physiological states of the body, which will encourage positive behavioral and lifestyle changes. Monitoring food intake, weight, and exercise is proven to aid in weight loss and weight maintenance and promotes health and wellbeing.

- WELLS requires that employers offer employees use of self-monitoring devices that measure and track things associated with health.
- Specifics:
 - A sensor capable of measuring at least 2 of the following to employees for personal use is subsidized by at least 50%
 - Body weight/mass
 - Activity and steps
 - Heart rate variability
 - Sleep duration, quality, and regularity
 - Body systems: cardiovascular
- Stress and Addiction Treatment
 - Chronic stress negatively impacts the body including the nervous and cardiovascular systems. Substance addiction is one of the biggest sources of stress because it combines toxicity of the substance with the mental distress. Recently, new treatments and stress reduction therapies along with pharmacological interventions have helped get rid of these bad conditions.
 - WELL has this feature that can complement other wellness programs to reduce employee stress levels, diminish addictive tendencies, and prevent relapse.
 - Specifics:
 - A program that addresses psychological and behavioral distress is available to occupants through Employee Assistance Programs (EAPs)
 - EAPs offer short term treatment and referrals to professionals (for depression, anxiety, substance use, addiction, and other mental health issues)
 - A stress management program is available to occupants through qualified counselors that offer group or private workshops and referrals
 - Body systems: cardiovascular, digestive, endocrine, immune, reproductive
- Altruism
 - Research shows that acts of generosity and charity are associated with good health outcomes. Volunteering gives individuals a way to express their values, strengthen social relationships, and gain career-related experience. Altruistic sentiments and behaviors are increasingly incentivized within the workplace.
 - WELL encourages employees to engage in altruistic activities outside of work to enhance wellbeing, contribute to a strong community, and promote social cohesion.
 - Specifics:
 - Individuals have the option for 8 hours paid time off to participate in volunteer activities organized by the employer for a charity twice a year
 - Employers contribute annually to a registered charity to match employee donations
 - Body systems: nervous
- Material Transparency
 - Consumers have the right to know the contents of products and materials that make up the built environment, just like they have the right to know what's in their food. Due to how materials are made from different sources, little is known about the chemicals in circulation today in the supply chain. This lack of info obscures information that is required to identify potential hazards to the environment and

- occupant health. The demand for material ingredient disclosure pushes for supply chain transparency and supports innovation and green chemistry.
- WELL requires the disclosure of material composition as a step toward choosing better products.
 - Specifics:
 - At least half of interior FF&E (by cost) has some combo of the following material descriptions: declare label, health product declaration, any method accepted in LEED credit: Building Product Disclosure and Optimization – Material Ingredients, Option 1: material ingredient reporting
 - All the info is compiled and available to occupants digitally or printed
 - Body systems: cardiovascular, digestive, endocrine, immune, integumentary, nervous, reproductive, respiratory
 - Organizational Transparency
 - Organizations that use fair, equitable, and just treatment toward their employees create a culture of reduced stress, greater employee satisfaction, and increased sense of loyalty. Research shows that high levels of justice in the decision making process at work are related to a lower risk of poor health (and low levels are related to higher risk of bad health). When companies share their policies and investment decisions, it allows people to decide if their personal values are shared by the organization and gives them the opportunity to voice their opinion.
 - WELL uses JUST participation and G4 Sustainability Reporting Guidelines to support fair and equitable organizations.
 - Specifics:
 - The project must use one of the following and the results must be available publicly on the premises or on their website:
 - JUST program operated by International Living Future Institute
 - Sustainability reporting following G4 Sustainability Reporting Guidelines (by the Global Reporting Initiative)
 - Body systems: not listed
 - Beauty and Design II
 - A beautiful and meaningful space where design aesthetics are considered can have a good impact on morale and mood. Elements that give visual complexity, balance, and proportion can give occupants a sense of comfort, ease, and reduce stress. WELL realizes the application of best practice guidelines, room proportions, integration of artwork, and things that enhance familiarity to create a visually appealing space.
 - Specifics:
 - Ceiling height should be proportional to room dimension to provide an open and comfortable feel to the interior. Floor to ceiling heights for regularly occupied spaces should meet the following:
 - Rooms 30' in width or less have ceiling height of at least 8.8'
 - Rooms greater than 30' width have ceiling height of at least 9' plus extra 0.5' for every 10' over 30'
 - Rooms that provide a full wall view to the outdoor or atrium space (with at least twice the ceiling height of the room) have min ceiling height of 9' for a room width of 40' plus at least 0.5' for every 15' over 40'

- Artwork in spaces adds complexity. A plan is developed that includes a description of how the project uses artwork in entrance, lobbies, and regularly occupied spaces greater than 300 sq. feet.
 - Design elements are used to establish way-finding, aid in orientation, and provide spatial familiarity. A plan should be written that includes a description of how the project uses way-finding elements in projects with 10,000 sq.ft.+ through:
 - Artwork (distinct in shape and color)
 - Visually grouped zones that use design elements (lighting, furniture color, flooring pattern) to unify them
 - Corridors over 30' in length end in artwork or a view window (to exterior with sill height no taller than 3' from floor) and with at least 100' vista
 - Body systems: nervous
- Biophilia II – Quantitative
 - Biophilia is the idea that people are drawn to nature. Evidence on emotional and psychological benefits of nature is increasing. Experience of nature can improve experience, mood, and happiness. WELL calls for the provision of indoor design elements that remind you of the natural environment that includes water features, plants, and access to outdoor areas.
 - Specifics:
 - At least 25% of the project site has either landscaped grounds or rooftop gardens for occupants and consists of at least 70% plantings including tree canopies (within that 25%)
 - Wall and potted plants are used in the interior design
 - Potted plants and beds cover at least 1% of floor area per floor
 - A plant wall per floor covering wall area at least 2% of the floor area or covering the largest of the available walls (whichever is more)
 - At least one water feature for every 100,000 sq. ft. (in projects bigger than 100,000 sq. ft.) that are at least 5.8' – 6'in height or 43 sq. ft. in area and use UV sanitation or other technology to address the water quality
 - Body systems: nervous

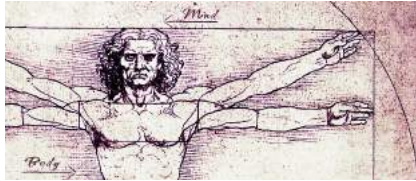
WELL

Mind

Emily Levinson | October 2016

BACKGROUND

- Mental and physical health are often thought to be separate, but mind and body are connected
- Exercise increases serotonin → elevates mood and regulates sleep cycle
- Worrying and stress → low mood, depression, and negative sense of self
- WELL identifies workplace policies to positively impact mood, sleep, stress levels, and promote overall wellbeing



BACKGROUND

- Mood disorders are linked to illness and bad health
- Chronic mental distress can lead to chronic disease
 - Depression → higher risk of heart disease and immunosuppression
 - Stress and anxiety → stress hormones associated with cardiovascular disease, GI disorders, skin conditions, etc.
- Mind plays role in individual's health so it's important to have atmosphere to support a healthy mental state



STATISTICS

- In 2010, mental illness and substance use disorders accounted for nearly 184 million disability-adjusted life years (DALYs); 8.6 million years of life was lost to premature mortality; and over 175 million years lived with disability worldwide
- Life expectancy among people with mental illness is 10 years shorter compared to those without it
- More than 14% or 8 million deaths each year are attributed to mental disorders
- Lifetime prevalence of mood disorders in the US (major depressive disorder, dysthymic disorder, bipolar) is estimated at 21%
- Major depression is most common affecting 16 million adults in the US

HEALTH AND WELLNESS AWARENESS

- Health literacy: how individuals understand health info they need to make decisions
- Accessibility of health lit are needed to promote health awareness
- WELL promotes availability of health literature
 - Library
 - Explanatory guide



INTEGRATIVE DESIGN

- A collaborative design process ensures that construction and maintenance follow their original goals and expectations
- Focus on health and wellness principles
- WELL requires all stakeholders to meet at various points during project development
- Stick to goals through all phases



POST-OCCUPANCY SURVEYS

- Occupancy surveys are useful to measure how much a building is promoting and protecting the health and need of its occupants
- It's good for people to be able to give feedback and know they have a stake in their own wellbeing
- WELL uses occupancy surveys to offer insight into the success of the features and to improve WELL
- Reported to building owners and managers, occupants, and IWBI within 30 days



BEAUTY AND DESIGN I

- A space where design aligns with the organization's cultural values can positively impact employees
- Aesthetically pleasing spaces make occupants comfortable and happy
- WELL designs environments that positively impact mood and comfort
 - Features that celebrate culture, spirit, place, and has art



BIOPHILIA I - QUALITATIVE

- Biophilia: the idea that people are drawn towards the natural world
- Exposure to nature can speed up healing, boost happy feelings, and reduce negative feelings
- WELL creates an interior environment that nurtures the innate human-nature connection
 - Biophilia plan that says how nature is used in project through (1) environmental elements, lighting and space layout; (2) project uses nature's patterns; (3) opportunities for human and nature interactions



ADAPTABLE SPACES

- Healthy work environments → reduce stress and increase productivity
- Adaptable to work, focus, collaborating, and rest
- Research shows that when people have a variety of workspaces to choose → job satisfaction and group cohesiveness
- WELL creates work environment free of distractions with spaces for different purposes



HEALTHY SLEEP POLICY

- High quality sleep is necessary for health
 - Improves mental health
 - Needed for mental and physical performance
 - Prevents unhealthy weight gain
- Insufficient sleep → depression, diabetes, heart attack, hypertension, stroke
- WELL sets reasonable work hour limits to reinforce a sleep and wake rhythm



BUSINESS TRAVEL

- Business travel → negative health outcomes
- Main stressors of business travel
 - Impacts on personal life
 - Jetlag
 - Increased workload upon return
 - Isolation from friends
- WELL aims to reduce stress with business travel through policies
 - Options for red-eye flights
 - Time limits of trips
 - Friend/family visits
 - Fitness during travel



BUILDING HEALTH POLICY

- Protecting employee health is important because it impacts work ethic
- Employees often feel overwhelmed but can't take the time they need to recover
- Health policies used to support wellbeing
- WELL provides support through
 - Health insurance/subsidies
 - Spending accounts
 - Savings accounts
 - On-site immunizations
 - Health policies for sick people to stay home



WORKPLACE FAMILY SUPPORT

- Work-life balance is important
- Personal lives sometimes neglected for work
- Family care policies ensure people take times for themselves and balance work and life → lower stress levels
- WELL supports work-life balance through
 - Paid maternity/paternity leave
 - Child care
 - Care for sick family
 - Care for nursing mothers (15 min breaks every 3 hours)



SELF-MONITORING

- Self-monitoring devices observe and quantify changes to body over time → promote your own health status
- Encourages positive behavioral changes
- Monitoring food intake, weight, and exercise proven to aid in weight loss and promotes health and wellbeing
- Requires that employers offer employees use of self-monitoring device



STRESS AND ADDICTION TREATMENT

- Chronic stress negatively impacts the body – specifically nervous and cardiovascular systems
- Substance addiction is one of the biggest sources of stress
- New treatments and stress reduction therapies have helped get rid of bad conditions
- WELL uses wellness programs to reduce stress, diminish addictive tendencies, and prevent relapse



ALTRUISM

- Research shows that acts of generosity → good health outcomes
- Volunteering gives people a way to express their values, strengthens social relationships and gain experiences – allowed 8 hours off 2x/year
- WELL encourages employees to engage in altruistic activities
 - enhance wellbeing
 - contribute to strong community
 - promote social cohesion



MATERIAL TRANSPARENCY

- Consumers have the right to know the contents of products and materials
- Similar to knowing what's in your food
- Little is known about the chemicals in today's supply chain
- Lack of info → potential hazards to environment and health
- WELL requires disclosure of material composition



ORGANIZATIONAL TRANSPARENCY

- Organizations that use fair, equal, and just treatment towards employees → culture of reduced stress, greater employee satisfaction, and increased sense of loyalty
- When companies share policies and decisions, it lets people
 - decide if their personal values are shared by the organization
 - voice their opinion



BEAUTY AND DESIGN II

- Good design aesthetics can have a good impact on morale and mood
- Elements that give complexity, balance, and proportion → occupant comfort and reduced stress
- WELL uses best practice guidelines, room proportions, artwork, and familiarity to create a visually appealing space



BIOPHILIA II - QUANTITATIVE

- Biophilia: idea that people are drawn to nature
- Experience of nature can improve experience, mood, and happiness
- WELL suggests indoor design elements that remind you of the natural environment
 - Water features
 - Plants
 - Access to outdoor areas



CHAPTER 3. ASSIGNMENTS

The assignments section of this curriculum includes one large design project and two smaller assignments, as well as rubrics for each of them. The project is intended for use in an interior design studio setting, though it can be modified to fit whatever the course requirements are. Although the project can be altered according to the needs of the class, is meant to take an entire semester and help students understand how to design a space with wellness at the forefront. Students will design a wellness retreat in Aspen, Colorado including a fitness center, restaurant, meditation, yoga studio, public space, spa, and suites. They will begin with research and programming, move into schematic design, design development, and present a final design, construction documents, and a process notebook. A complete rubric has been provided for the instructor.

The next assignment for the course is a group presentation intended to teach students about the WELL Pilot programs, as well as develop presentation skills and how to work in a team. Groups of approximately four students will present a 20-25 minute Powerpoint presentation on one of the WELL Pilot programs: retail, multifamily residential, education, restaurant, and commercial kitchen. They will also create a poster that sums up their topic. A rubric has also been provided for the instructor.

The final assignment for this course is an evaluation of a LEED certified building using the WELL scorecard. Students will be in groups of approximately four and given time in class, as well as required to meet out of class, to evaluate a nearby LEED certified building. LEED buildings were chosen because of the overlap the LEED credits have with the WELL features. A rubric has been provided for the instructor, but the instructor should keep in mind that students may not be able to evaluate everything on the scorecard and this is a learning experience.

Colorado Wellness Retreat Project

CADS 5320: Health + Wellness in the Built Environment

Description: You have been hired as the designer on a new wellness retreat in Aspen, Colorado due to your qualifications as a wellness design expert. The client has requested that the retreat include a fitness center, restaurant, meditation and yoga studios, public space, spa, and suites. The client will be submitting for WELL certification and trusts that you will design the space to their standards. They want the space to be calming, serene, and natural, but you have the freedom to choose your own scheme.

Phase 1: Programming (100 points)

due:

Good design is informed design. You should include the following information in your *designed* presentation of the following:

- Precedent Studies: Research five existing wellness retreats, spas, centers, etc.
 - Include a brief description (name, location, architect, designer, other information)
 - Include images and note what you like/dislike about them
 - You will deliver (5) 17" x 22"(ARCH C) *designed* boards (1 location per board) to present this information. You will also include these later in your process notebook.
- Brand Identity: preliminary name and logo of your wellness retreat
- Interview of client
- Adjacency matrix and bubble diagram

Phase 2a: Schematic Design & Design Development (100 points)

due:

For this phase, you will be diagramming, space planning, and conceptualizing. You should include the following information in your *designed* presentation of the following:

- Design Concept Board: The goal is to communicate the overall design concept for the project. This should be printed on 17" x 22" (ARCH C) *designed* boards. The following should be included:
 - Project description, location, concept, site information
 - Design concept (graphics, sketches, images, etc.)
 - Finish and scheme concepts
- Space Planning and Diagrams: You should include a conceptual space plan plotted at 1/8" scale along with your zoning and circulation diagrams. Your final floor plan should look very different from this conceptual plan.
- 3D Model Development: Develop a 3D model based on your conceptual floor plan in a software of your choice. This should be a "mass model" to show architectural details.

Phase 2b: Final Design (100 points)

due:

For this phase, you will be refining everything from Phase 2a and creating a final presentation. You should include the following in this phase:

- Presentation Floor Plan, Furniture Plan, RCP, Elevations, and Details: These should be to a scale of your choosing and should be as close to the final plans as possible. Keep in mind these are presentation drawings and NOT construction drawings, so they can be presented graphically (i.e. rendered, isometric, etc.)
- FF&E Selections and Spec Notebook: You should specify ALL major FF&E in the space and include finish samples when appropriate. You should include the look and feel in your presentation and be able to explain why you chose certain finishes, but your specification notebook will have the printed cut sheets.
- Final Presentation: You will present this project via digital boards, but what you include is up to you. *YOU MUST SELL THE PROJECT*. This means you'll need the "sexy" information – whether those are perspectives, elevations, hand sketches, fly-throughs, etc. Failure to include a sales pitch presentation will be a failed project.

Phase 3: Construction Documents & Process Notebook

due:

- Construction Documents: You will be required to submit a printed set of construction documents at 1/8" scale. Everything should be labeled, to scale, include a North arrow, title block, and dimensions when noted. You should include the following:
 - A0: Cover Page
 - A2: Floor Plans (dimensioned)
 - A3: Reflected Ceiling Plans (dimensioned)
 - A4: Building Sections (1 Transverse and 1 Longitudinal)
 - A5: Interior Elevations and Details
 - A6: Schedules
 - A6.1: Finishes, furniture, and equipment
 - A6.2: Window
 - A6.3: Door
 - A6.4: Lighting
 - A7: Coded Furniture Plan
- Process Notebook: You should include the entirety of this project in your process notebook, organized into sections with a table of contents. This includes, but is not limited to the following:
 - Cover page
 - Table of contents
 - Interview of client
 - Precedent studies
 - Adjacency matrix & bubble diagram

- Concept board
- Conceptual plans and diagrams
- Sketches
- FF&E specs
- Presentation

Colorado Wellness Retreat Project Rubric
 CADS 5320: Health + Wellness in the Built Environment

Phase 1: Programming (100 points)

	Below Average	Fair	Competent	Good	Excellent	Total
Precedent Studies (40 pts)	Missing most or all of the information required.	Includes most of the required information but a few key pieces are missing.	Includes most of the required information, but could be missing correct sizes, format, etc.	Includes ALL required information and went above the information provided in class to some extent.	Includes ALL required information with correct format and went well above the information provided in class.	
Brand Identity (20 pts)	Shows little development of an idea or concept. Design is thrown together haphazardly.	Design appears to be somewhat thought out but knowledge and use of design theory is not obvious.	Design is well thought out but errors in the correct use of design theory exist.	Well-designed brand with minimal errors. Evident use of design theory and education.	Perfectly thought out design plan with zero design layout issues. Excellent use of design theory and educational background.	
Client Interview (15 pts)	Little attention was paid to the client's needs.	Some information on the client's needs are noted.	Most of the client's needs are noted.	The client's needs and wants are evident in the designer's notes.	The designer's notes show evidence that they understand what the client's needs are.	

Adjacency Matrix & Bubble Diagram (25 pts)	End users needs were not considered and the adjacencies do not function well.	Some end users needs are met; however, the overall spatial ideas present function problems.	End users basic needs are met without above and beyond solutions.	End users needs are met and an articulate attention to detail is shown.	End users needs are met using creative design solutions.	
Total out of 100: _____						

Comments:

Phase 2a: Schematic Design & Design Development (100 points)

	Below Average	Fair	Competent	Good	Excellent	Total
Design Concept Board (30 pts)	Missing most or all of the information required, not formatted, and with no clear concept.	Includes some of the required information with a general idea of concept.	Includes most of the required information with a direction of the concept that is mostly formatted and designed.	Includes ALL required information formatted correctly with a clear idea of their concept.	Includes ALL required information with correct format; a clear direction of design and concept are evident.	
Space Planning and Diagrams (50 pts)	Shows little development and missing plans and/or diagrams. Design is thrown together haphazardly.	Design appears to be somewhat thought out but knowledge and use of design theory is not obvious.	Design is well thought out but there are obvious errors in functionality of space.	There is clear development for the space and diagrams have guided the space planning.	Perfectly thought out diagrams that influence the developed space plan.	
3D Model Development (20 pts)	Hardly any development to the 3D model.	3D model is made, but there is little direction to architectural details.	There is good direction of architectural details in the space.	The 3D model is developed to show the major architectural components of the space.	Above and beyond detailed work of major architectural details shown in the 3D model.	
Total out of 100: _____						

Comments:

Phase 2b: Final Design (100 points)

	Below Average	Fair	Competent	Good	Excellent	Total
Presentation Plans (20 pts)	Missing most of the required plans.	Includes some of the required plans with no presentation quality.	Includes most of the required information with some presentation quality.	Includes ALL required information with good presentation quality.	Includes ALL required information with above and beyond presentation quality.	
FF&E Selection and Spec Book (20 pts)	Missing many of the specifications with no clear scheme or reason to choices.	Some specifications are selected with little reasons and lackluster scheme.	Most of the major specifications are thought out, scheme has direction, and reasoning is evident.	All of the major specifications are selected, scheme is cohesive, and reasoning is evident.	Above and beyond with the specification selections, scheme is interesting and cohesive, and reasoning makes sense.	
Final Digital Presentation (50 pts)	The designer does not “sell” the project and only has the bare minimum.	The designer includes slightly more than the bare minimum, but the design still isn’t “sold”.	The designer includes enough information to possible “sell” the project.	The designer includes “sexy” presentation info to sell the project.	The designer goes above and beyond with making the project look amazing.	

Oral Presentation (10 pts)	There is little to no evidence that the designer knows what they're talking about.	There is little to no evidence that the designer has practiced their presentation.	The presentation may have been practiced, but there are a few flaws.	The presentation is delivered with very few problems.	The presentation is delivered without any issues or problems.	
Total out of 100: _____						

Comments:

Phase 3: Construction Documents & Process Notebook (100 points)

	Below Average	Fair	Competent	Good	Excellent	Total
Construction Documents (70 pts)	Missing plans with errors in functionality.	Some plans are included with problems in the design.	Most required plans are included; the design is good, but has some functionality errors.	All required plans are included and the design is well thought out.	All the plans are required with a creative solution to the design problems.	
Process Notebook (30 pts)	Missing process work without correct formatting.	Some process work is included with some correct formatting.	Most process work is included with some correct formatting and tabs.	All process work is included with good formatting.	All process work is included with correct and creative formatting.	
Total out of 100: _____						

Comments:

Student Presentation Assignment

CADS 5320: Health + Wellness in the Built Environment

Assignment

- Choose a group of four people.
- Investigate one of the topics listed below and present your findings to the class. You should seek reputable sources other than your course text.
<http://www.wellcertified.com> is a good place to start.
 - Wellness in Retail
 - Wellness in Multifamily Residential
 - Wellness in Education
 - Wellness in Restaurants
 - Wellness in Commercial Kitchens
- **DUE** uploaded digital files of the Powerpoint Presentation to Canvas by the start of your assigned lecture data. Bring a hard copy of the poster to class.

Presentation Guidelines

- Length: 20 – 25 minutes
- Complete the presentation in Powerpoint
- Use bullets – not complete sentences and check your spelling
- Include references (either in the notes section or at the bottom of the slide) using APA style
- Include the URL for all images in the notes section of each slide
- No font smaller than 18 point
- Ideas to include in your presentation:
 - a. How are these places utilizing wellness or how can they
 - b. Any statistics or measurements regarding wellness in these places
 - c. Any research being conducted on the effects of wellness in these places
 - d. Case studies and examples of places that are WELL certified related to your topic
 - e. Any information that IWBI provides about wellness in these areas
 - f. Visuals and diagrams related to the topic. Pay attention to the image quality.
 - g. A quiz/review section or game at the end

Visual Guidelines

- Size: 18 x 24 inch (landscape or portrait)
- Complete in Illustrator, InDesign, or Photoshop
- Incorporate texts and visuals
- Summarize info shared in Powerpoint
- Include references using APA

Rubric

Oral Presentation

_____ / 25 Content

_____ / 10 Supporting material

_____ / 10 Delivery

Poster Presentation

_____ / 20 Content

_____ / 10 Visual Presentation

Total

_____ / 75

WELL Scorecard Assignment
CADS 5320: Health + Wellness in the Built Environment

Task: For this assignment, you and your group of 4 people will be given a WELL scorecard (page 6-14 of the Educational Facilities Pilot Addendum File on Canvas) and a LEED certified building on campus to evaluate. You have one week (including studio time) to visit your assigned building and evaluate it according to the WELL scorecard. Please fill out the scorecard the best you can, write notes, and turn in your final score and process work.

This is due by 4 pm on the Friday after the last studio. Turn in all your process and final work in a folder with the groups name on it.

Sample LEED Certified Building Options:

- The Gorrie Center
- Aquatic Resource Management Center
- Auburn Research Park Building One
- Office of Information and Technology building

Points:

____ / 10 Group Evaluation

____ / 10 Process Notes

____ / 10 Participation

____ / 20 Scorecard Completion

Total: ____ / 50

CHAPTER 4. ASSESSMENTS

It is vital that students in this course take practice quizzes and tests before they take their official WELL AP examination. Throughout the course, ten question multiple choice quizzes will be given to evaluate the student's knowledge of the information for each concept. These quizzes are provided in this chapter. For any other examinations, such as midterm exams, final exams, or general practice exams, it is recommended that instructors use the WELL AP Practice Tests from Green Building Education Services [GBES]. These are available on their website at <https://www.gbcs.com/catalog/well-ap/product-well-ap-practice-tests/> for \$79.95 and includes 400 practice questions (GBES, 2015). Please note that these practice tests expire after 120 days. Since this resource is available with the types of questions the WELL AP exam asks, it only makes sense for this to be the main source of assessment for students.

Other resources that can be used for preparing for the exam include the GBES flashcards, online webinars, the WELL AP Exam Preparation Guide from IWBI available online for \$95.00 at <https://store.wellcertified.com/products/well-ap-exam-preparation-guide> (IWBI, 2017), and the WELL AP Study Plan available online at <https://www.wellcertified.com/node/2608> (IWBI, 2017).

Introduction to WELL Practice Quiz

Q1: How many concepts are there in The WELL Building Standard?

- A. 5
- B. 6
- C. 7
- D. 8

Q2: Which of the following is NOT a level of certification you can receive in WELL?

- A. **Bronze**
- B. Silver
- C. Gold
- D. Platinum

Q3: Which of the following is NOT a body system The WELL Building Standard addresses?

- A. Integumentary
- B. **Lymphatic**
- C. Nervous
- D. Cardiovascular

Q4: How many preconditions must a project meet in order to receive a silver certification?

- A. 10
- B. None of them
- C. 25
- D. **All of them**

Q5: What score must a project get to receive gold certification?

- A. 7
- B. 5
- C. 9
- D. There is no gold certification

Q6: What score must a project get to receive platinum certification?

- A. 1
- B. 6
- C. **9**
- D. There is no platinum certification

Q7: Which of the following is NOT a typology for The WELL Building Standard?

- A. New and Existing Buildings
- B. **Surrounding Grounds and Landscape**
- C. New and Existing Interiors
- D. Core and Shell

Q8: How often must a Core and Shell compliant building be recertified?

- A. Core and shell is not recertified**
- B. Annually
- C. Every three years
- D. Every five years

Q9: Which of the following is NOT a concept in The WELL Building Standard?

- A. Air Quality
- B. Water
- C. Environmental Factors**
- D. Comfort

Q10: What is the integumentary system concerned with?

- A. Heart and blood
- B. Muscles
- C. Brain and nerves
- D. Skin**

Air Quality Practice Quiz

Q1: How many liters of air do we breath each day?

- A. **15,000**
- B. 1,500
- C. 20,000
- D. 150,000

Q2: Approximately, how many adults in the US smoke?

- A. 1 billion
- B. 4.2 million
- C. **42 million**
- D. 10 million

Q3: What is the maximum level of total volatile organic compounds (VOCs) allowed according to Feature 1: Air Quality Standards?

- A. 10,000 $\mu\text{g}/\text{m}^3$
- B. 5,000 $\mu\text{g}/\text{m}^3$
- C. 1,000 $\mu\text{g}/\text{m}^3$
- D. **500 $\mu\text{g}/\text{m}^3$**

Q4: What is the minimum distance smoking is prohibited from building openings according to the feature, Smoking Ban?

- A. 50 feet
- B. **25 feet**
- C. 100 feet
- D. 250 feet

Q5: What is the ASHRAE standard that applies to ventilation rates?

- A. **ASHRAE 62.1**
- B. ASHRAE 50.9
- C. ASHRAE 43.5
- D. ASHRAE 75.2

Q6: What level MERV filters are required for the Air Filtration feature?

- A. 10
- B. 15
- C. **13**
- D. 9

Q7: What is the minimum length a walk-off system can be according to the Healthy Entrance feature?

- A. 5 feet
- B. **10 feet**
- C. 15 feet
- D. 20 feet

Q8: According to the Fundamental Material Safety feature, what building material is banned because it can lead to cancer, mesothelioma, and neurotoxic issues?

- A. Asbestos
- B. Lead
- C. VOCs
- D. Formaldehyde

Q9: To meet the optimization feature, Increased Ventilation, how much should you exceed the ASHRAE outdoor air supply rates?

- A. 20%
- B. 30%
- C. 50%
- D. 75%

Q10: According to the Cleaning Equipment feature, what is the maximum denier allowed for mops, rags, and dusters?

- A. 1.0
- B. 2.0
- C. 3.0
- D. 5.0

Water Practice Quiz

Q1: According to the Institute of Medicine, how many liters of water should a man drink each day?

- A. 2.7
- B. 3.7**
- C. 5.0
- D. 7.5

Q2: According to the background section of the water concept in The WELL Building Standard, quality of US surface water relies on what?

- A. The Clean Water Act of 1974**
- B. Drinking Water Law 1995
- C. Safe Water Code
- D. Potable Water Proposal of 2004

Q3: What two properties of water does the Fundamental Water Quality feature address?

- A. Contamination and color
- B. Total lead and total mercury
- C. Total coliforms and turbidity**
- D. Fluxion and total dissolved metals

Q4: What is the maximum level of lead allowed in water according to the precondition, Inorganic Contaminants?

- A. 0.01 mg/L**
- B. 0.10 mg/L
- C. 1.0 mg/L
- D. 10.0 mg/L

Q5: What are activated carbon filters intended to remove?

- A. Agricultural contaminants
- B. Organic contaminants**
- C. Inorganic contaminants
- D. Public water additives

Q6: What is a pesticide that is thought to disrupt the endocrine system and is associated with heart problems?

- A. Mercury
- B. Lead
- C. Glyphosate
- D. Atrazine**

Q7: Which of the following is NOT a public water additive addressed in The WELL Building Standard?

- A. Fluoride
- B. Nitrate**

- C. Chloramine
- D. Chlorine

Q8: According to the feature, Periodic Water Quality Testing, how often should you test for inorganic metals?

- A. Monthly
- B. Annually
- C. Quarterly**
- D. Daily

Q9: Which of the following is NOT an option for filtration and sterilization to comply with the feature, Water Treatment?

- A. Carbon filter
- B. UV sanitization
- C. Sediment filter
- D. HEPA filter**

Q10: To encourage occupants to drink water, at least one water dispenser is located every _____ feet.

- A. 250 feet
- B. 75 feet
- C. 100 feet**
- D. 500 feet

Nourishment Practice Quiz

Q1: What is the BMI level that indicates obesity?

- A. 20
- B. 30**
- C. 25
- D. 35

Q2: What is average dietary intake per day, according to The WELL Building Standard?

- A. 2,600 calories**
- B. 1,500 calories
- C. 3,000 calories
- D. 2,000 calories

Q3: What is the recommended average serving of fruits and vegetables each day?

- A. 3 fruits; 5 vegetables
- B. 5 fruits; 7 vegetables
- C. 3 fruits; 3 vegetables
- D. 4 fruits; 5 vegetables**

Q4: What ingredient is not allowed in any food or beverage according to the Processed Foods feature?

- A. Gluten
- B. Saturated Fat
- C. Partially hydrogenated oil**
- D. MSG

Q5: Which of the following is NOT an allergen that is addressed in the feature, Food Allergies?

- A. Peanuts
- B. Poultry**
- C. Fish
- D. Soy

Q6: According to the Hand Washing feature, sinks are required to have a column of water that is at least how many inches in length?

- A. 10**
- B. 15
- C. 20
- D. 25

Q7: What two body systems does the feature, Food Contamination, address according to The WELL Building Standard?

- A. Cardiovascular and endocrine
- B. Reproductive and digestive
- C. Endocrine and integumentary

D. Digestive and immune

Q8: Which of the following is NOT required to be included on nutrition labels according to the feature, Nutritional Information?

- A. Total calories
- B. Serving Size**
- C. Total sugar
- D. Micronutrient content

Q9: What is the maximum volume that cups can be, according to Serving Sizes?

- A. 15 ounces
- B. 12 ounces
- C. 10 ounces
- D. 8 ounces**

Q10: To comply with Food Production, how much space is required per occupant for a garden or greenhouse?

- A. 1 square foot**
- B. 2 square feet
- C. 3 square feet
- D. 4 square feet

Light Practice Quiz

Q1: Light is a visible form of electromagnetic energy. What is the smaller wavelength on the spectrum?

- A. **UV radiation**
- B. Microwave
- C. Infrared
- D. X-rays

Q2: What color sensitivity do rods have?

- A. Yellow light
- B. Teal-blue light
- C. **Green-blue light**
- D. White light

Q3: What are the external cues that align physiological function to solar day and keeps our internal clock synchronized?

- A. Cones
- B. **Zeitgebers**
- C. Suprachiasmatic nucleus
- D. Circadian rhythm

Q4: What does exposure to light in the late afternoon/early night do?

- A. **Phase delay**
- B. Phase advance
- C. Phase forward
- D. Increase fatigue

Q5: To comply with Visual Lighting Design, ambient lighting maintains an average of what footcandle level at workstations?

- A. 15 fc
- B. **20 fc**
- C. 25 fc
- D. 30 fc

Q6: To comply with the feature Electric Light Glare Control, a lamp with more than 500,000 cd/m² needs a shield with an angle of what?

- A. 15 degrees
- B. 20 degrees
- C. **30 degrees**
- D. 40 degrees

Q7: What does CRI stand for?

- A. Ceiling Reflectance Index
- B. Color Reduction and Increase
- C. Cardiovascular Rescue Institute

D. Color Rendering Index

Q8: To comply with Right to Light, 75% of all workstations are within how many feet of an atrium or window with an exterior view?

- A. 10 feet
- B. 25 feet**
- C. 50 feet
- D. 75 feet

Q9: Annual sunlight exposure is achieved for no more than how much of the occupied space?

- A. 10%**
- B. 20%
- C. 30%
- D. 40%

Q10: On facades, the window to wall ratio measured on the external elevation is between what, according to Daylight Fenestration?

- A. 10% - 20%
- B. 30% - 50%
- C. 25% - 75%
- D. 20% - 60%**

Fitness Practice Quiz

Q1: What is “the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure time pursuits, and respond to emergencies”?

- A. Health
- B. Weight management
- C. Lifestyle
- D. Fitness**

Q2: Physical inactivity increases the risk of Type 2 diabetes by how much?

- A. 18%
- B. 21%
- C. 27%**
- D. 32%

Q3: The American College of Sports Medicine recommends 30 minutes of aerobic activity how many days each week?

- A. 3
- B. 4
- C. 5**
- D. 6

Q4: For projects with two to four floors, at least one staircase is located within how many feet of the entrance of a building?

- A. 20 feet
- B. 25 feet**
- C. 30 feet
- D. 35 feet

Q5: To comply with Activity Incentive Programs, a subsidy of at least how much is offered to employees for a bike share membership?

- A. \$50**
- B. \$75
- C. \$100
- D. \$125

Q6: To meet Exterior Active Design, a WalkScore of what is required?

- A. 40
- B. 50
- C. 60
- D. 70**

Q7: To comply with the feature, Physical Activity Spaces, access to parks, gyms, fields, or pools are located within how far of a building?

- A. 0.5 miles**

- B. 0.75 miles
- C. 1.0 miles
- D. 2.0 miles

Q8: What is NOT a required part of Active Transportation Support?

- A. Bicycle maintenance tools
- B. Showers
- C. Bike locks**
- D. Lockers

Q9: Treadmills, elliptical machines, rowing machines, and stationary bikes are required for what percentage of occupants to comply with Fitness Equipment?

- A. 1%**
- B. 5%
- C. 10%
- D. 20%

Q10: At least how many workstations are required to have either adjustable height standing desks or standard desks with desk-top height adjustment stands to comply with Active Furnishings?

- A. 20%
- B. 30%
- C. 50%
- D. 60%**

Comfort Practice Quiz

Q1: Which body system relates to ergonomics the most?

- A. Cardiovascular
- B. Immune
- C. Musculoskeletal**
- D. Respiratory

Q2: How many variables are mentioned in the background section of the comfort concept that contributes to an occupant's thermal comfort?

- A. 5
- B. 6**
- C. 7
- D. 8

Q3: How much of a project must comply with ADA regulations?

- A. 25%
- B. 50%
- C. 75%
- D. 100%**

Q4: Average sound pressure level from the outside should not exceed how many decibels to meet Exterior Noise Intrusion?

- A. 20 dBA
- B. 35 dBA
- C. 42 dBA
- D. 50 dBA**

Q5: What is the term that refers to the balancing of heat gains and losses to maintain the body's core temperature?

- A. Hypoxia
- B. Homeothermy**
- C. Hypothalamus
- D. HEPA

Q6: What ASHRAE standard regulates thermal comfort?

- A. ASHRAE 55**
- B. ASHRAE 62.1
- C. ASHRAE 75
- D. ASHRAE 84.2

Q7: To comply with the feature, Reverberation Time, open workspaces have a maximum RT60 of how long?

- A. 0.3 seconds
- B. 0.4 seconds
- C. 0.5 seconds**

D. 0.6 seconds

Q8: If there is a sound masking system used in a space, the sound levels for enclosed offices are what?

- A. 30 – 35 dBA
- B. 40 – 42 dBA**
- C. 45 – 48 dBA
- D. 52 – 56 dBA

Q9: To comply with Sound Barriers, doors connecting to private offices and conference rooms are constructed with any of the following EXCEPT:

- A. Sweeps
- B. Non-hollow core
- C. Bolts**
- D. Gaskets

Q10: What is the term that refers to individuals selecting their own area to work in to best fit their thermal need?

- A. Free address**
- B. Open workspace
- C. Self selection
- D. Thermal Control

Mind Practice Quiz

Q1: Approximately how many deaths are attributed to mental health disorders each year, according to the WELL Building Standard?

- A. 80 million
- B. 800,000
- C. 8 million**
- D. 8.8 million

Q2: What term is used to describe “the degree to which individuals can obtain, process, and understand the basic health information and services they need to make appropriate health decisions”?

- A. Wellness Understanding
- B. Health Literacy**
- C. Occupant Awareness
- D. Physical Ability

Q3: Post-occupancy surveys are reported to whom within how many days of being conducted?

- A. Building owners and managers, occupants, and IWBI within 30 days**
- B. IWBI within 60 days
- C. Occupants and architects within 1 year
- D. WELL Assessor, building owners and managers within 45 days

Q4: Which of the following does the biophilia plan not need to address to meet Feature 88: Biophilia I: Qualitative?

- A. How nature is incorporated in the project through environmental elements, lighting, and space layout
- B. How the project uses nature’s patterns
- C. Provides opportunities for human and nature interactions within the building and within the project boundary
- D. How many water features and walking paths will be included in the project**

Q5: Insufficient sleep is associated with which negative health issues according to Feature 90: Healthy Sleep Policy?

- A. Asthma and respiratory problems
- B. Cancer
- C. Diabetes and hypertension**
- D. Skin and eye irritation

Q6: Which of the following is not a main stressor of business travel according to Feature 91: Business Travel?

- A. Impacts on family and personal life
- B. Issues with carrying luggage**
- C. Jetlag

D. Increased workload upon return

Q7: Which of the following is not something that employers need to provide to meet Feature 92: Building Health Policy?

- A. **On-site childcare or subsidies for daycare**
- B. Health insurance and/or subsidies
- C. On-site immunization or time off to get them
- D. Policies to encourage ill occupants to stay home

Q8: According to Feature 93: Workplace Family Support, what are employers required to provide to nursing mothers?

- A. 30 minute breaks every hour
- B. **15 minute breaks every 3 hours**
- C. 1 hour breaks twice a day
- D. 3 hour breaks every work day

Q9: What two systems does chronic stress mainly impact according to Feature 95: Stress and Addiction Treatment?

- A. Integumentary and reproductive
- B. Respiratory and nervous
- C. **Nervous and cardiovascular**
- D. Reproductive and cardiovascular

Q10: What must employers offer to occupants participating in volunteering to comply with Feature 96: Altruism?

- A. 4 hours off each month to participate in volunteer activities
- B. 1 hour off each day to participate in volunteer activities
- C. 10 hours off once a year to participate in volunteer activities
- D. **8 hours off twice a year to participate in volunteer activities**

CHAPTER 5. CONCLUSION

The International WELL Building Institute aims to make people's lives better and healthier through the WELL Building Standard. The WELL Building Standard is "the leading tool for advancing health and wellbeing in buildings and communities globally" according to IWBI's Web site (IWBI, 2017). Research has shown that people spend nearly 90% of their time indoors (IWBI, 2017). Since studies have found that the built environment affects our health, it is imperative that these interior spaces are designed with human health and wellbeing at the forefront. IWBI, launched in 2013 after a Clinton Global Initiative commitment, understands the importance of designing for the wellbeing of the occupants. Their standard includes different features that buildings must meet in order to be certified as a WELL building. People can study the WELL Building Standard and take a comprehensive exam to become a WELL AP, who can later help guide projects to successful certification.

Although WELL is similar to LEED, the sustainable building certification program, it is much newer and has yet to gain the popularity that LEED has. There are currently over 200,000 LEED APs (USGBC, 2016) compared to the approximately 800 WELL APs (IWBI, 2017). Wellness trends in the design industry are growing and will soon become as common as sustainability. With this trend growing so quickly, it is important that we are educating design students and professionals about this certification system and standard. Designers should recognize that the WELL Accredited Professional is a value added credential that works with their other credentials and allows them to best design environments for occupant wellbeing. There is currently not a complete educational course developed based solely on the WELL Building Standard. This thesis includes all the material necessary to teach a university studio,

lecture, or even a professional development course on WELL, and therefore addresses a gap in what is currently available.

Resources such as this are important in teaching current best practices and design trends so that people can implement them into practice. Students in design school can begin their career with up to date knowledge and designers can stay current with their professional development. To evaluate the effectiveness of the course content in this thesis, a pilot study was conducted using an upper level sustainability class at Auburn University. The students were first given a ten question multiple choice quiz about the mind concept in the WELL Building Standard. After the pre-test, students listened to the mind lecture included in this course packet, and were then given the same ten question quiz. Students performed better on the second quiz because they were exposed to the information. Information on the pilot study can be found in Appendices B, C, and D. As this course becomes adopted in educational settings, its effectiveness can be further tested.

Wellness research in relation to the built environment is still in the early stages, but there is opportunity for growth and future studies. As buildings become WELL certified, we will be able to measure the effects it has on the occupants and continue to improve the standard.

In order to get to the point where wellness is a common consideration in designing the built environment, people need to be educated on how this can be accomplished. If educators use this thesis information in their course curriculum and professional development, wellness will be further incorporated into the design process and occupants will be able to live a healthier life.

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APPENDIX A

2017 CIDA Standards

The Council for Interior Design Accreditation [CIDA] sets standards for postsecondary interior design education and is the recognized accrediting organization for interior design education programs at higher education institutions internationally. Over 150 interior design programs around the world are currently accredited by CIDA, which encourages high academic achievement. Programs go through a process every four years of self-evaluation and peer review using the CIDA Standards.

The CIDA Standards Section II. Knowledge Acquisition and Application is included in this appendix (CIDA, 2017). The standards that are relevant to this course when offered as an interior design studio are highlighted in the appendix. This course and the standards it addresses could help an interior design program at a university achieve their CIDA accreditation.

Section II. Knowledge Acquisition and Application

Standard 4. Global Context

Interior designers have a global view and consider social, cultural, economic, and ecological contexts in all aspects of their work.

Intent: This standard ensures that graduates are prepared to work in a variety of contexts as well as across geographic, political, social, environmental, cultural, and economic conditions.

Student Learning Expectations

- a) Students are aware that building technology, materials, and construction vary according to geographic location.

Student work demonstrates understanding of:

- b) how social, economic, and cultural contexts inform interior design.
c) how environmental responsibility informs the practice of interior design.

Program Expectations

The interior design program provides:

- d) exposure to the current and relevant events that are shaping contemporary society and the world.
e) exposure to a variety of cultural norms.
f) opportunities for developing multi-cultural awareness.¹

Guidance

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

¹ Examples could include opportunities to study abroad, cultural exchanges, or community-based projects that expose students to cultural and/or economic diversity.

Standard 5. Collaboration

Interior designers collaborate and also participate in interdisciplinary teams.

Intent: This standard ensures graduates are able to work in teams and recognize the value of integrated design practices. Graduates are prepared to maximize their effectiveness in leadership roles or as contributing team members.

Student Learning Expectations

Students have **awareness** of:

- a) the nature and value of integrated design practices.¹
- b) the terminology and language necessary to communicate effectively with members of allied disciplines.
- c) technologically-based collaboration methods.²

Students **understand**:

- d) team work structures.³
- e) leadership models and the dynamics of collaboration.
- f) Student work demonstrates the **ability** to effectively collaborate with multiple disciplines in developing design solutions.⁴

Guidance

The following guidance is provided to promote consistent understanding of the referenced criteria. Examples offered are for the purposes of illustration only and should not be construed as required or as an inclusive list of items that must be evidenced.

- ¹ This involves an integrated team process in which a design team representing all disciplines (interior design, architecture, construction, etc.) and all affected stakeholders (clients, community participants, etc.) work together.
- ² Examples could include shared building information modeling, groupware technology, and collaborative software.
- ³ Examples could include aligning individual personality traits and skills with leading or contributing roles on a team and team work that involves both inter-dependent and independent focus.
- ⁴ Examples could include engaging in multi-disciplinary team projects and/or involving experts from other disciplines. Disciplines may be within or outside of the built environment.

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

Standard 6. Business Practices and Professionalism

Interior designers understand the principles and processes that define the profession and the value of interior design to society.

Intent: This standard ensures graduates understand accepted standards of practice, are ready to contribute to a variety of professional work environments, and are aware of the interrelationships that influence design, design responsibility, and ethics.

Student Learning Expectations

Students have **awareness** of the:

- a) contexts for interior design practice.¹
- b) impact of a global market on design practices.²
- c) **breadth and depth of interior design's impact and value.**³
- d) components of business practice.⁴

Students **understand**:

- e) types of professional business formations.⁵
- f) elements of project management.⁶
- g) instruments of service: contract documents, transmittals, schedules, budgets, and specifications.
- h) professional ethics and conduct.⁷

Program Expectations

The interior design program provides exposure to:

- i) career opportunities an interior design education can afford and the options for advanced study.
- j) role models who are qualified by education and experience in interior design.

The interior design program provides exposure to the role and value of:

- k) legal recognition for the profession.
- l) professional organizations.
- m) life-long learning.
- n) public service.

Guidance on next page

Standard 7. Human-Centered Design

Interior designers apply knowledge of human experience and behavior to designing the built environment.

Intent: This standard ensures that graduates identify, analyze, and apply information from a variety of stakeholders and sources to develop a successful response to user needs and to promote health and wellbeing.

Student Learning Expectations

Student work demonstrates **understanding** of:

- a) the impact of the built environment on human experience, behavior, and performance.¹
- b) the relationship between the natural and built environment as it relates to the human experience, behavior, and performance.
- c) methods for gathering human-centered evidence.²

Student work demonstrates the **ability** to:

- d) analyze and synthesize human perception and behavior patterns to inform design solutions.
- e) apply human factors, ergonomics, and universal design principles to design solutions.³
- f) apply wayfinding techniques to design solutions.

Guidance

The following guidance is provided to promote consistent understanding of the referenced criteria. Examples offered are for the purposes of illustration only and should not be construed as required or as an inclusive list of items that must be evidenced.

- ¹ Refers to systems thinking, biophilia, cognition and perception, social interactions, and contextualizing human experience and behavior in environments.
- ² Examples could include precedent studies, case studies, surveys, observations, peer-reviewed literature, and focus groups.
- ³ Refers broadly to “the design of products and environments to be useable by all people to the greatest extent possible, without the need for adaptation or specialized design.” Quote attributed to Ron Mace, excerpted from North Carolina State University Center for Universal Design website. ADA and similar Canadian regulations are addressed in Standard 16.

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

Standard 8. Design Process

Interior designers employ all aspects of the design process to creatively solve a design problem.

Intent: This standard ensures graduates can employ methods of inquiry, data collection, and analysis to appropriately frame design questions. Additionally, graduates should apply problem-solving methods throughout the design process to arrive at a comprehensive design solution that incorporates skills and knowledge previously acquired in the curriculum. Familiarity with effective design processes enables graduates to understand complex problems as a system of interconnected issues.

Student Learning Expectations

a) Student work demonstrates the ability to **apply** space planning techniques throughout the design process.¹

Student work demonstrates the ability to **apply** knowledge and skills learned to:

b) solve progressively complex design problems.

c) identify and define issues relevant to the design problem.²

d) execute the design process: pre-design, schematic design, and design development.

e) synthesize information to generate evidenced-based design solutions.

f) explore and iterate multiple ideas.

g) design original and creative solutions.³

h) Students **understand** the importance of evaluating the relevance and reliability of information and research impacting design solutions.⁴

Program Expectations

The interior design program includes:

- i) exposure to a range of problem identification and problem solving methods.
- j) opportunities for innovation and risk taking.
- k) exposure to methods of idea generation and design thinking.

Guidance on next page

Standard 12. Light and Color

Interior designers apply the principles and theories of light and color effectively in relation to environmental impact and human wellbeing.

Intent: This standard ensures graduates understand the art and science of light and color. Graduates should be able to integrate light and color in the design process to enhance the human experience.

Student Learning Expectations

a) Students are **aware** of the environmental impact of illumination strategies and decisions.

Students **understand**:

- b) the principles of natural and artificial lighting design. ¹
- c) strategies for using and modulating natural light.
- d) Students competently select and **apply** luminaires and light sources.
- e) Students have **awareness** of a range of sources for information and research about color.

f) Students **understand** how light and color in the interior environment impact health, safety, and wellbeing.

Student work demonstrates **understanding** of:

- g) color terminology.
- h) color principles, theories, and systems.
- i) color in relation to materials, textures, light, and form.

Student work demonstrates the **ability** to appropriately:

- j) select and apply color to support design concepts.
- k) select and apply color to multiple design functions. ²
- l) use color solutions across different modes of design communication. ³

Guidance

The following guidance is provided to promote consistent understanding of the referenced criteria. Examples offered are for the purposes of illustration only and should not be construed as required or as an inclusive list of items that must be evidenced.

- ¹ Examples could include color, quality, sources, use, and/or control.
- ² Functions could include composition, symbolism and associations, preferences and responses, practical and pragmatic considerations, historical precedence, and market trends.
- ³ Examples of evidence could include models, materials boards, and digital and hand renderings.

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

Standard 13. Products and Materials

Interior designers complete design solutions that integrate furnishings, products, materials, and finishes.

Intent: This standard ensures graduates have the skills and knowledge required to appropriately select and apply manufactured products and custom design elements to a design solution. Graduates should consider the multiple properties of products and materials as well as their aesthetic contribution.

Student Learning Expectations

a) Students are **aware** of the influence of furnishings, objects, materials, and finishes on human wellbeing.¹

Student work demonstrates **understanding** of:

b) how furnishings, objects, materials, and finishes work together to support the design intent.

c) typical fabrication, installation methods, and maintenance requirements.

d) **appropriate design or specification of products and materials in relation to project criteria and human well being.**¹

e) Students select and **apply** products and materials on the basis of their properties and performance criteria, including ergonomics, environmental attributes, life safety, and life cycle cost.

f) Students are **able** to lay out, design, and specify a broad range of appropriate products, materials, objects, and elements in support of the design intent.²

Guidance

The following guidance is provided to promote consistent understanding of the referenced criteria. Examples offered are for the purposes of illustration only and should not be construed as required or as an inclusive list of items that must be evidenced.

¹ Dimensions of wellbeing include safety, health, comfort, as well as psychological wellness.

² Products, materials, objects and elements could include window treatments; textiles; hard and soft goods; wall, floor and ceiling treatments; appliances; office equipment; plumbing fixtures and hardware; a/v.

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

Standard 14. Environmental Systems and Comfort

Interior designers use the principles of acoustics, thermal comfort, and indoor air quality in relation to environmental impact and human wellbeing.

Intent: This standard ensures graduates are able to contribute to the development of appropriate strategies for achieving wellbeing, comfort, and performance within interior environments. Additionally, graduates are aware of the environmental impact of their design decisions.

Student Learning Expectations

a) Students are **aware** that design decisions relating to acoustics, thermal comfort, and indoor air quality have an environmental impact.

Students **understand**:

b) **the principles of acoustical design.**¹

c) appropriate strategies for acoustical control.²

Students **understand**:

d) **the principles of thermal design.**³

e) how active and passive thermal systems and components impact interior design solutions.

Students **understand**:

f) **the principles of indoor air quality.**⁴

g) how the selection and application of products and systems impact indoor air quality.

Guidance

The following guidance is provided to promote consistent understanding of the referenced criteria. Examples offered are for the purposes of illustration only and should not be construed as required or as an inclusive list of items that must be evidenced.

¹ Examples could include noise control, sound distribution, and/or voice transmission.

² Examples could include material selection, white noise, space planning, floor, and/or wall and ceiling systems.

³ Examples could include passive and mechanical system design, airflow, and/or occupant reaction to thermal variables.

⁴ Examples could include pollutant source control, filtration, ventilation variables, CO₂ monitoring, and/or mold prevention.

The underlined student learning levels in bold are defined to clearly communicate expectations. Refer to pages 9-10 for student learning level definitions.

APPENDIX B

Approved IRB Protocols

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS REQUEST FOR EXEMPT CATEGORY RESEARCH

For Information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE**, 115 Ramsay Hall
Phone: 334-844-5966 **e-mail:** IRBAdmin@auburn.edu **Web Address:** <http://www.auburn.edu/research/vpr/ohs/index.htm>

Revised 2/1/2014 **Submit completed form to IRBsubmit@auburn.edu or 115 Ramsay Hall, Auburn University 36849.**
 Form must be populated using Adobe Acrobat / Pro 9 or greater standalone program (do not fill out in browser). Hand written forms will not be accepted.
Project activities may not begin until you have received approval from the Auburn University IRB.

1. PROJECT PERSONNEL & TRAINING

PRINCIPAL INVESTIGATOR (PI):

Name Emily Levinson **Title** Graduate Student **Dept./School** CADS
Address 528 Oak Meadow Lane Auburn, AL **AU Email** ec10010@auburn.edu
Phone 803-727-2244 **Dept. Head** Carol Warfield

FACULTY ADVISOR (if applicable):

Name Lindsay Tan **Title** Assistant Professor **Dept./School** CADS
Address 162 Spidle Hall Auburn University
Phone 805-776-3826 **AU Email** tan@auburn.edu

KEY PERSONNEL: List Key Personnel (other than PI and FA). Additional personnel may be listed in an attachment.

Name	Title	Institution	Responsibilities

KEY PERSONNEL TRAINING: Have all Key Personnel completed CITI Human Research Training (including elective modules related to this research) within the last 3 years? YES NO

TRAINING CERTIFICATES: Please attach CITI completion certificates for all Key Personnel.

2. PROJECT INFORMATION

Title: Pilot Test for Preparing for specialized practice in design and wellness: A model curriculum

Source of Funding: Investigator Internal External

List External Agency & Grant Number: _____

List any contractors, sub-contractors, or other entities associate with this project.

List any other IRBs associated with this project (including those involved with reviewing, deferring, or determinations).

FOR ORC OFFICE USE ONLY	
<p>DATE RECEIVED: _____</p> <p>DATE OF INITIAL REVIEW: _____</p> <p>DATE OF CONTINUING REVIEW: _____</p> <p>DATE OF APPROVAL: _____</p> <p>COMMENTS: _____</p>	<p>APPROVAL INTERVAL: _____</p> <div style="border: 2px solid red; padding: 5px; margin: 10px 0;"> <p style="color: red; text-align: center;">Add this approval information in sentence form to your electronic information letter!</p> </div> <div style="border: 2px solid blue; padding: 5px; margin: 10px 0;"> <p style="color: blue; text-align: center;">The Auburn University Institutional Review Board has approved this Document for use from <u>03/22/2017</u> to <u>03/21/2020</u> Protocol # <u>17-124 EX 1703</u></p> </div>

3. **PROJECT SUMMARY**

a. Does the research involve any special populations?

- YES NO Minors (under age 19)
 YES NO Pregnant women, fetuses, or any products of conception
 YES NO Prisoners or Wards
 YES NO Individuals with compromised autonomy and/or decisional capacity

b. Does the research pose more than minimal risk to participants? YES NO

Minimal risk means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. 42 CFR 46.102(i)

c. Does the study involve any of the following?

- YES NO Procedures subject to FDA Regulation Ex. Drugs, biological products, medical devices, etc.
 YES NO Use of school records of identifiable students or information from instructors about specific students
 YES NO Protected health or medical information when there is a direct or indirect link that could identify the participant
 YES NO Collection of sensitive aspects of the participant's own behavior, such as illegal conduct, drug use, sexual behavior or use of alcohol
 YES NO Deception of participants

If you checked "YES" to any response in Question #3 STOP. It is likely that your study does not meet the "EXEMPT" requirements. Please complete a PROTOCOL FORM for Expedited or Full Board Review. You may contact IRB Administration for more information. (Phone: 334-844-5966 or Email: IRBAdmin@auburn.edu)

4. **PROJECT DESCRIPTION**

a. **Subject Population** (Describe, include age, special population characteristics, etc.)

The subject population for this pilot study will include the 28 students in CADS 5310: Sustainable Design and LEED Accreditation. Neither the PI (Levinson) or Faculty Advisor (Tan) are the instructors of the course being used for the study, so as not to create coercion. All of the students are between the ages of 19-24 and include both males and females and a variety of ethnicities. They are all students at Auburn University, but come from different colleges and majors.

b. Describe, step by step, all procedures and methods that will be used to consent participants.

- N/A (Existing data will be used)

An information letter will be used in lieu of the informed consent letter in order to ensure anonymity of those who participated in the study. The information letter will be shared with the students as the first page in the survey process. The information letter will provide information about the study and state that having read the information provided, the students must decide if they want to participate in this study. If they decide to participate, the data they provide will serve as their agreement to do so.

- c. **Brief summary of project.** (Include the research question(s) and a brief description of the methodology, including recruitment and how data will be collected and protected.)

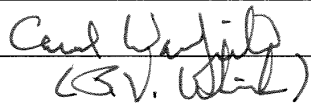
My graduate thesis is designing a curriculum to teach students about the WELL Building Standard, the new building certification system that promotes wellness in the built environment. This pilot study will be conducted over one class period (1.5 hours) to a class of 28 students to evaluate the effectiveness of the curriculum's content. This class was chosen based on their interest in the built environment and professional credentials. At the start of class, the students will be given 15 minutes to complete a pre-test with 10 questions about the WELL Building Standard Concept, Mind, via an online survey platform, such as Qualtrics. The PI will then present a lecture for 45 minutes on the WELL Building Standard Concept, "Mind". After the lecture, the students will have 15 minutes to complete the same 10 questions on the same platform as a post-test. Their answers will be anonymous, but the pre-tests and post-tests will be matched using a randomly assigned identifier to evaluate the effectiveness of the lecture content. The questions that will be used for the pre and post test are attached.

- d. **Waivers.** Check any waivers that apply and describe how the project meets the criteria for the waiver.

- Waiver of Consent (Including existing de-identified data)
- Waiver of Documentation of Consent (Use of Information Letter)
- Waiver of Parental Permission (for college students)

The information letter will provide information about the study and state that having read the information provided, the students must decide if they want to participate in this study. The use of the information letter will help to ensure anonymity.

- e. **Attachments.** Please attach Informed Consents, Information Letters, data collection instrument(s), advertisements/recruiting materials, or permission letters/site authorizations as appropriate.

Signature of Investigator	<u>Emily Levinson</u> <small>Digitally signed by Emily Levinson DN: cn=Emily Levinson, o=OU, email=emily.levinson@gmail.com, c=US Date: 2017.03.01 11:21:01 -08'00'</small>	Date	<u>03/01/2017</u>
Signature of Faculty Advisor	<u>Lindsay Tan</u> <small>Digitally signed by Lindsay Tan Date: 2017.03.01 14:50:53 -08'00'</small>	Date	<u>03/01/2017</u>
Signature of Department Head	<u></u> <small>(C.W. White)</small>	Date	<u>03/22/2017</u>

APPENDIX C

Information Letter Used for Pilot Study

Add this approval information in sentence form to your electronic information letter!

The Auburn University Institutional Review Board has approved this Document for use from
03/22/2017 to 03/21/2020
Protocol # 17-124 EX 1703

DEPARTMENT OF
CONSUMER AND
DESIGN SCIENCES



Participant Consent Form

Pilot Test for *Preparing for specialized practice in design and wellness: A model curriculum*

You are invited to participate in a research study to evaluate the effectiveness of the content for part of *Preparing for specialized practice in design and wellness: A model curriculum*. The study is being conducted by Emily Levinson, Masters student in the Department of Consumer and Design Sciences at Auburn University. You were selected as a possible participant because you are an Auburn University student and are age 19 or older.

What will be involved if you participate? Your participation is completely voluntary. If you decide to participate in this research study, you will be asked to complete an online questionnaire, listen to a lecture, and complete the same questionnaire after the lecture. Your total time commitment will be approximately 1.5 hours.

Are there any risks or discomforts? There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life.

Are there any benefits to yourself or others? You will receive no direct benefits from participating in this research study. However, your participation will help us learn more about successful curriculum design.

If you change your mind about participating, you can withdraw at any time during the study by closing your browser window. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Once you have submitted anonymous data, it cannot be withdrawn since it will be unidentifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with your university or your department.

Any data obtained in connection with this study will remain anonymous. We will protect your privacy and the data you provide by not collecting IP addresses from research participants. Anonymous information collected through your participation may be published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study, please contact Emily Levinson at ecl0010@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334) 844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION ABOVE, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, PLEASE CLICK ON THE LINK BELOW. YOU MAY PRINT A COPY OF THIS LETTER TO KEEP.

Emily Levinson 02/21/2017

Investigator Date

The Auburn University Institutional Review Board has approved this document for use from _____ to _____. Protocol # _____

Add this approval information in sentence form to your electronic information letter!

The Auburn University Institutional Review Board has approved this Document for use from 03/22/2017 to 03/21/2020
Protocol # 17-124 EX 1703

APPENDIX D

Pilot Study Results and Discussion

A pilot study was conducted to evaluate the effectiveness of the course material in this curriculum. The subject population for the study included students in the CADS 5310: Sustainable Design and LEED Accreditation. All of the participants were between the ages of 19-24 and included a mix of males and females from various ethnicities. The participants were all Auburn University students, but had different majors. This group was chosen based on their interest in the built environment and professional credentials.

The pilot study occurred over the course of one class period, which lasted an hour and a half. When students came in to the class, they were instructed to bring out their laptops and go to a specific link provided by the researcher. The link took them to a Qualtrics survey and the first page of the survey was an information letter. An information letter was used in lieu of an informed consent letter to ensure anonymity. Students were instructed to read the letter and decide if they wanted to participate in the study. Participants that proceeded were asked for a four-digit identifier that could be used to match pre-test and post-test scores. The next page of the Qualtrics survey had the 10-question multiple choice quiz for the Mind lecture, which can be found on page 129. After everyone had completed the survey, the researcher presented the Mind lecture, found on page 88. Following the lecture presentation, students were asked to return to the link, reread the letter, enter their 4-digit identifier, and complete the same 10-question multiple choice quiz once again. This post-test was compared with the results from the pre-test to evaluate the effectiveness of the lecture presentation.

There were 24 responses and 23 were viable and used in the data analysis. The pre-test had a mean score of 5.565, with scores ranging from 3 to 8. The post-test had a mean score of

6.826, with scores ranging from 4 to 10. Overall, there was an average increase of 1.261 points total. The data indicates an increase in student knowledge of the mind concept, one area of the WELL Building Standard. This suggests that the course content included in this thesis is effective at teaching material that could be on the WELL AP exam.

The next step for this study is to repeat it with more people and the other lectures. Once adequate data has been collected, questions could be individually analyzed to see where participants are having the most difficulty. Those items could be improved or addressed more clearly in the lecture content. One limitation of this study is that it used a small sample of people that are already interested in this type of material. Another limitation was that one participant answered all A's for their pre-test answers. Limitations such as these could be addressed in future research studies.