Designing for Efficiency in a Mixed-Use Space – 38 NW Davis

Allies for Efficiency

November 14, 2017

EnergyTrust of Oregon

Who we are

Energy Trust is an independent nonprofit dedicated to helping 1.5 million utility customers invest in energy efficiency and clean, renewable power.

We provide:

- Information
- Technical services
- Engineering studies
- Cash incentives
- Contractor connections

Energy Trust New Buildings

- New construction
- Major renovation
- Tenant build-out
- Additions or expansions

New Buildings Training & Education

Allies for Efficiency (AFE)

- Case study presentations on high-performance design and construction projects
- Take place 3-5 times per year in Portland + regionally

High Performance Design Trainings

- Advanced training events for designers, architects and/or engineers
- Take place 2 – 3 times per year
- Content is focused on specific techniques or technologies

Building Energy Simulation Forum (BESF)

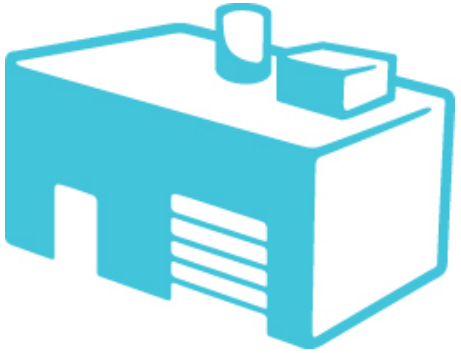
- Advanced energy modeling presentations
- Topics relevant to energy modelers / analysts, and engineers
- Take place every other month

Upcoming High Performance Design Trainings

December 7, 2017

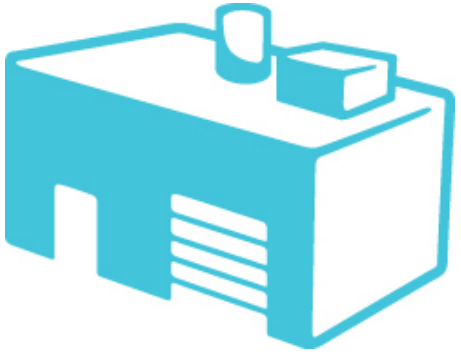
Setting Measurable Building Performance Targets for Deep Energy Savings

Presented by Connor Jansen, Seventhwave



Upcoming Building Energy Simulation Forum Trainings

BESF usually takes place the third Wednesday of every other month at the Ecotrust Building at noon.



December 13, 2017:

Energy Trust EDAPT Launch and a User's Perspective of OpenStudio

Presented by Forest Tanier-Gesner, CLEAResult

Training & Education Webpage

energytrust.org/commercial/commercial-training-events/

Boost your knowledge with Energy Trust's continuing education opportunities and special training events. Trainings include real-world examples, case studies, and detailed technical information presented by experts from the fields of architecture, engineering, construction and development, as well as specialists in a variety of building types and market sectors. Attendees may be eligible for continuing education units, CEUs.

Find Upcoming Trainings and Events

Questions?

Have questions about upcoming training and education opportunities *or* about becoming an Energy Trust New Buildings Ally?

Contact Kirsten.Vogel@clearesult.com

Thank You

Kirsten Vogel
Market Outreach Specialist
kirsten.vogel@clearesult.com

EnergyTrust of Oregon

Allies for Efficiency

Designing for Efficiency in a Mixed-Use Space

11.14.2017

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GERDINGEDLEN
PEOPLE·PLANET·PROSPERITY

BRIGHTWORKS
SUSTAINABILITY

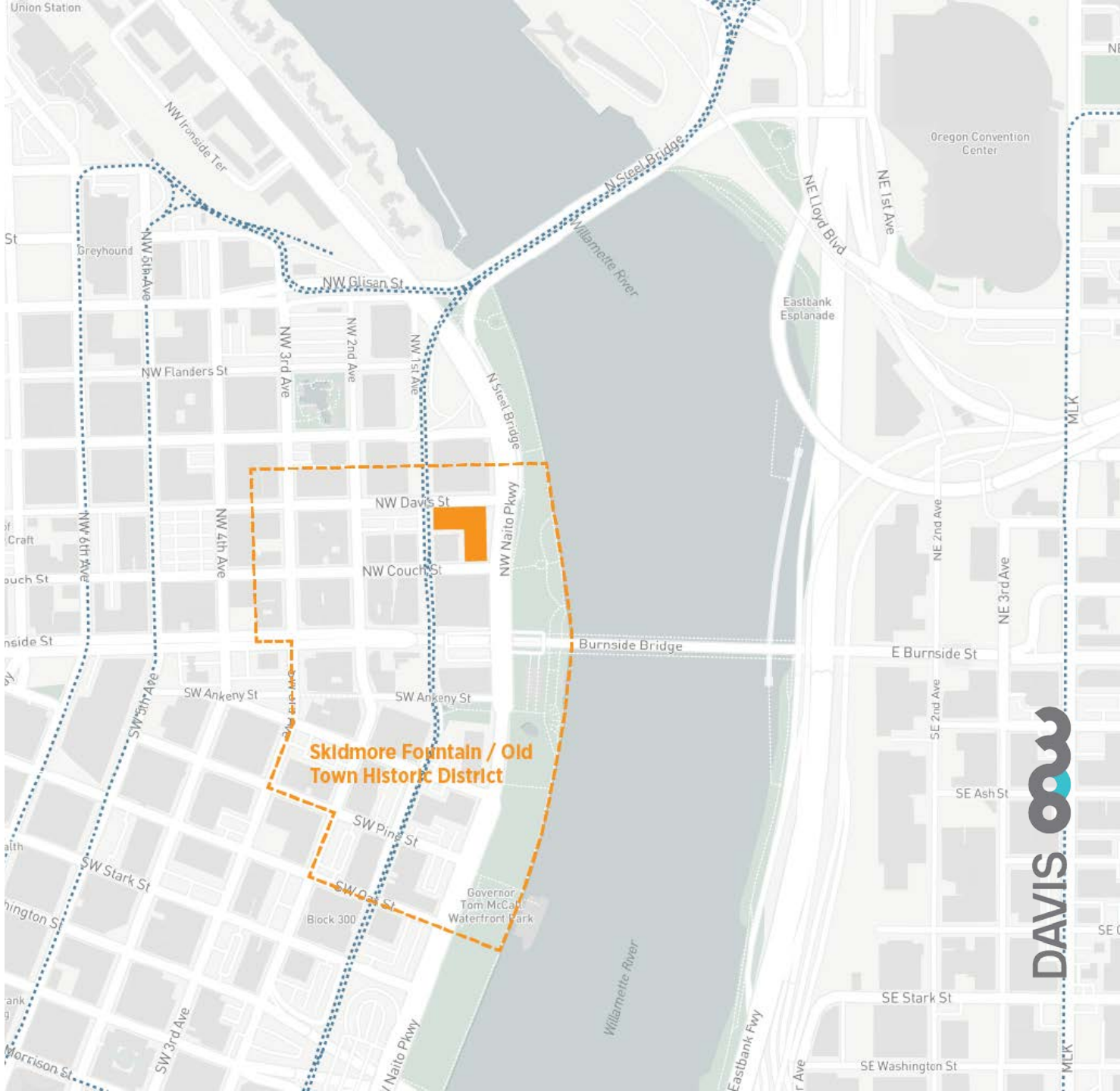
Ankrom Moisan

GLUMAC
A TETRA TECH COMPANY

SITE HISTORY

FROM SAILER'S BOARDING HOUSES TO CREATIVE RESURGENCE


NO TURNS
ONLY
DO NOT ENTER


Union Station
NW Ironside Ter
Greyhound
NW 5th Ave
NW Glisan St
N Steel Bridge
Willamette River
NE Lloyd Blvd
NE 1st Ave
Oregon Convention Center
Eastbank Esplanade
NW Flanders St
NW 3rd Ave
NW 2nd Ave
NW 1st Ave
NW Davis St
NW Naito Pkwy
NW Couch St
NW 4th Ave
NW 6th Ave
NE 2nd Ave
NE 3rd Ave
MLK
Burnside Bridge
E Burnside St
SW Ankeny St
SW 5th Ave
Skidmore Fountain / Old Town Historic District
SW Pine St
SW Oak St
SW Stark St
Block 300
Governor Tom McCall Waterfront Park
SE Ash St
SE 2nd Ave
SE Stark St
SE Washington St
SW 3rd Ave
Morrison St
Eastbank Fwy
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www.pdc.us

PARTNERSHIP

DIVERSE PUBLIC AND PRIVATE PARTNERS

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UNIVERSITY OF OREGON

EnergyTrust of Oregon

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DESIGN SOLUTION

UBER MIXED-USE IN AN HISTORIC DISTRICT


W DAVIS ST


EXIT

WHY TIMBER

TRADITIONAL CONSTRUCTION FOR CREATIVE USES

38 Davis
First LEED v4 in Oregon!

A Huge Accomplishment!

As of November 2017, only 246 Certified LEEDv4 Projects in the World!

This team is the first to navigate such a complex mix of building program through a LEEDv4 certification: Mixed-use Office with Residential & Retail.

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SUSTAINABILITY

STAKEHOLDERS SHARED PASSION FOR SUSTAINABILITY

Integrative Process

New Credit

- Discovery Phase: Create opportunities to question assumptions, align team members around goals and foster ongoing engagement. Requires Analysis.
- Implementation Phase: LEED Credit Form Worksheet questions must be answered with narrative information.”
- Documentation: Baseline summary, “shoebox” energy analysis and water supply/demand modeling, summary of evaluation of options, and inclusion of decisions in OPR & BOD.

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Integrative Process

Energy-Related Systems

Site Conditions

Massing and Orientation

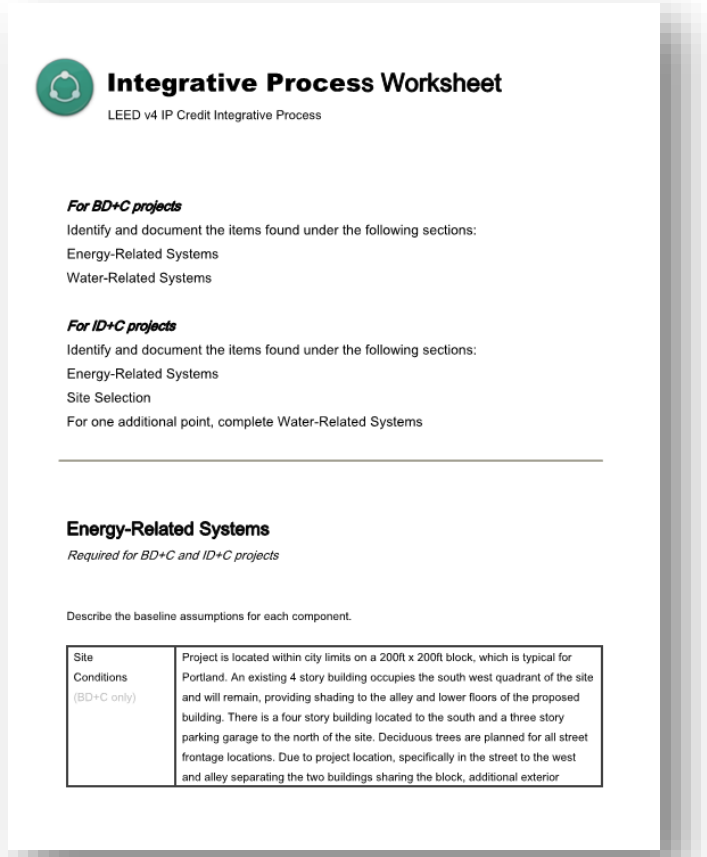
Envelope

Lighting Levels

Thermal Comfort Levels

Plug and Process Loads

Programmatic and Operational Parameters



Integrative Process Worksheet

LEED v4 IP Credit Integrative Process

For BD+C projects

Identify and document the items found under the following sections:
Energy-Related Systems
Water-Related Systems

For ID+C projects

Identify and document the items found under the following sections:
Energy-Related Systems
Site Selection
For one additional point, complete Water-Related Systems

Energy-Related Systems

Required for BD+C and ID+C projects

Describe the baseline assumptions for each component.

Site Conditions (BD+C only)	Project is located within city limits on a 200ft x 200ft block, which is typical for Portland. An existing 4 story building occupies the south west quadrant of the site and will remain, providing shading to the alley and lower floors of the proposed building. There is a four story building located to the south and a three story parking garage to the north of the site. Deciduous trees are planned for all street frontage locations. Due to project location, specifically in the street to the west and alley separating the two buildings sharing the block, additional exterior

Baseline Assumptions → Assess 2 potential load reduction strategies → Design Influence → Informing the OPR and BOD

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Integrative Process

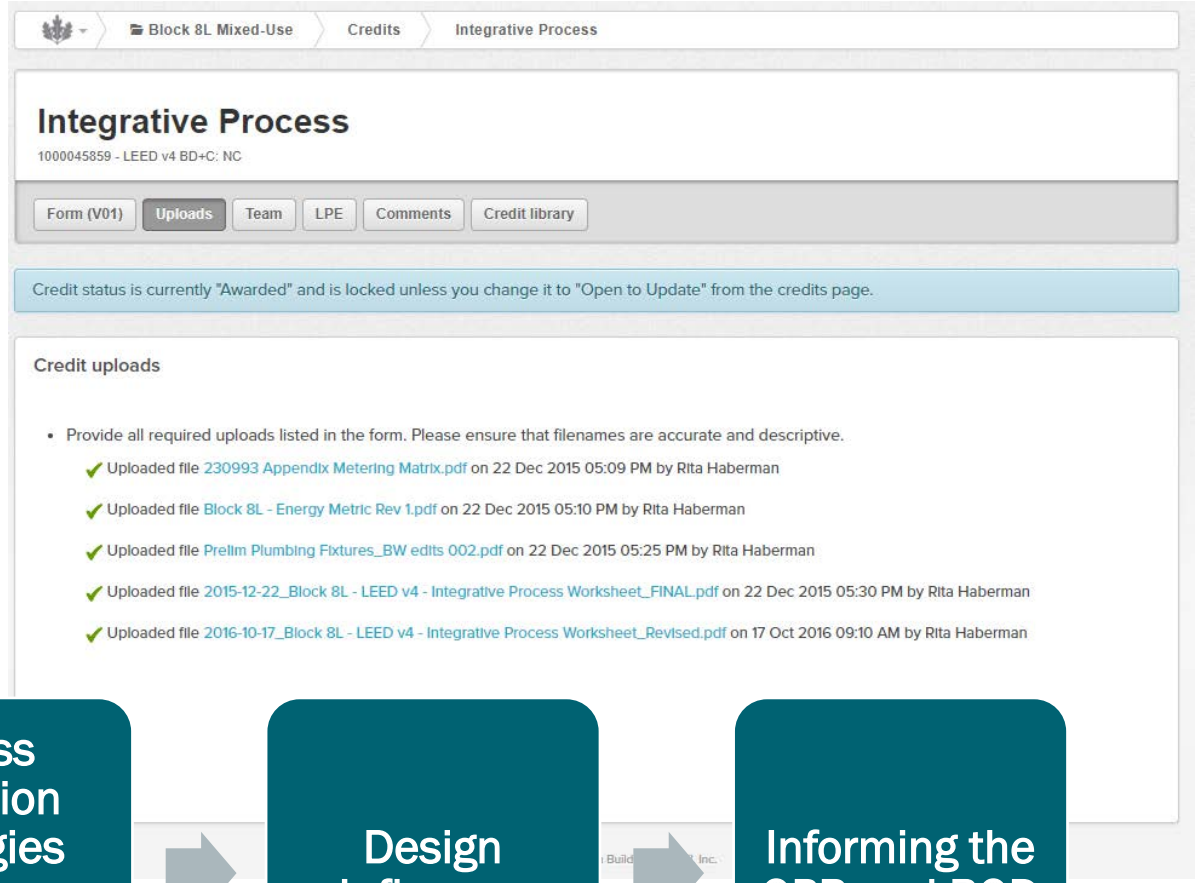
Water -Related Systems

Indoor Water Demand

Outdoor Water Demand

Process Water

Supply Sources



Baseline Assumptions → Assess reduction strategies and non-potable water use → Design Influence → Informing the OPR and BOD

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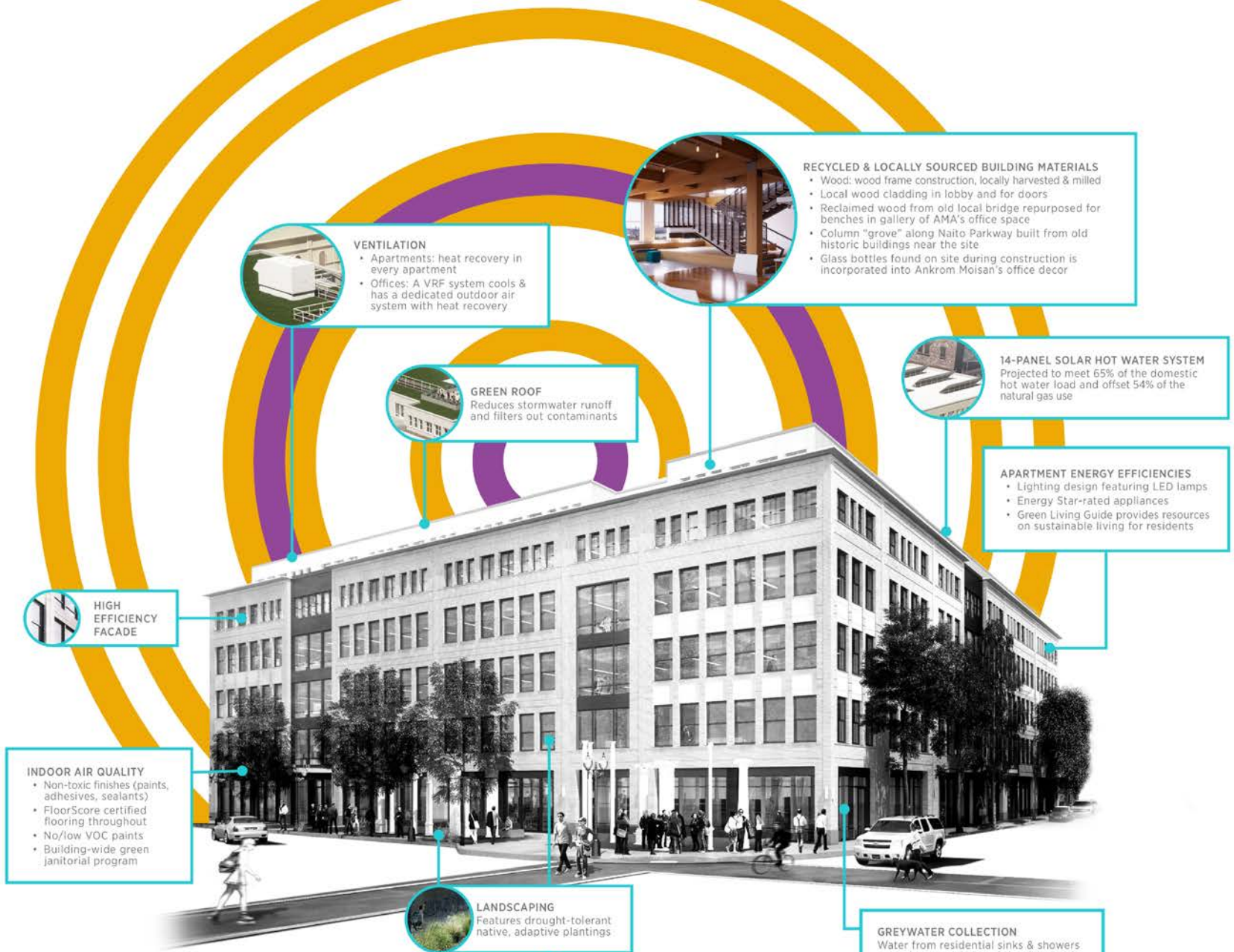

RECYCLED & LOCALLY SOURCED BUILDING MATERIALS

- Wood: wood frame construction, locally harvested & milled
- Local wood cladding in lobby and for doors
- Reclaimed wood from old local bridge repurposed for benches in gallery of AMA's office space
- Column "grove" along Naito Parkway built from old historic buildings near the site
- Glass bottles found on site during construction is incorporated into Ankrom Moisan's office decor

VENTILATION

- Apartments: heat recovery in every apartment
- Offices: A VRF system cools & has a dedicated outdoor air system with heat recovery

14-PANEL SOLAR HOT WATER SYSTEM

Projected to meet 65% of the domestic hot water load and offset 54% of the natural gas use

GREEN ROOF

Reduces stormwater runoff and filters out contaminants

APARTMENT ENERGY EFFICIENCIES

- Lighting design featuring LED lamps
- Energy Star-rated appliances
- Green Living Guide provides resources on sustainable living for residents

HIGH EFFICIENCY FACADE

INDOOR AIR QUALITY

- Non-toxic finishes (paints, adhesives, sealants)
- FloorScore certified flooring throughout
- No/low VOC paints
- Building-wide green janitorial program

LANDSCAPING

Features drought-tolerant native, adaptive plantings

GREYWATER COLLECTION

Water from residential sinks & showers reused to meet 100% of the demand for the commercial toilets

WATER FIXTURES

Efficient, Water Sense-certified building fixtures targeting 40% overall potable water reduction

AIMING FOR
LEED NC Gold

DAVIS | SUSTAINABILITY

Integrative Process

Review Comments

DESIGN FINAL REVIEW

The additional documentation demonstrates compliance. — 24 Oct 2016 9:54 AM

DESIGN PRELIM REVIEW

29 Jun 2016 3:18 PM

The LEED Form states that the project team has identified and executed synergistic opportunities for high performance outcomes across different disciplines and building systems. The analyses informed the project's Owner's Project Requirements (OPR), Basis of Design (BOD), Design Documents, and Construction Documents for Energy-Related Systems (programmatic and operational parameters, site conditions, massing and orientation, basic envelope attributes, lighting levels, thermal comfort ranges, plug and process load needs) and Water-Related Systems (indoor water demand, outdoor water demand, process water demand, and supply sources). However, to demonstrate compliance, the following must be addressed.

TECHNICAL ADVICE

1. Provide a revised worksheet describing at least two potential load reduction strategies that were assessed for site conditions (shading, exterior lighting, hardscape, landscaping, and adjacent site conditions) through simple box energy modeling before the completion of schematic design.

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Water Efficiency (WE)

What's new?

New Prerequisites & Credits
WEp Outdoor Water Use
WEp Bldg-Level Water Metering
WEc Cooling Tower Water Use
WEc Water Metering

New Concepts
- EPA WaterSense
- Outdoor Water Use Calculator
- Process Water & Equipment

EPA WaterSense

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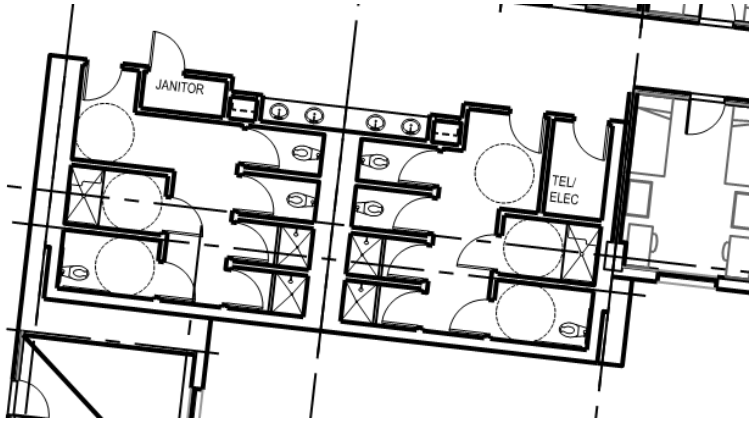
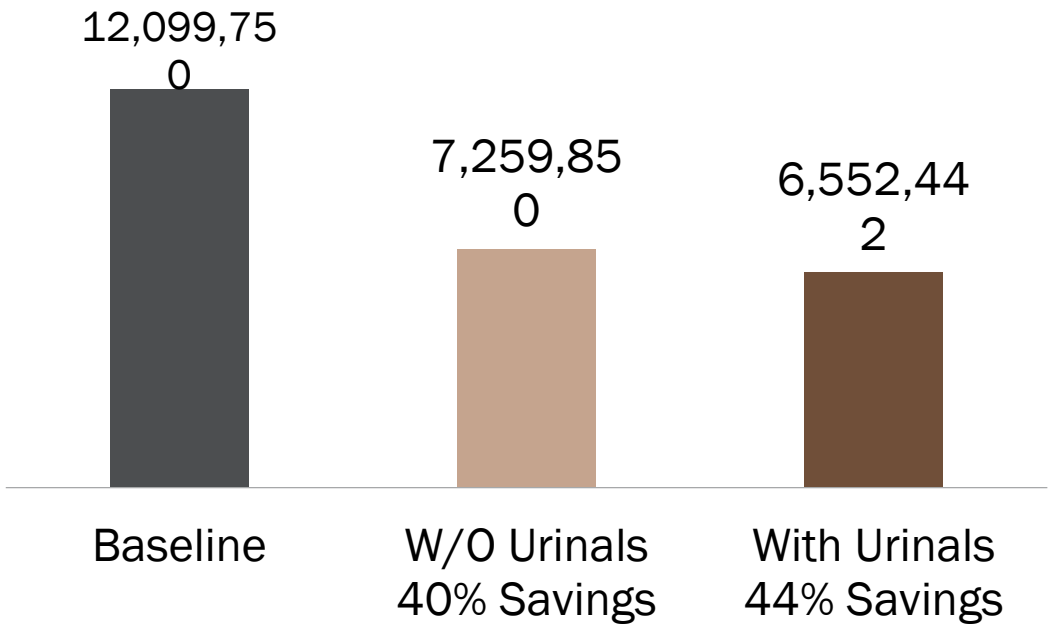
WEc, Indoor Water Use Reduction Efficiency





Recommended Flush/Flow

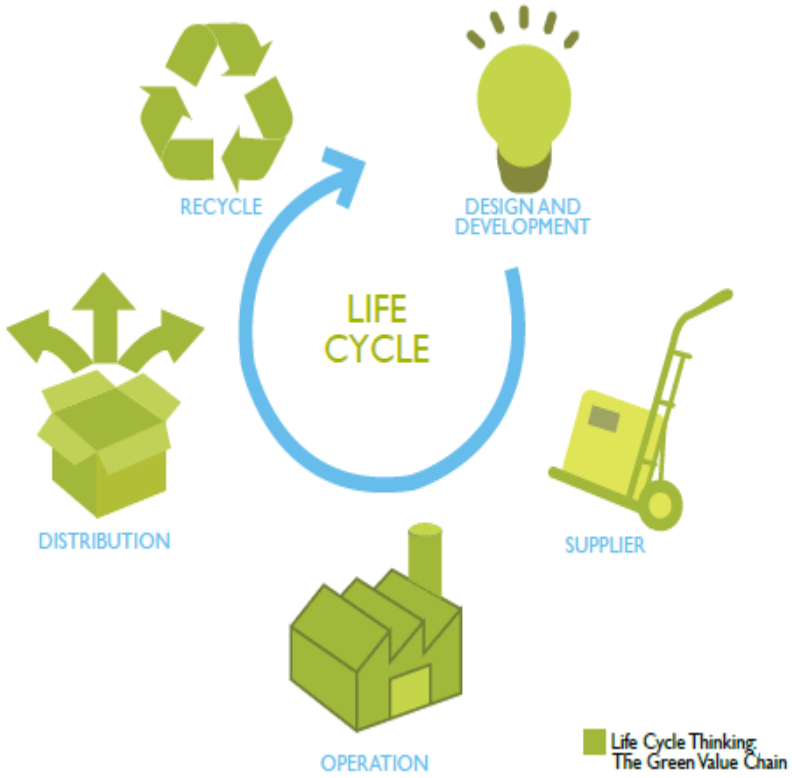
Water Closets: 1.28 GPF
Urinals: .125 GPF
Lavatory Faucets: 1 GPM
Showers: 1.5 GPM

Materials & Resources (MR)

What's new?

New Concepts

- Environmental Product Declaration (EPD)
- Life Cycle Assessment (LCA)
- Corporate Sustainability Report (CSR)
- Extended Producer Responsibility
- Health Product Declaration (HPD)



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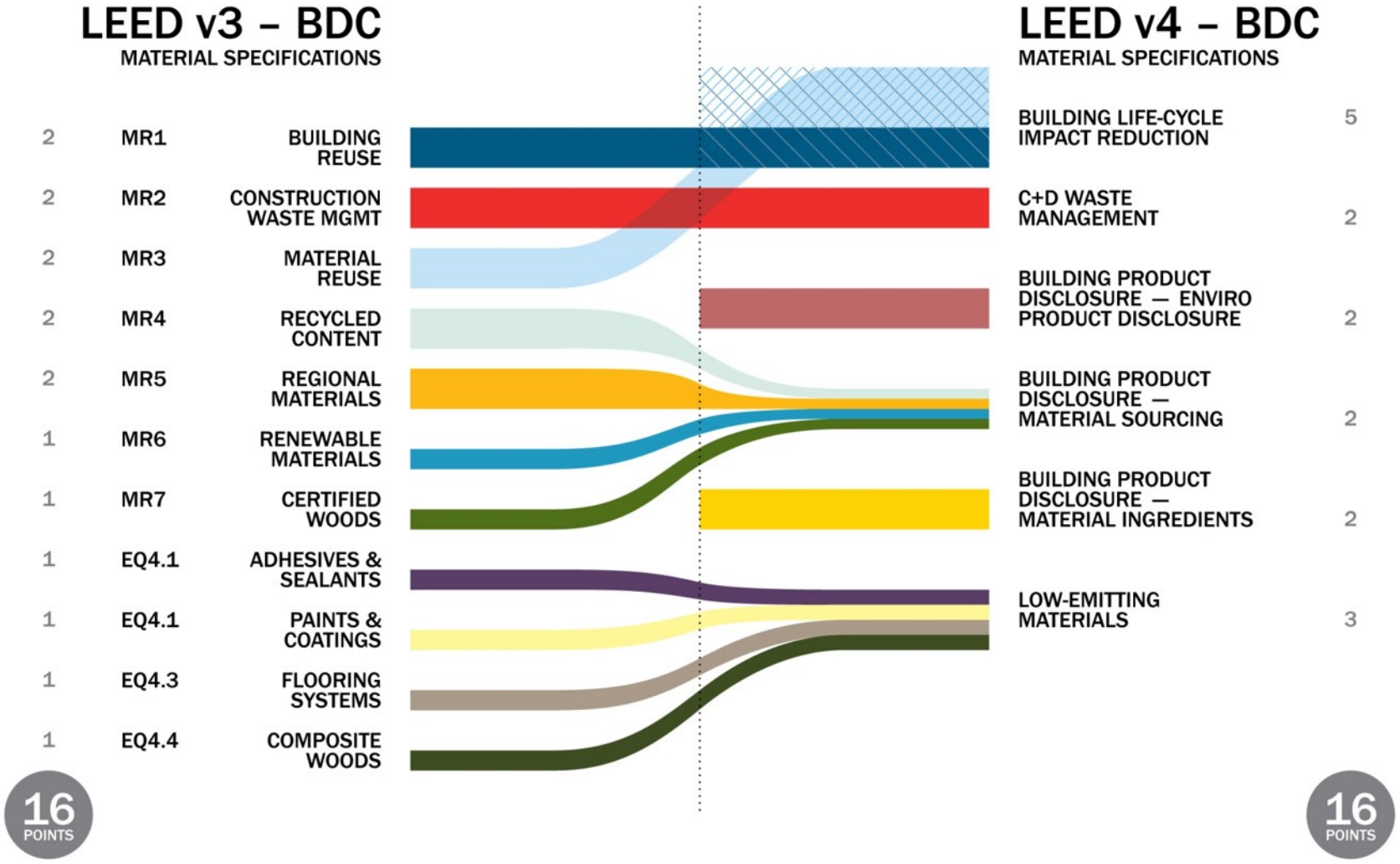
Material Specification



Indoor Environmental Quality (EQ)

What's new?

New Credit
- Acoustic Performance

New Concepts
- Emissions Evaluation
- Ceilings, walls, and insulation emissions requirements
- Lighting Quality
- Quality Views

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EQc Acoustic Performance

New LEED v4 Credit

HVAC Background Noise – per 2011 ASHRAE Handbook

Sound Isolation – STC ratings for adjacent spaces

Adjacency Combinations		STC Rating
Residence	Hallway	50
Mech equip	Any Occupied Area	60

Reverberation Time Requirements

- < 0.6 T60 (sec), at 500 Hz, and 2000 Hz

Sound Reinforcement and Masking Systems – N/A?

- For all large conference rooms and auditoriums seating more than 50 persons, **evaluate whether sound reinforcement and AV playback capabilities** are needed.
- Masking systems **design levels must not exceed 48 dBA**

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Yes	?Y	?N	No	Total Project Score		
60	0	0	48			

Yes	?Y	?N	No			
1	0	0	0	**Integrative Process**		1 Point Possible
1				d Credit 2	**Integrative Process**	1
14	0	0	2	**Location and Transportation**		16 Points Possible
			16	d Credit 1	LEED for Neighborhood Development Location	16
1				d Credit 2	**Sensitive Land Protection**	1
1			1	d Credit 3	**High Priority Site**	1 or 2
5				d Credit 4	**Surrounding Density and Diverse Uses**	2-5
5				d Credit 5	**Access to Quality Transit**	1-5
1				d Credit 6	**Bicycle Facilities**	1
1				d Credit 7	**Reduced Parking Footprint,** 40%	1
			1	d Credit 8	Green Vehicles	1
3	0	0	7	**Sustainable Sites**		10 Points Possible
Y				c Prereq 1	**Construction Acitivity Pollution Prevention**	n/a
1				d Credit 1	**Site Assessment**	1
			2	d Credit 2	Site Development, Protect or Restore Habitat	1 or 2
			1	d Credit 3	Open Space	1
			3	d Credit 4	Rainwater Management	2 or 3
2				d Credit 5	**Heat Island Reduction,** Option 1 roof and nonroof	1 or 2
			1	d Credit 6	Light Pollution Reduction	1
8	0	0	3	**Water Efficiency**		11 Points Possible
Y				d Prereq 1	**Outdoor Water Use Reduction,** 30%	n/a
Y				d Prereq 2	**Indoor Water Use Reduction,** 20%	n/a
Y				d Prereq 3	**Building-Level Water Metering**	n/a
1			1	d Credit 1	**Outdoor Water Use Reduction,** Option 2 Reduced Irrigation, 59	1 or 2
6				d Credit 2	**Indoor Water Use Reduction-** 58.64% reduction with alt water	1-6
			2	d Credit 3	Cooling Tower Water Use	1 or 2
1				d Credit 4	**Water Metering**	1
17	0	0	16	**Energy & Atmosphere**		33 Points Possible
Y				c Prereq 1	**Fundamental Commissioning and Verification**	n/a
Y				d Prereq 2	**Minimum Energy Performance**	n/a
Y				d Prereq 3	**Building-Level Energy Metering**	n/a
Y				d Prereq 4	**Fundamental Refrigerant Management**	n/a
3			3	c Credit 1	**Enhanced Commissioning**	2-6
11			7	d Credit 2	**Optimize Energy Performance ,** 26.2%	1-18
			1	d Credit 3	Advanced Energy Metering	1
			2	d Credit 4	Demand Response	1 or 2
1			2	d Credit 5	**Renewable Energy Production** - 2.88%	1-3
			1	d Credit 6	Enhanced Refrigerant Management	1
2				c Credit 7	**Green Power and Carbon Offsets**	1 or 2

Yes	?Y	?N	No			
3	0	0	5	**Materials & Resources**		13 Points Possible
Y				d Prereq 1	**Storage and Collection of Recyclables**	n/a
Y				c Prereq 2	**Construction and Demolition Waste Mgt. Planning**	n/a
			5	d Credit 1	Building Life-Cycle Impact Reduction	2-5
1			1	c Credit 2	**Bldg Products:** Env'l Product Declarations	1-2
			2	c Credit 3	Bldg Products: Sourcing of Raw Materials	1-2
			2	c Credit 4	Bldg Products: Material Ingredients	1-2
2				c Credit 5	**Construction and Demolition Waste Mgt.**	1 or 2
6	0	0	11	**Indoor Environmental Quality**		16 Points Possible
Y				d Prereq 1	**Minimum IAQ Performance,** Option 1 ASHRAE 2010	n/a
Y				d Prereq 2	**Environmental Tobacco Smoke Control**	n/a
2				d Prereq 3	**Enhanced Indoor Air Quality Strategies**	1 or 2
1			3	c Credit 2	**Low-Emitting Materials**	1-3
1				c Credit 3	**Construction Indoor Air Quality Management Plan**	1
			2	c Credit 4	Indoor Air Quality Assessment	1 or 2
			1	d Credit 5	Thermal Comfort	1
1			1	d Credit 6	**Interior Lighting**	1 or 2
			3	d Credit 7	Daylight	1-3
1				d Credit 8	**Quality Views**	1
			1	d Credit 9	Acoustic Performance	1
6	0	0	0	**Innovation & Design Process**		6 Points Possible
1				c Credit 1.1	**Innovation: Green Building Education**	1
1				c Credit 1.2	**Innovation: Salmon Safe Certified**	1
1				d Credit 1.3	**Exemplary Performance: LTc5 Access to Quality Transit**	1
1				d Credit 1.4	**Exemplary Performance: LTc3 High Priority Site - Option 2**	1
1				c Credit 1.5	**Pilot Credit: Social Equity Project Team**	1
1				c Credit 2	**LEED™ Accredited Professional**	1
2	0	0	4	**Regional Priority**		4 Points Possible
97209				←	**Project Zip Code**	
			1	d Credit 1.1	Regional Credit: SSc Rainwater Management 3	1
1				d Credit 1.2	**Regional Credit: WEc Indoor Water Use Reduction 4**	1
			1	d Credit 1.3	Regional Credit: EAc Demand Response 1	1
			1	d Credit 1.4	Regional Credit: EAc Renewable Energy Production 2	1
1				d Credit 1.5	**Regional Credit: MRc Building Products: EPDs 1**	1
			1	d Credit 1.6	Regional Credit: MRc Bldg Products: Sourcing 1	1

CERTIFIED SILVER **GOLD** PLATINUM

Certified (Gold)

CERTIFIED: 40-49, SILVER: 50-59, GOLD: 60-79, PLATINUM: 80+

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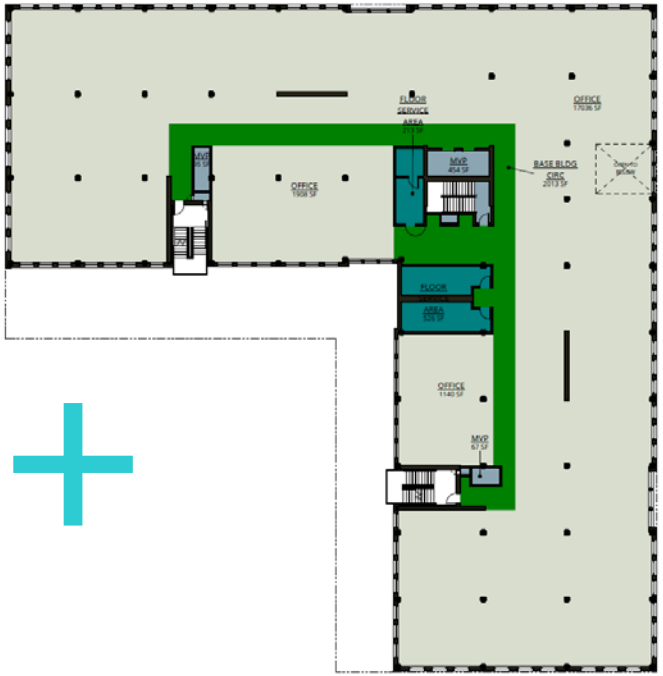
38 Davis – Building Program

A truly “Mixed” program

What is 38 Davis

x1

+



x3

+

X2 (65 Units)

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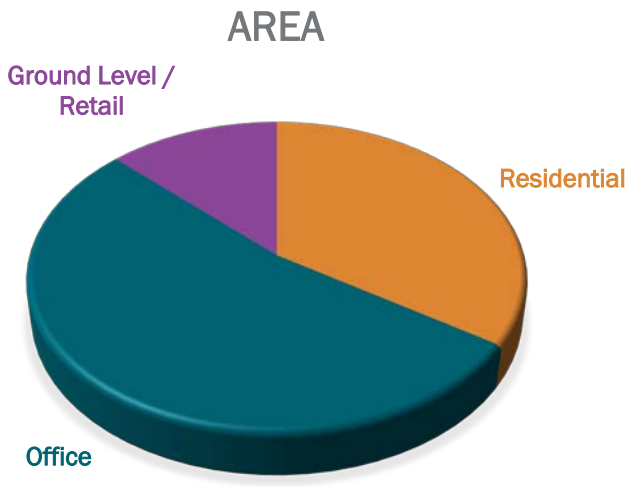
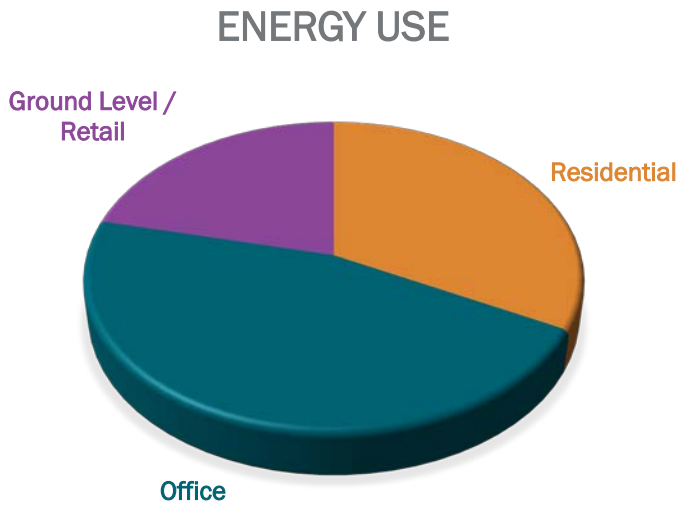
Where Does 38 Davis Use Energy





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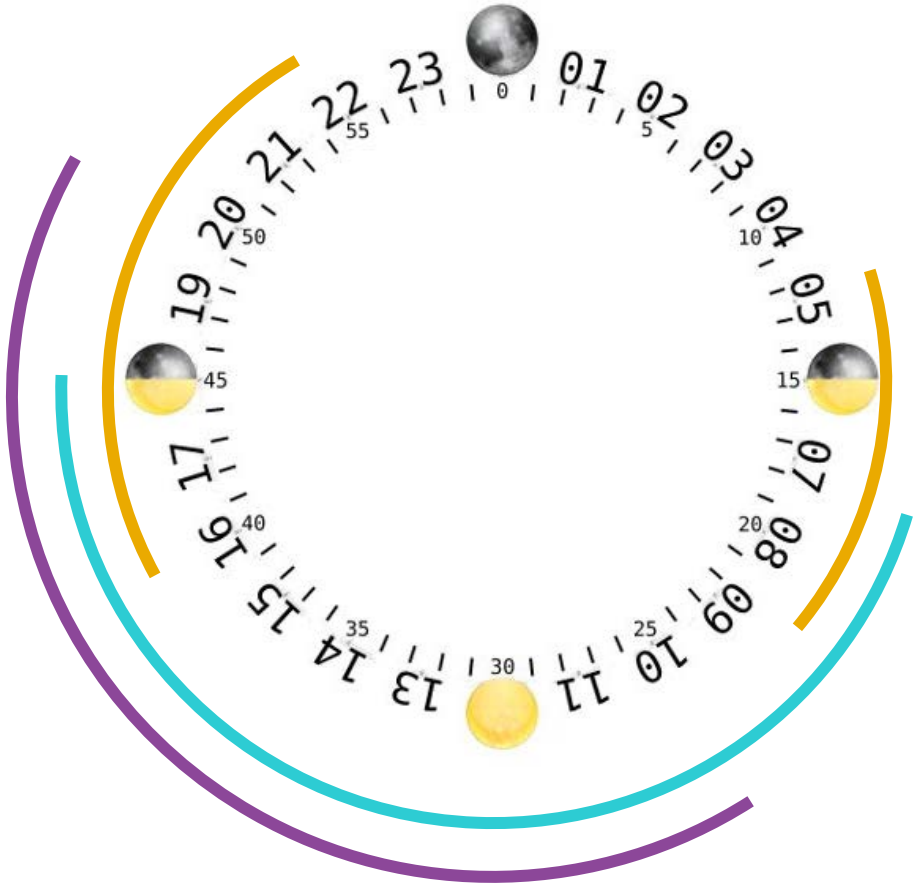
When Does 38 Davis Use Energy



Residential
Office
Ground Level / Retail

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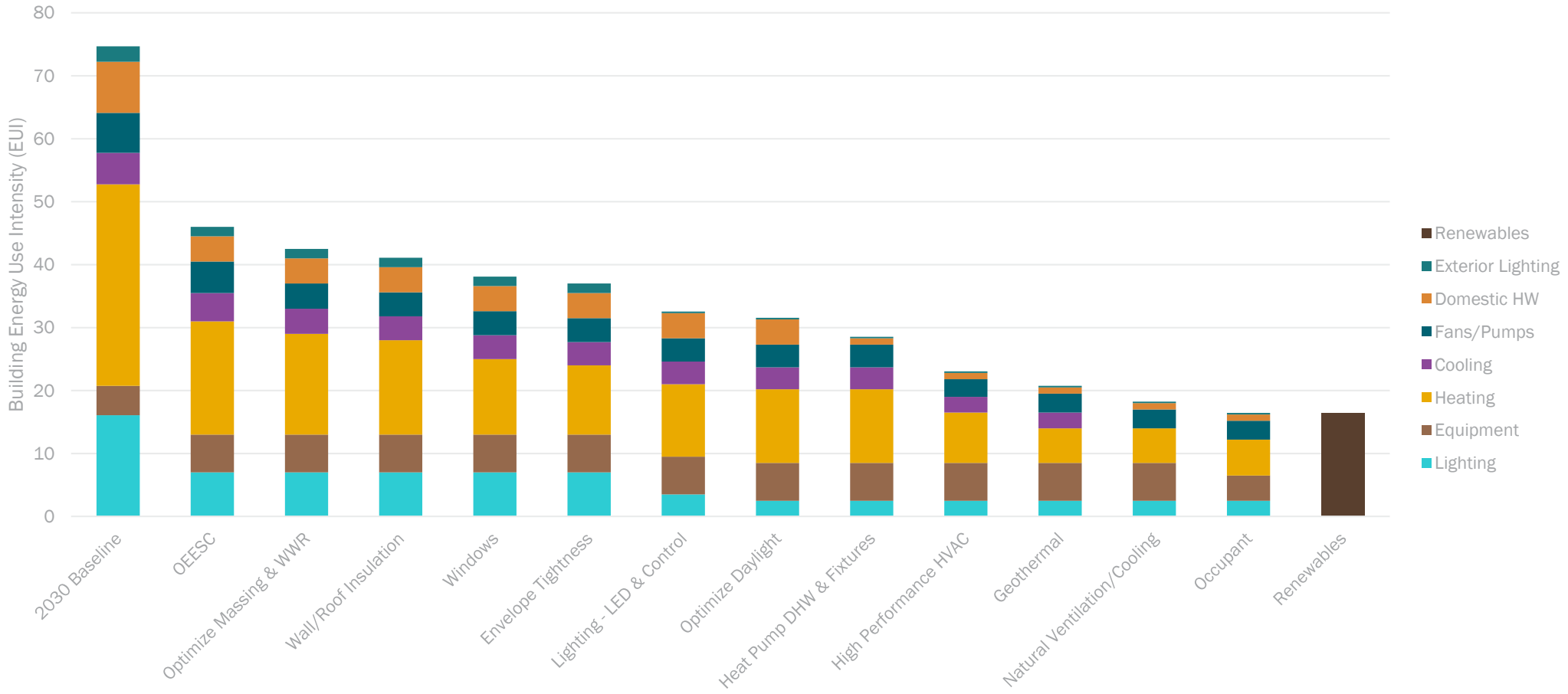
Mixed Use & Energy

More Measure Needed to get Results

Path to Performance



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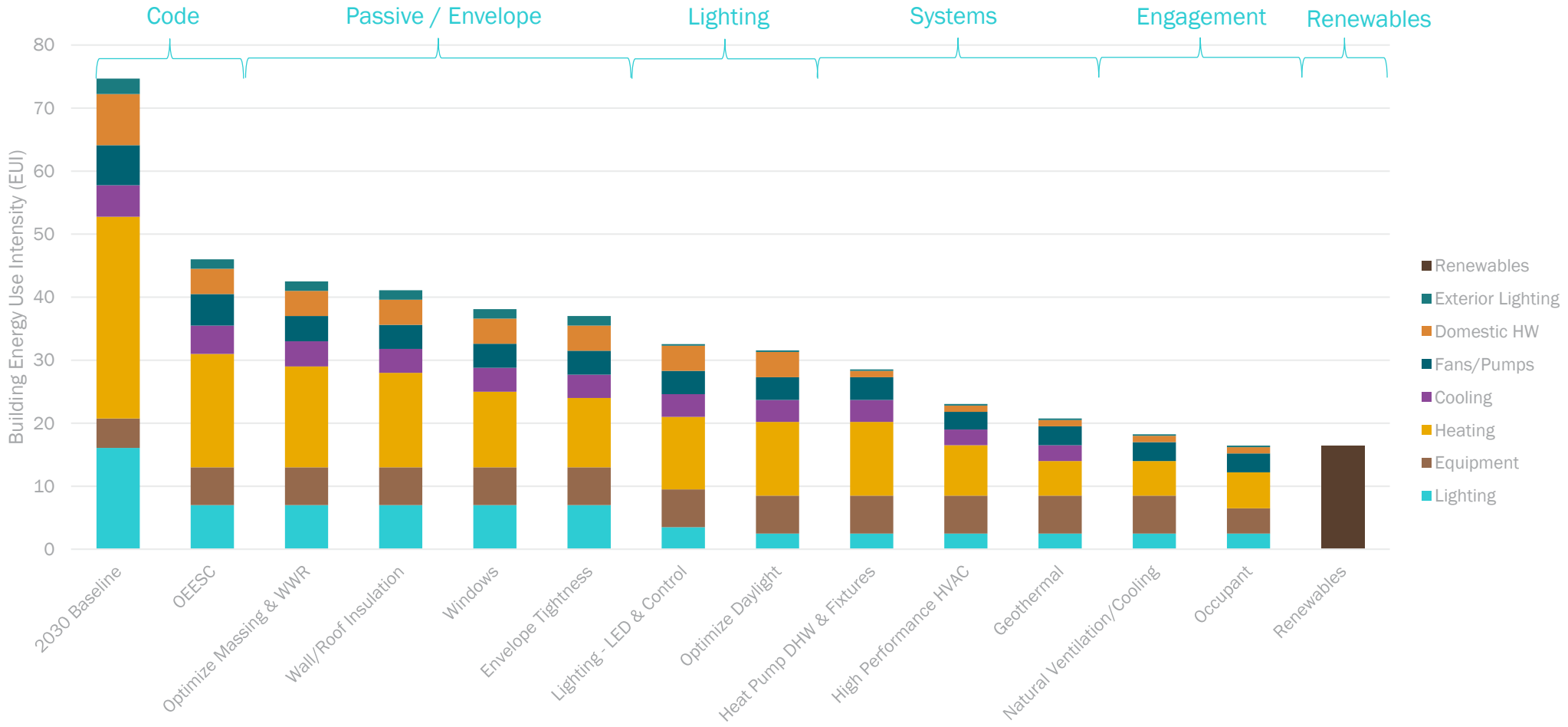
Path to Performance



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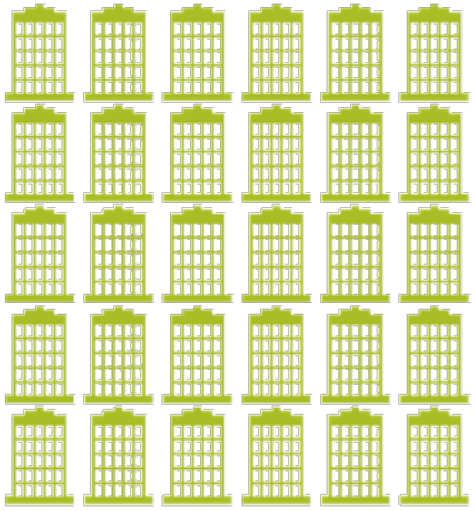
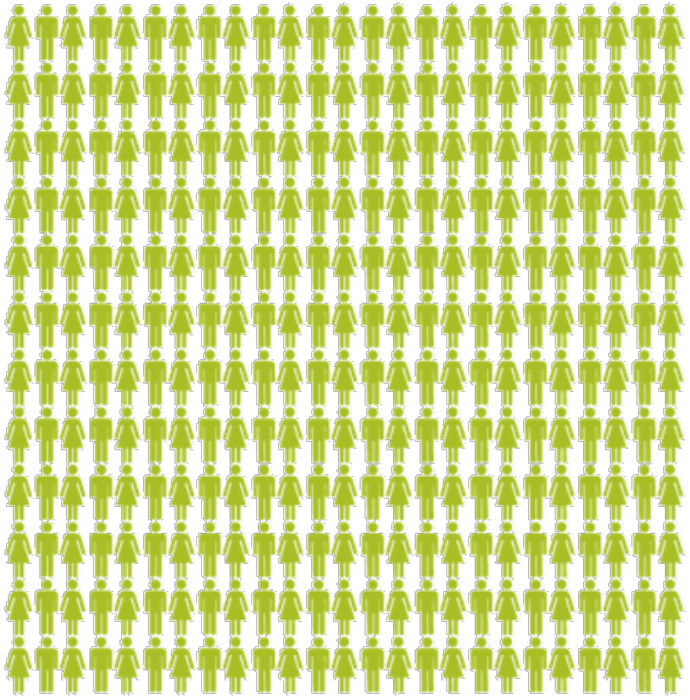
Rethinking Metrics

$3
UTILITIES



$30
RENT + OPERATIONS



$300
SALARY + BENEFITS

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Energy & Buildings

“Buildings don’t use energy, people do.”
– Kirk Davis, Glumac

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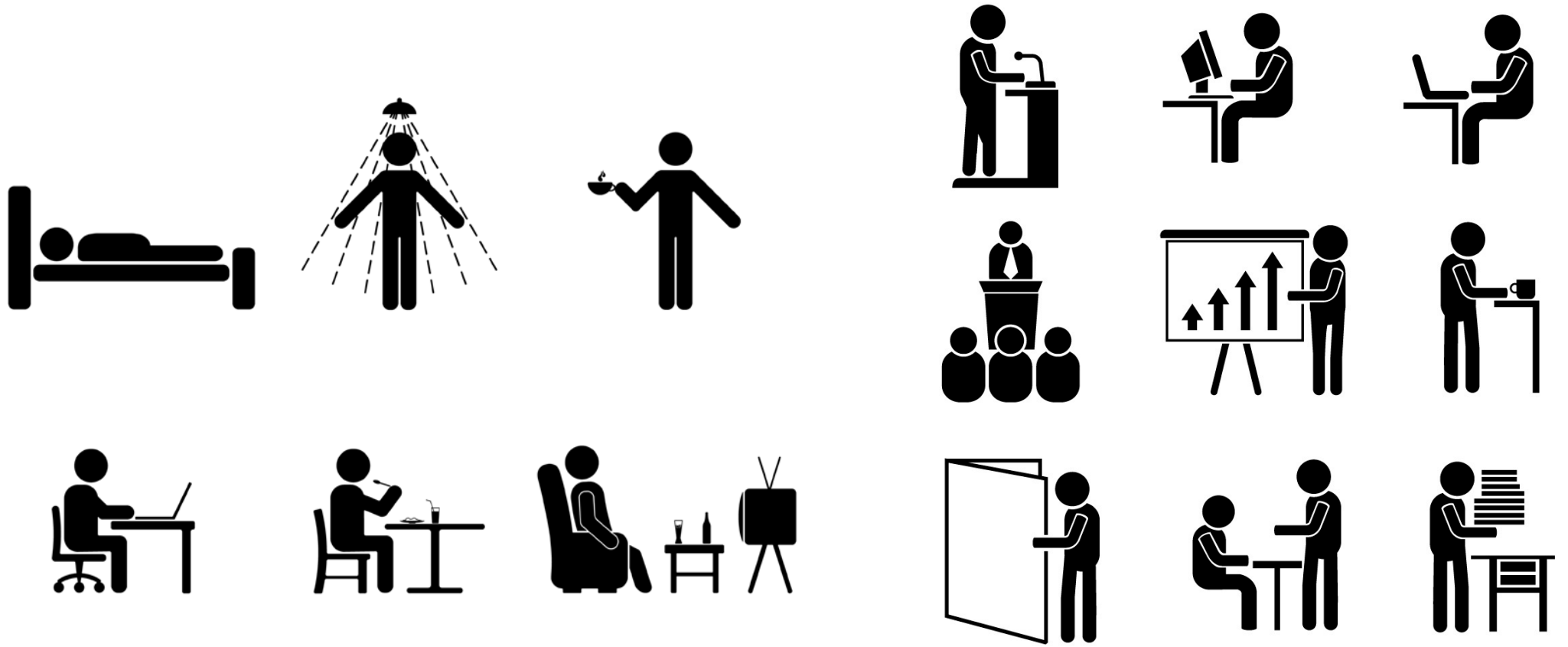
Understanding Occupancy



Building Envelope

The Devil is in the Details

Thermal Performance Metric

$$U - Value = \frac{Btu/h}{ft^2 \times °\mathrm{F}}$$

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Oregon Specialty Energy Efficiency Code

TABLE 502.1.2
BUILDING ENVELOPE REQUIREMENTS
OPAQUE ELEMENT, MAXIMUM *U*-FACTORS

CLIMATE ZONE	5 AND MARINE 4	
	All other	Group R
Roofs		
Insulation entirely above deck	U-0.048	U-0.048
Metal buildings	U-0.055	U-0.055
Attic and other	U-0.027	U-0.027
Walls, Above Grade		
Mass[b]	U-0.150[c]	U-0.090
Metal building	U-0.069	U-0.069
Metal framed	U-0.064	U-0.064
Wood framed and other	U-0.064	U-0.051
Walls, Below Grade		
Below-grade wall[a]	C-0.119	C-0.119
Floors		
Mass	U-0.074	U-0.064
Joist/Framing	U-0.033	U-0.033
Slab-on-Grade Floors		
Unheated slabs	F-0.730	F-0.540
Heated slabs[a]	F-0.860	F-0.860

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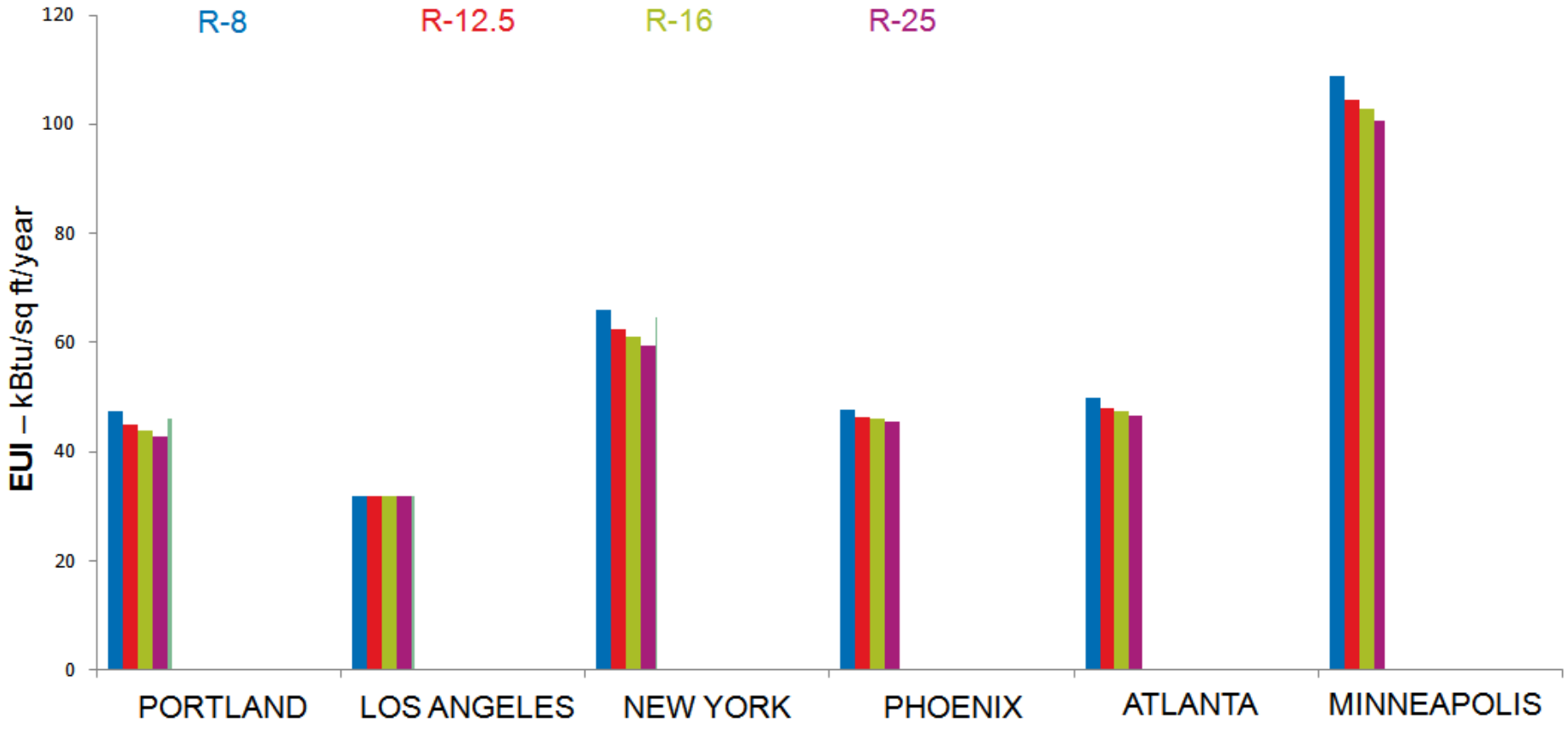
The Point of Diminishing Return



Wall Insulation

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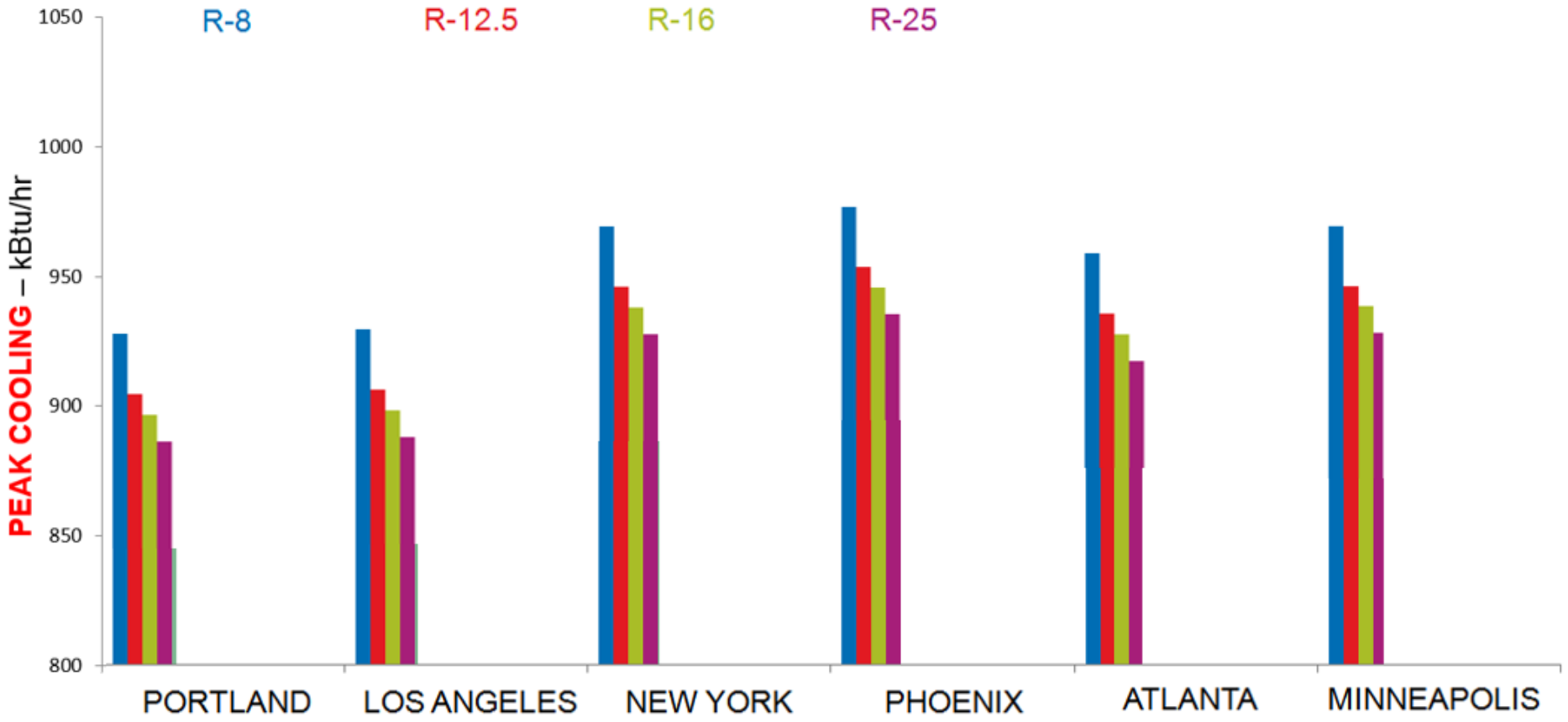
The Point of Diminishing Return



Wall Insulation

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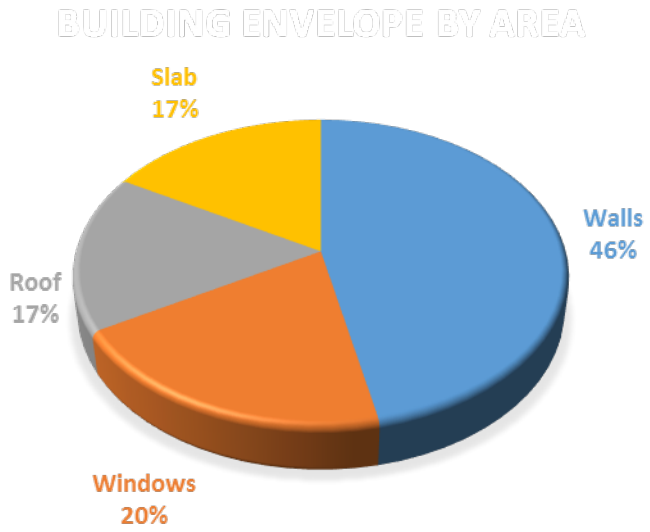
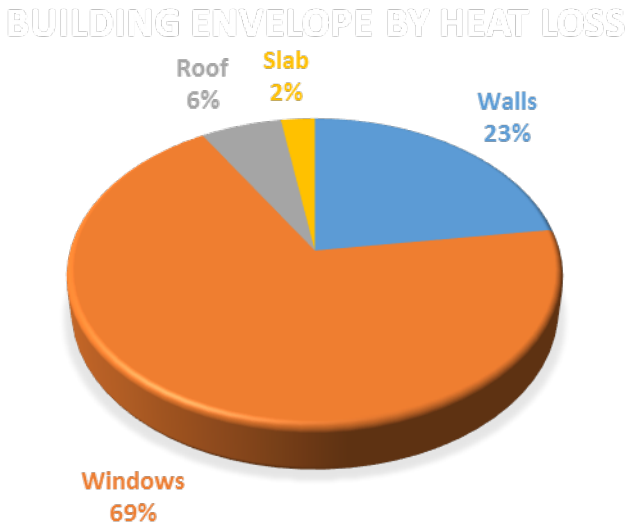
U-Values Translated



Area



Heat Loss

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Different Components of U-Values

U_T = Total effective

U_o = Clear field thermal transmittance

Ψ = Heat flow from linear thermal bridge

X = Heat flow from point thermal bridge

$$U_T = \frac{\Psi + X}{Area\ of\ Assembly} + U_o$$

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Glazing Transitions

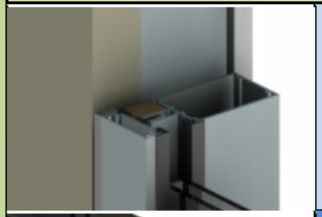
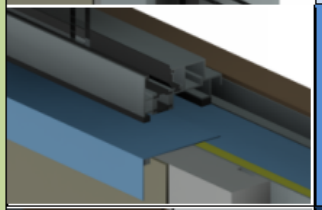
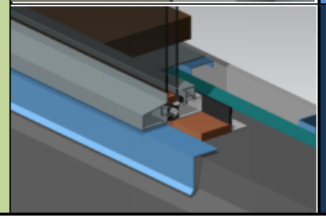
GLAZING TRANSITIONS	Performance Category		Description and Examples	Linear Transmittance	
				Btu / hr ft F	W / m K
		Efficient	**Well aligned glazing without conductive bypasses** Examples: wall insulation is aligned with the glazing thermal break. Flashing does not bypass the thermal break.	0.12	0.2
		Regular	**Misaligned glazing and minor conductive bypasses** Examples: wall insulation is not continuous to thermal break and framing bypasses the thermal insulation at glazing interface.	0.20	0.35
		Poor	**Un-insulated and conductive bypasses** Examples: metal closures connected to structural framing. Un-insulated concrete opening (wall insulation ends at edge of opening).	0.29	0.5

Image Courtesy of Morrison Hershfield

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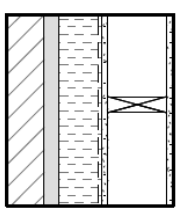
Typical Exterior Wall Assemblies

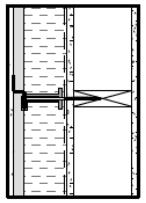


EXTERIOR ASSEMBLY - A
MR GYPSUM SHEATHING
FRT WOOD FRAMING
GYPSUM WALLBOARD

60A1

FIRE RATING / SOURCE: 0 HOUR

STC RATING / SOURCE:



EXTERIOR ASSEMBLY - B
MR GYPSUM SHEATHING
FRT WOOD FRAMING
GYPSUM WALLBOARD

60B1

FIRE RATING / SOURCE: 0 HOUR

STC RATING / SOURCE:

A. BRICK VENEER
1 1/4" MIN AIR SPACE
4" MINERAL FIBERBOARD INSULATION
FA-WRB

B. STUCCO FINISH COAT
1/2" CEMENT BACKER BOARD
1" AIR SPACE
FIBERGLASS FURRING CONNECTORS
4" MINERAL FIBERBOARD INSULATION
FA-WRB

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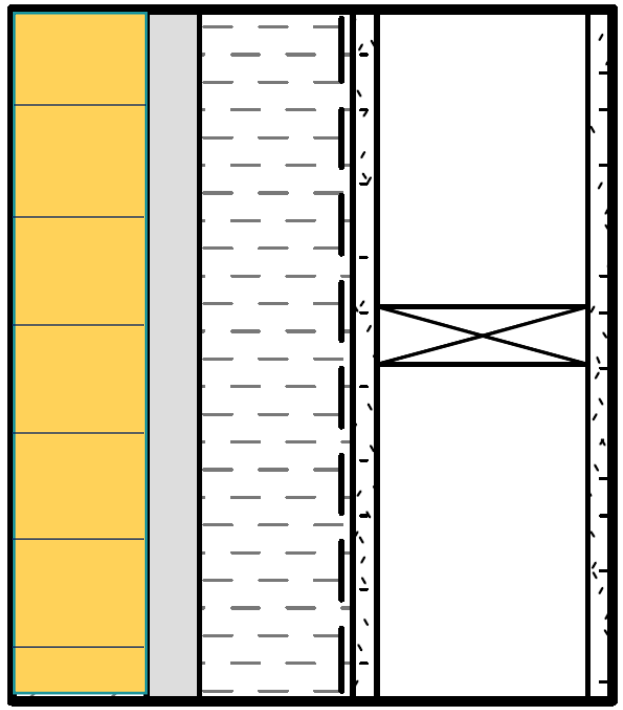
Don’t Underestimate BRICK



4 IN. BRICK w = (130 lb/ft3) x [(0.75)(3.63 in.) / 12in./ft] = 29.5 lb/ft2

(>75% SOLID) c = 0.20 Btu/(lb-°F)

HC = 29.5 x 0.20 = 5.9 Btu/(ft2-°F)

4 IN. STUD w = 45 lb/ft3 x [(3.5 in. x 1.5 in.) / (144 in.2/ft2)] x (12 in./ft / 16 in.)

= 1.23 lb/ft2

c = 0.30 Btu/(lb-°F)

HC = 1.23 x 0.30 = 0.4 Btu/(ft2-°F)

(2) 1/2 IN. w = 50 lb/ft3 x [(2)(0.5 in.) / 12 in./ft] = 4.2 lb/ft2

GYPSUM BOARD c = 0.26 Btu/(lb-°F)

HC = 4.2 x 0.26 = 1.1 Btu/(ft2-°F)

INSULATION NEGLIGIBLE

TOTAL HC = 5.9 + 0.4 + 1.1 = 7.4 Btu/(ft2°F)

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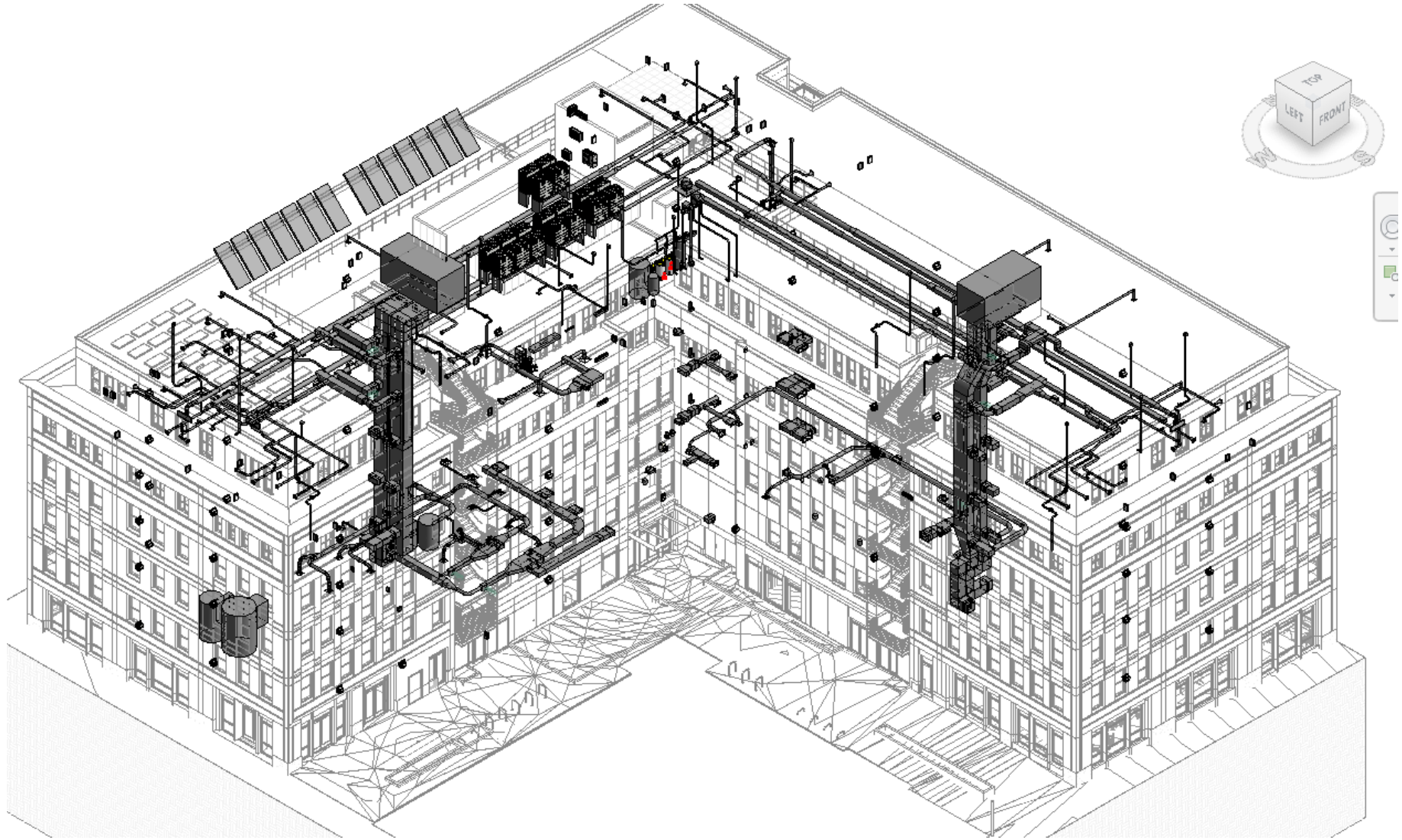
Don’t Underestimate Setbacks

Systems

DOAS / VRF / Mixed Mode Ventilation / Solar Hot Water



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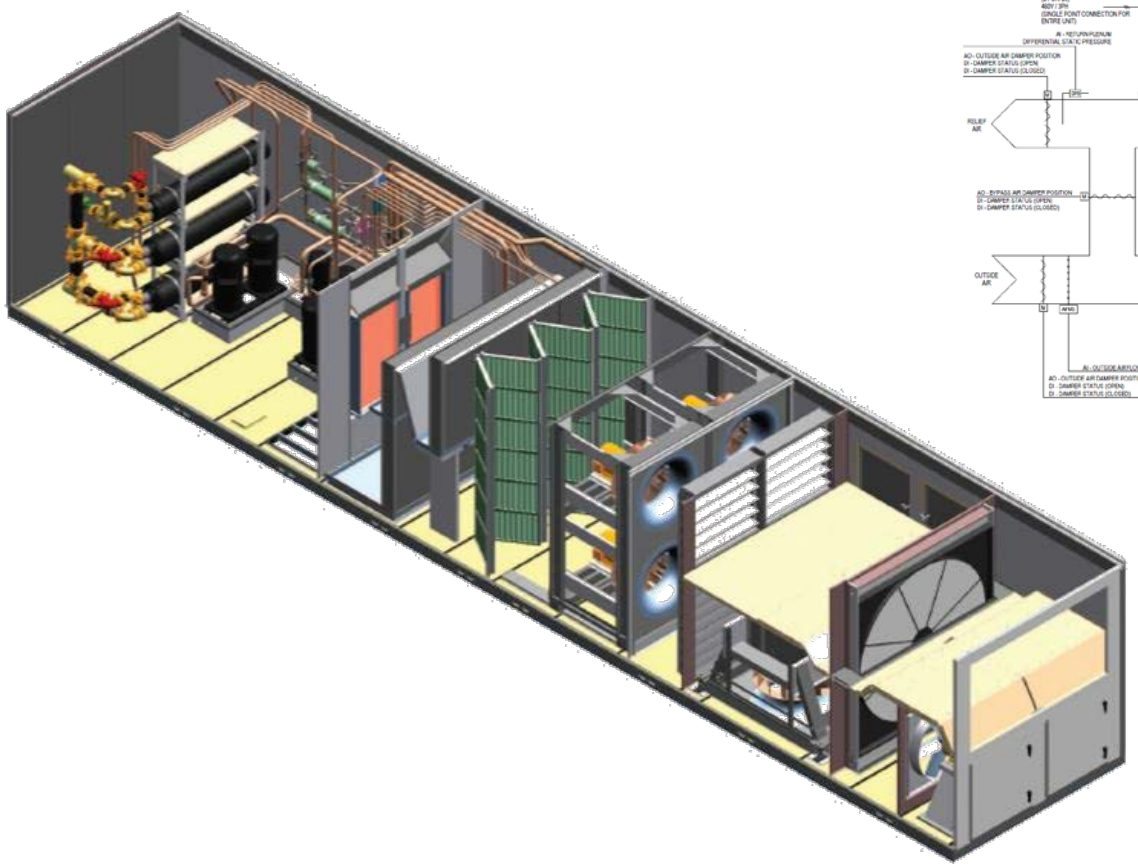
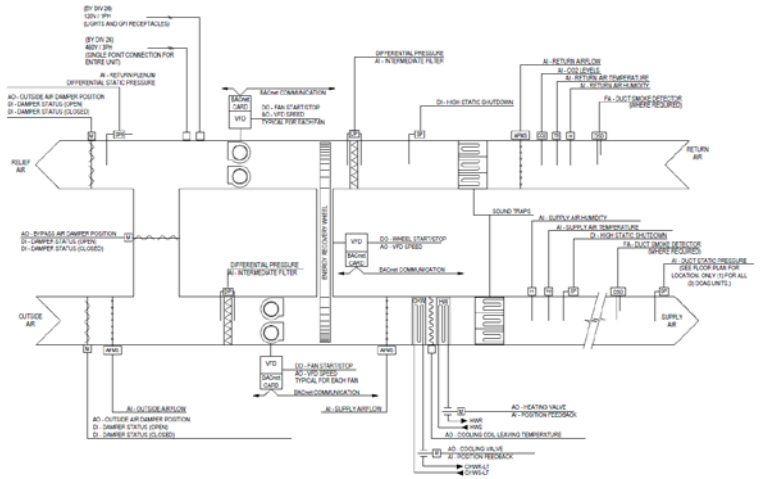
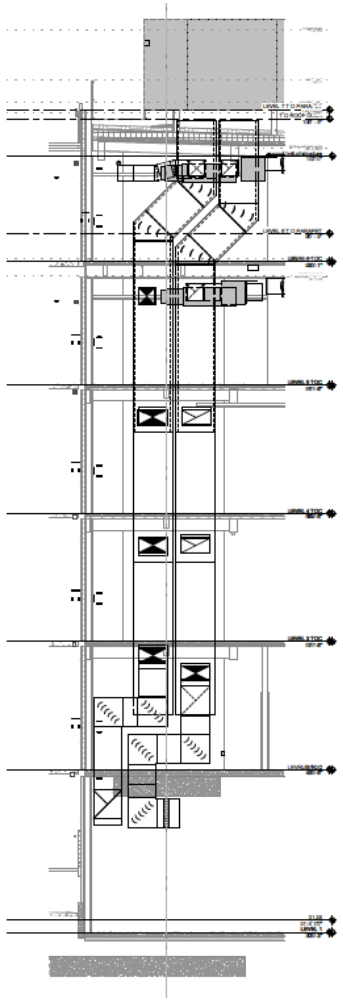
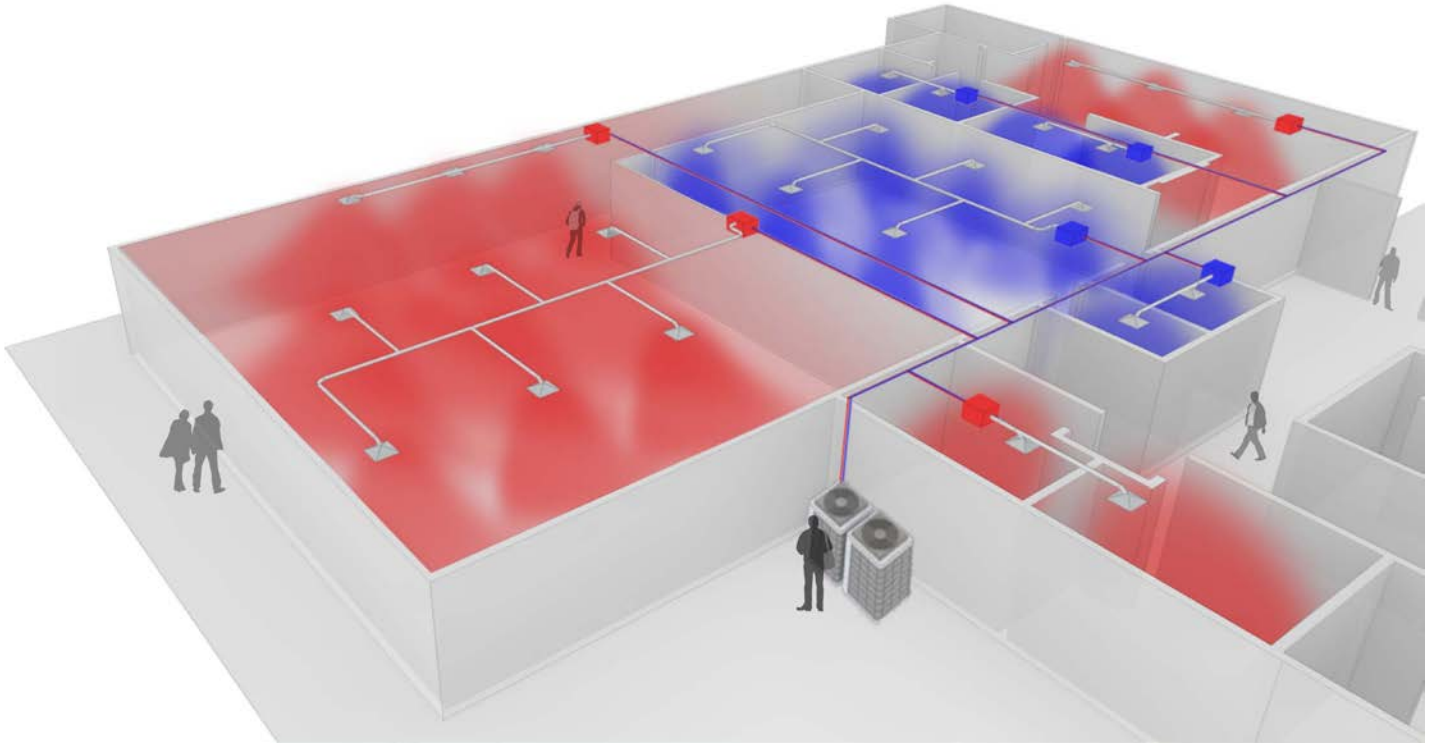
Dedicated Outside Air Systems (DOAS)







Variable Refrigerant Volume (VRV)



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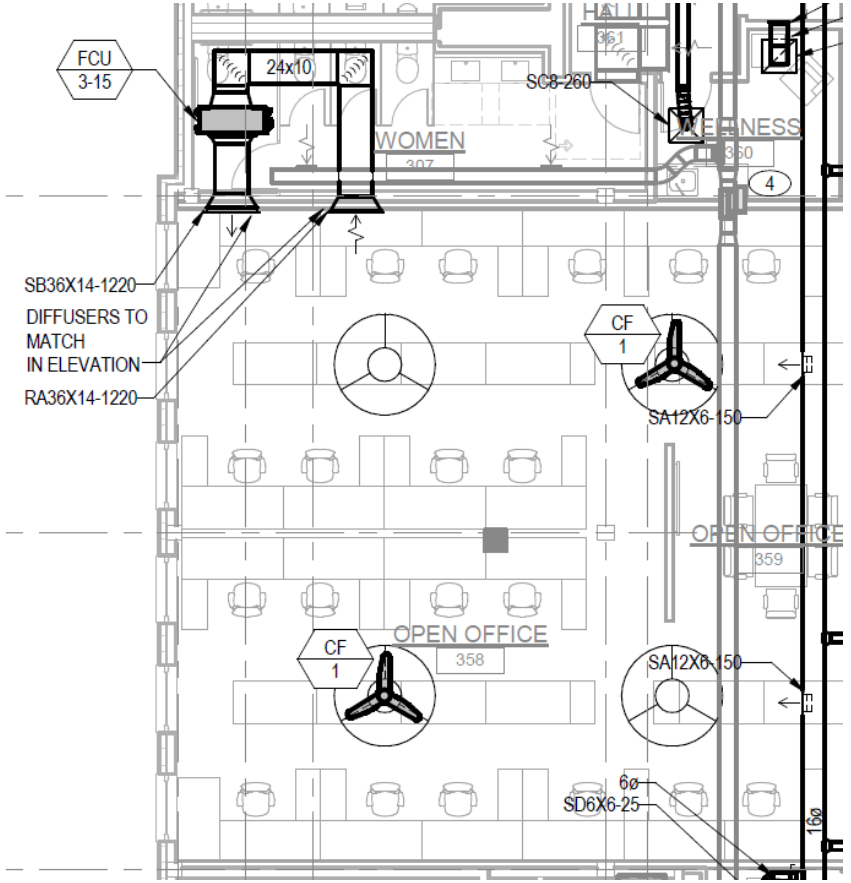
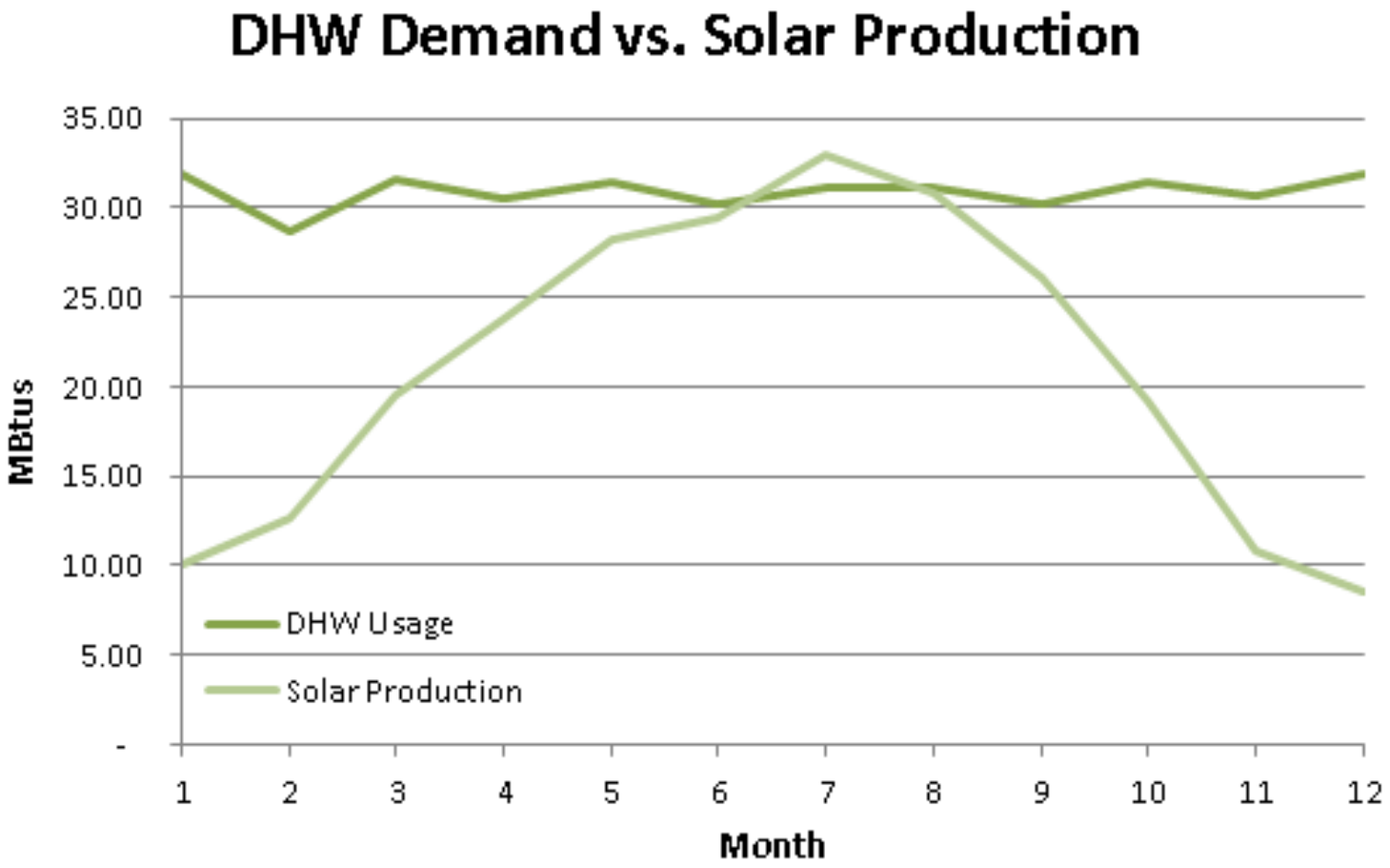
Ventilation & Cooling/Heating



Renewables


DHW Demand vs. Solar Production
35.00
30.00
25.00
20.00
15.00
10.00
5.00
-
MBtus
DHW Usage
Solar Production
1
2
3
4
5
6
7
8
9
10
11
12
Month

Water

Just as Important as Energy

What is Grey Water?

	NSF 350 STANDARD	
	MAX	AVG
Turbidity	5	2
TSS	30	10
CBOD	25	10
E. coli	200	2.2
Odor	Non-Offensive	
pH	6.0 – 9.0	

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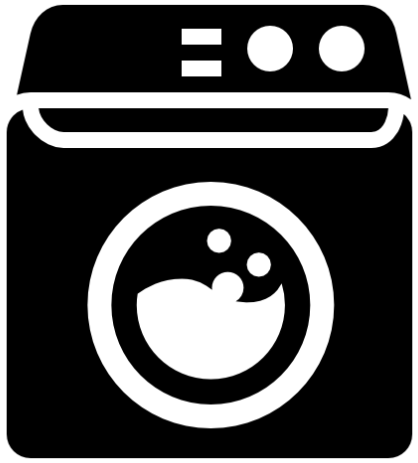
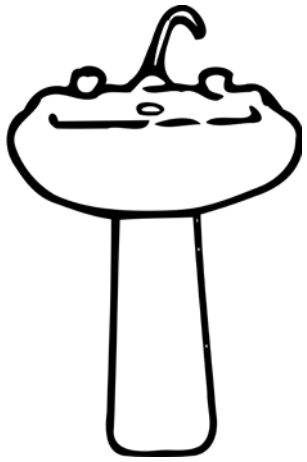
What Fixtures CAN go to Grey Water?

- Showers & Tubs

- Washing Machines



- Lavatories



In addition, condensate & rain water CAN go to a grey water system

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What Fixtures were used

Showers and Tubs only

- LEED estimates:
  - 1 shower/person/day
  - 8 min shower average
  - 1.5gpm low flow fixture
  - Water Use:
    - 12 gallons/person/day
    - 4,380 gallons/person/yr

- Unused grey water must be discarded after 24 hrs.

- Creating more grey water than you need is a waste of energy

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Block 8L Estimated Water Savings

Usage Calculations

- Estimated Annual Grey Water Created:
  - 368,042 gal/yr
- Estimated Annual Grey Water Used:
  - 240,762 gal/yr
- Total Estimated Water Savings Annually:
  - 240,762 gal/yr

Annual Savings

$1,268

Portland, OR water Rates:
$3.940/748 gallons

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How Does it Work?

Settling Tank

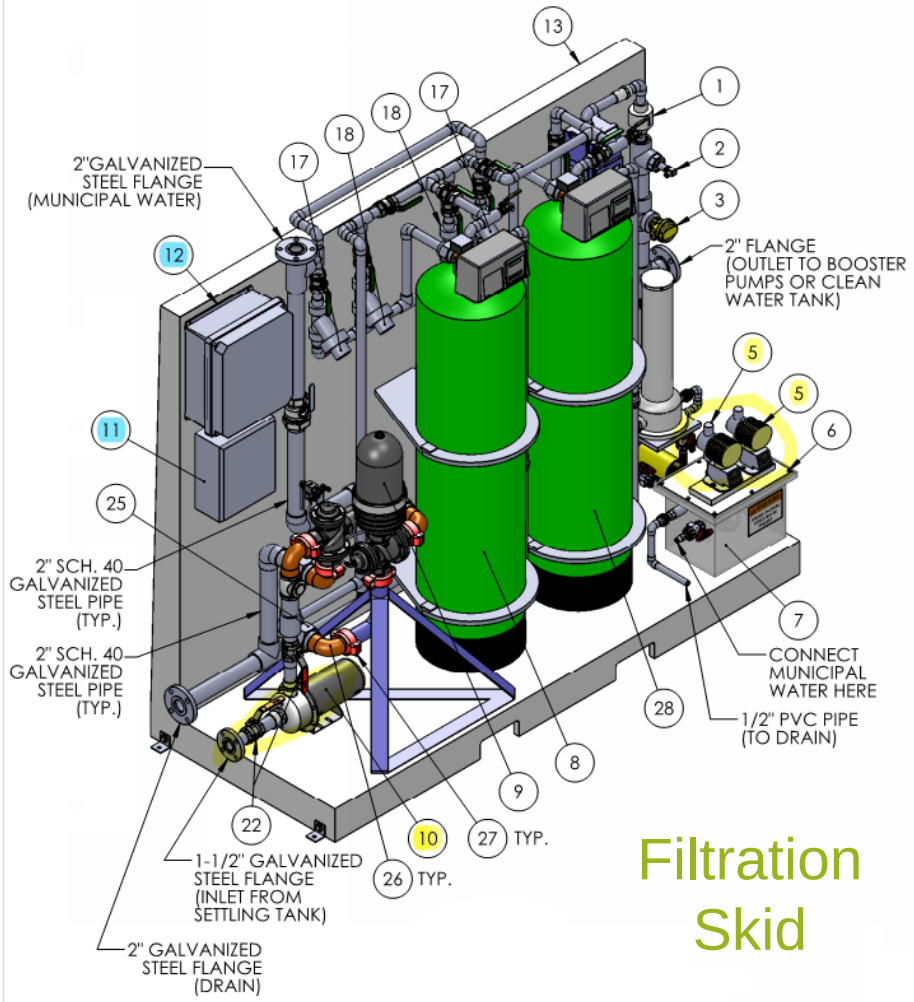
- First chlorine dosage
- Solids precipitate out and are flushed into sanitary syste

Filtration

- 80 micron disk filter
- 10 micron multi-media filter
- 1 micron carbon filter

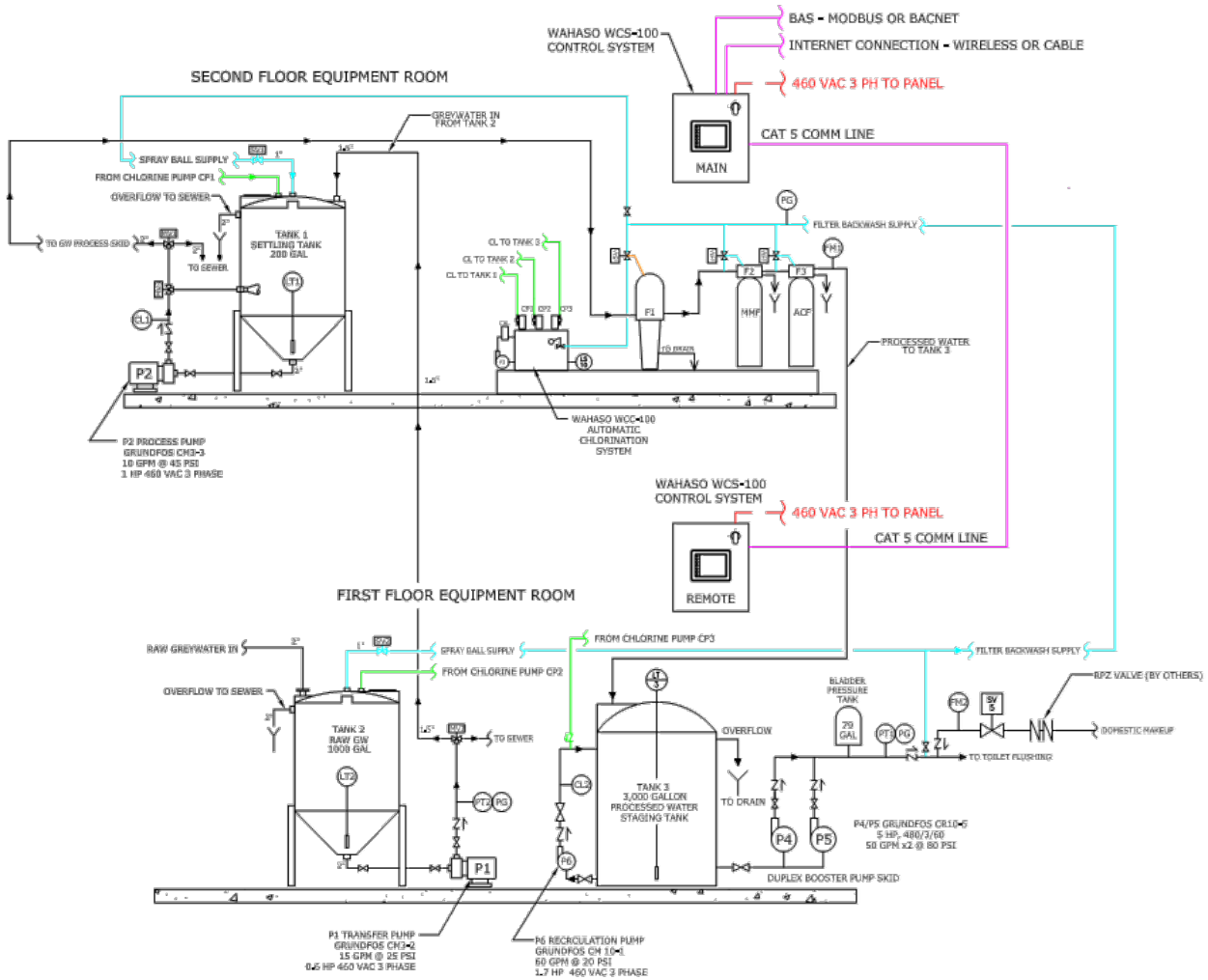
Sterilization

- Chlorine injection (max 0.5 ppm)
  - safe for landscape use



Filtration Skid

Block 8L Piping Schematic



Incentives

Keep a Constant eye out for Opportunity

Incentives

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THANK YOU!

GERDINGEDLEN
PEOPLE·PLANET·PROSPERITY

BRIGHTWORKS
SUSTAINABILITY

Ankrom Moisan

GLUMAC
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