LUNCH & LEARN

Thursday Nov 16, 2017

Energy Code Compliance: Tips, Tricks and Case Studies

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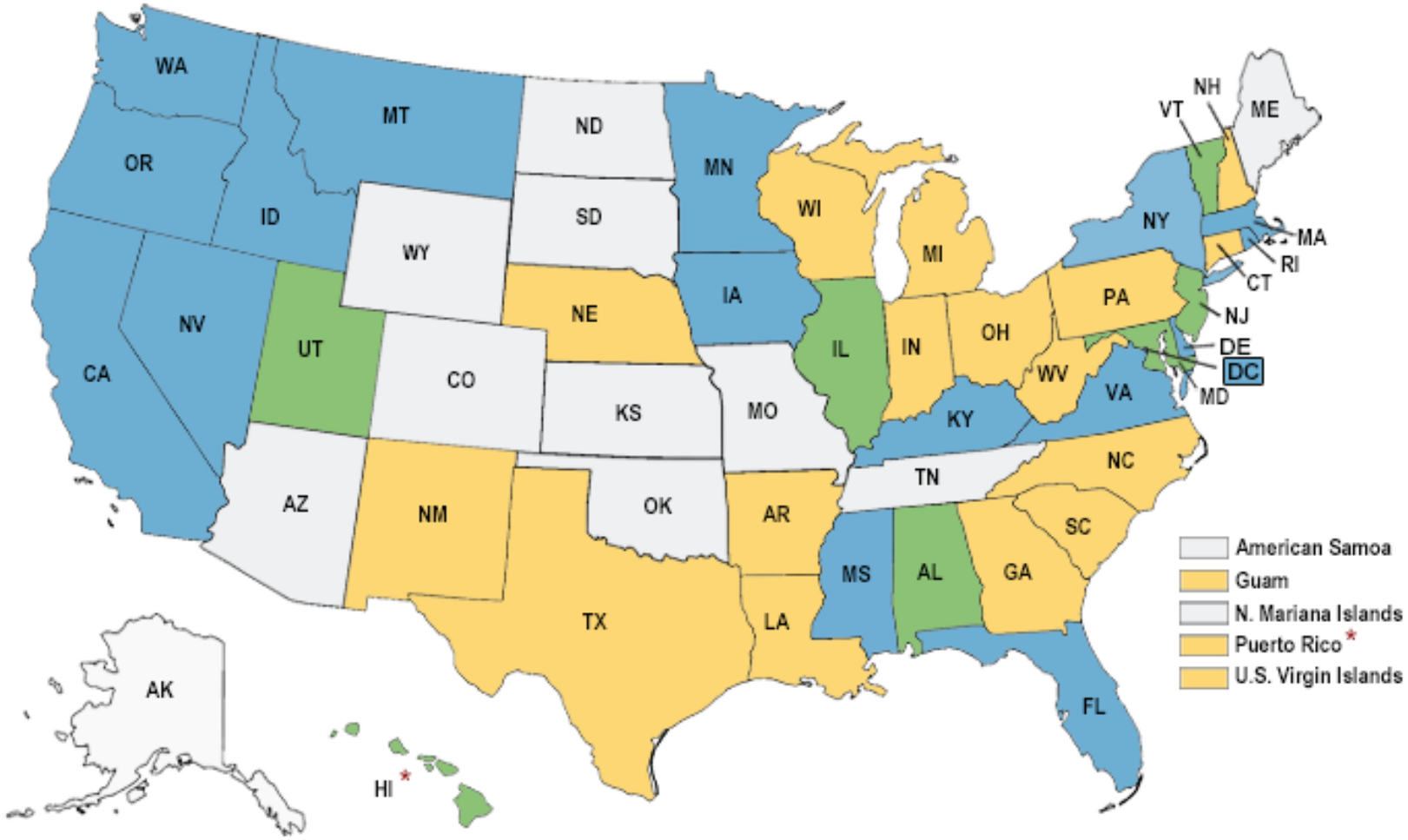
Learning Objectives

1. Understand the common features of energy codes across different jurisdictions.
2. Understand the common ways to comply with building envelope performance requirements including prescriptive path, simplified trade-off and whole building analysis.
3. Understand how and where analysis is recommended in the design process to ensure there is not a code compliance issue.
4. Understand how energy codes and the simplified trade-off process has been used to leverage and inform the design process for a mixed use high rise in Portland, Oregon

Energy Codes



7	ASHRAE 90.1-2013/2015 IECC, equivalent, or more energy efficient
17	ASHRAE 90.1 - 2010/2012 IECC, equivalent, or more energy efficient
19	ASHRAE 90.1 - 2007/2009 IECC, equivalent, or more energy efficient
13	Older or less energy efficient than ASHRAE 90.1 - 2007/2009 IECC, or no statewide code.

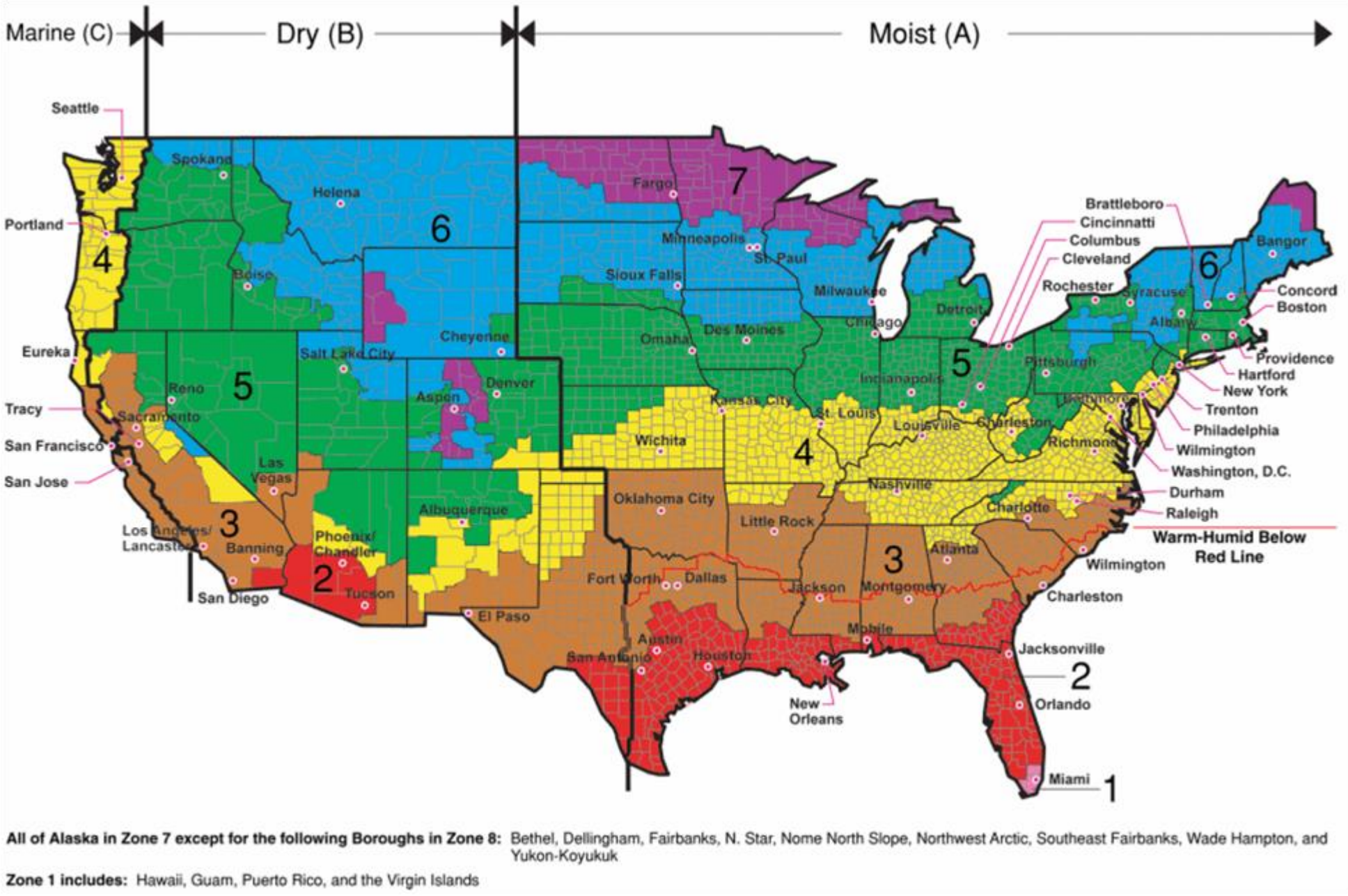
* Adopted new Code to be effective at a later date

As of July 2016

- Typically published on a three-year cycle
- Typically based on model codes with state or regional amendments
- Required for all new construction, additions, major renovations
  - Extent of requirements for major renovations varies widely

- Typical organization
  - Electrical
    - Lighting
    - Controls
  - Mechanical
    - HVAC Equipment
    - Controls
    - Heating water
  - Envelope

Climate Zones



All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dellingham, Fairbanks, N. Star, Nome North Slope, Northwest Arctic, Southeast Fairbanks, Wade Hampton, and Yukon-Koyukuk

Zone 1 includes: Hawaii, Guam, Puerto Rico, and the Virgin Islands

- Lighting power density
  - Interior
  - Exterior
- Controls
  - Occupancy
  - Daylight

TABLE 9.5.1 Lighting Power Densities Using the Building Area Method

Building Area Type[a]	*LPD* (W/ft²)
Automotive facility	0.82
Convention center	1.08
Courthouse	1.05
Dining: bar lounge/leisure	0.99
Dining: cafeteria/fast food	0.90
Dining: family	0.89
Dormitory	0.61
Exercise center	0.88
Fire station	0.71
Gymnasium	1.00
Health-care clinic	0.87
Hospital	1.21
Hotel	1.00
Library	1.18
Manufacturing facility	1.11
Motel	0.88
Motion picture theater	0.83
Multifamily	0.60
Museum	1.06
Office	0.90
Parking garage	0.25
Penitentiary	0.97
Performing arts theater	1.39
Police station	0.96
Post office	0.87
Religious building	1.05
Retail	1.40
School/university	0.99
Sports arena	0.78
Town hall	0.92
Transportation	0.77
Warehouse	0.66
Workshop	1.20

[a] In cases where both a general building area type and a specific building area type are listed, the specific building area type shall apply.

- HVAC Equipment
- Controls
- Heating water

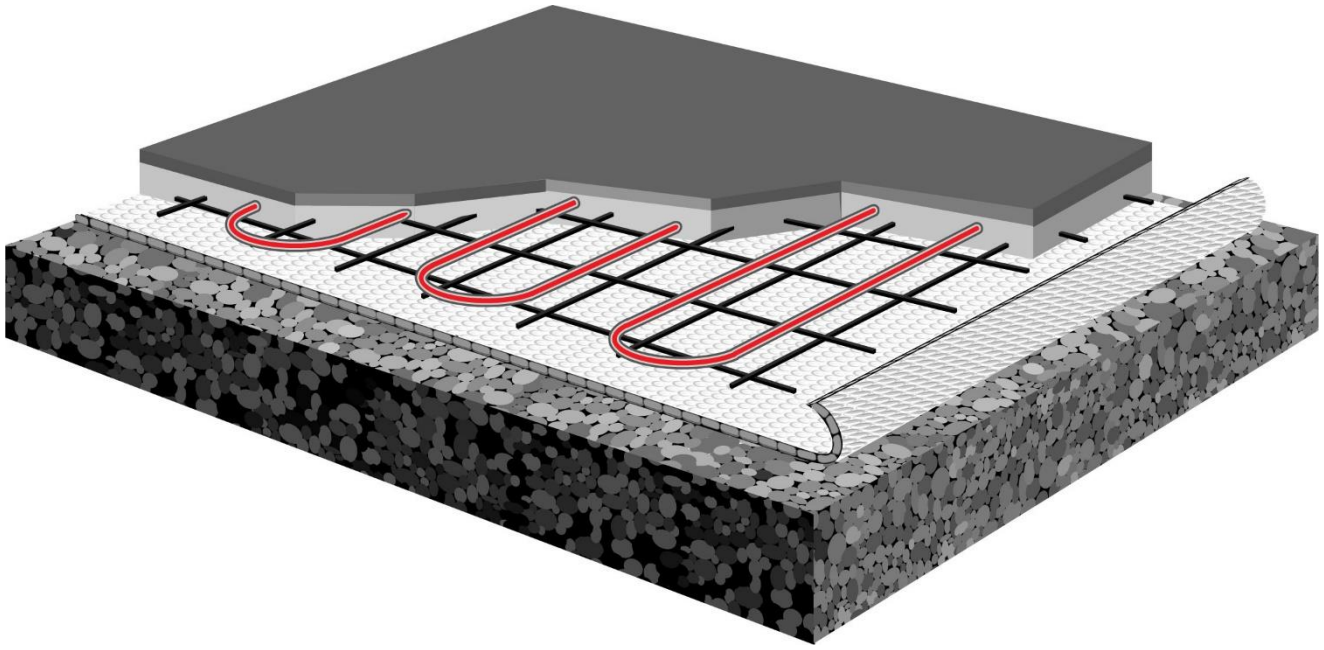


TABLE 6.8.1A Electronically Operated Unitary Air Conditioners and Condensing Units—Minimum Efficiency Requirements

Equipment Type	Size Category	Heating Section Type	Subcategory or Rating Condition	Minimum Efficiency[a]	Test Procedure[b]
Air conditioners, air cooled	<65,000 Btu/h[c]	All	Split system	13.0 SEER	AHRI 210/240
			Single package	13.0 SEER	
Through-the-wall (air cooled)	≤30,000 Btu/h[c]	All	Split system	12.0 SEER	
			Single package	12.0 SEER	
Air conditioners, air cooled	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	Split system and single package	11.2 EER 11.4 IEER	AHRI 340/360
		All other	Split system and single package	11.0 EER 11.2 IEER	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	Split system and single package	11.0 EER 11.2 IEER	
		All other	Split system and single package	10.8 EER 11.0 IEER	
	≥240,000 Btu/h and <760,000 Btu/h	Electric resistance (or none)	Split system and single package	10.0 EER 10.1 IEER	
		All other	Split system and single package	9.8 EER 9.9 IEER	
	≥760,000 Btu/h	Electric resistance (or none)	Split system and single package	9.7 EER 9.8 IEER	
		All other	Split system and single package	9.5 EER 9.6 IEER	
Air conditioners, water cooled	<65,000 Btu/h	All	Split system and single package	12.1 EER 12.3 IEER	AHRI 210/240
	≥65,000 Btu/h and <135,000 Btu/h	Electric resistance (or none)	Split system and single package	11.5 EER (before 6/1/2011) 12.1 EER (as of 6/1/2011) 11.7 IEER (before 6/1/2011) 12.3 IEER (as of 6/1/2011)	AHRI 340/360
		All other	Split system and single package	11.3 EER(before 6/1/2011) 11.9 EER(as of 6/1/2011) 11.5 IEER (before 6/1/2011) 12.1 IEER (as of 6/1/2011)	
	≥135,000 Btu/h and <240,000 Btu/h	Electric resistance (or none)	Split system and single package	11.0 EER (before 6/1/2011) 12.5 EER (as of 6/1/2011) 11.2 IEER (before 6/1/2011) 12.5 IEER (as of 6/1/2011)	
		All other	Split system and single package	10.8 EER (before 6/1/2011) 12.3 EER (before 6/1/2011) 11.0 IEER (before 6/1/2011) 12.5 IEER (before 6/1/2011)	
Air conditioners, water cooled	≥240,000 Btu/h and <760,000 Btu/h	Electric resistance (or none)	Split system and single package	11.0 EER (before 6/1/2011) 12.4 EER (as of 6/1/2011) 11.1 IEER (before 6/1/2011) 12.6 IEER (as of 6/1/2011)	AHRI 340/360
		All other	Split system and single package	10.8 EER (before 6/1/2011) 12.2 EER (as of 6/1/2011) 10.9 IEER (before 6/1/2011) 12.4 IEER (as of 6/1/2011)	

- Thermal Performance
- Air Barriers
  - Continuous air barrier requirement
- Air Leakage
  - Louvers
  - Loading docks
- Vestibules

TABLE 5.5-4 Building Envelope Requirements for Climate Zone 4 (A, B, C)*

Opaque Elements	Nonresidential		Residential		Semiheated	
	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
Roofs						
Insulation Entirely above Deck	U-0.048	R-20.0 c.i.	U-0.048	R-20.0 c.i.	U-0.173	R-5.0 c.i.
Metal Building[a]	U-0.055	R-13.0 + R-13.0	U-0.055	R-13.0 + R-13.0	U-0.097	R-10.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above-Grade						
Mass	U-0.104	R-9.5 c.i.	U-0.090	R-11.4 c.i.	U-0.580	NR
Metal Building	U-0.084	R-19.0	U-0.084	R-19.0	U-0.113	R-13.0
Steel-Framed	U-0.064	R-13.0 + R-7.5 c.i.	U-0.064	R-13.0 + R-7.5 c.i.	U-0.124	R-13.0
Wood-Framed and Other	U-0.089	R-13.0	U-0.064	R-13.0 + R-3.8 c.i.	U-0.089	R-13.0
Walls, Below-Grade						
Below-Grade Wall	C-1.140	NR	C-0.119	R-7.5 c.i.	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 c.i.	U-0.074	R-10.4 c.i.	U-0.137	R-4.2 c.i.
Steel-Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood-Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.540	R-10 for 24 in.	F-0.730	NR
Heated	F-0.860	R-15 for 24 in.	F-0.860	R-15 for 24 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Nonswinging	U-0.500		U-0.500		U-1.450	
Fenestration	**Assembly Max. U**	**Assembly Max. SHGC**	**Assembly Max. U**	**Assembly Max. SHGC**	**Assembly Max. U**	**Assembly Max. SHGC**
Vertical Glazing, 0%–40% of Wall						
Nonmetal framing (all)[c]	U-0.40		U-0.40		U-1.20	
Metal framing (curtainwall/storefront)[d]	U-0.50	SHGC-0.40 all	U-0.50	SHGC-0.40 all	U-1.20	SHGC-NR all
Metal framing (entrance door)[d]	U-0.85		U-0.85		U-1.20	
Metal framing (all other)[d]	U-0.55		U-0.55		U-1.20	
Skylight with Curb, Glass, % of Roof						
0%–2.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-0.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-NR
2.1%–5.0%	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-0.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic, % of Roof						
0%–2.0%	U_{all}-1.30	$SHGC_{all}$-0.65	U_{all}-1.30	$SHGC_{all}$-0.62	U_{all}-1.90	$SHGC_{all}$-NR
2.1%–5.0%	U_{all}-1.30	$SHGC_{all}$-0.34	U_{all}-1.30	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All, % of Roof						
0%–2.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.58	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-NR
2.1%–5.0%	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-0.58	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

*The following definitions apply: c.i. = *continuous insulation* (see Section 3.2), NR = no (insulation) requirement.
[a]When using R-value compliance method, a thermal spacer block is required; otherwise use the *U-factor* compliance method. See Table A2.3.
[b]Exception to Section A3.1.3.1 applies.
[c]Nonmetal framing includes framing materials other than metal with or without metal reinforcing or cladding.
[d]Metal framing includes metal framing with or without thermal break. The "all other" subcategory includes operable windows, fixed windows, and non-entrance doors.

- Air Barrier Testing
  - Washington State
- Commissioning
  - California
  - Washington State
- Switched Receptacles
  - California
  - Washington State
- Envelope tradeoff starting at 30% glazing rather than 40% glazing
  - Oregon
  - Washington State
- LEED Mandates
  - City of San Francisco
  - Vancouver, BC, Canada

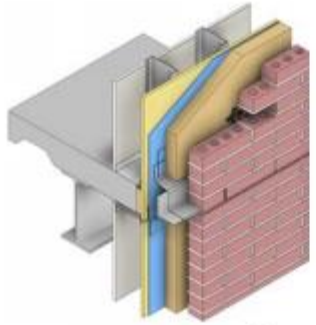
- Prescriptive
- Simplified Trade-off
  - COMcheck
  - State-specific spreadsheet
- Performance

COMcheck

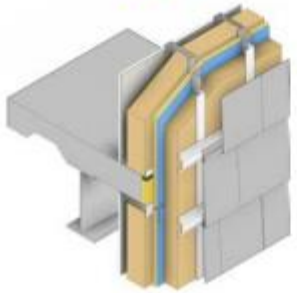
- Meet all code requirements individually

Zimmer Gunsul Frasca Architects LLP

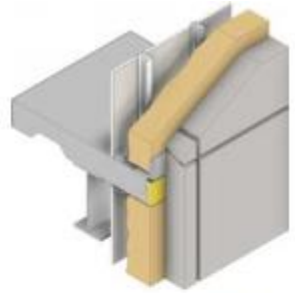
Principles of Exterior Wall Systems



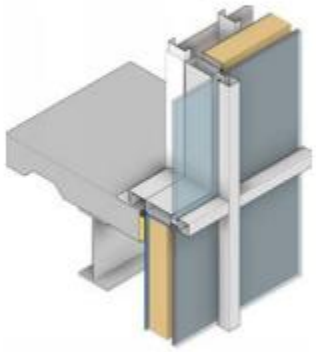
Rain Screen
- Brick Veneer
- Metal Panel
- Stone Veneer
- Terra Cotta
- Stucco
- Wood



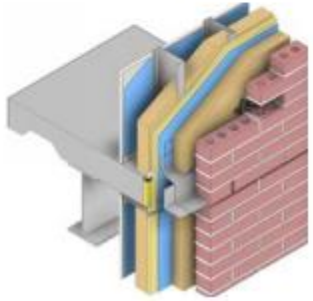
Dual Insulation
- Brick Veneer
- Metal Panel
- Stone Veneer
- Terra Cotta
- Stucco
- Wood
- Metal Shingles



Mass Wall
- Precast Concrete
- Cast-in-Place Concrete

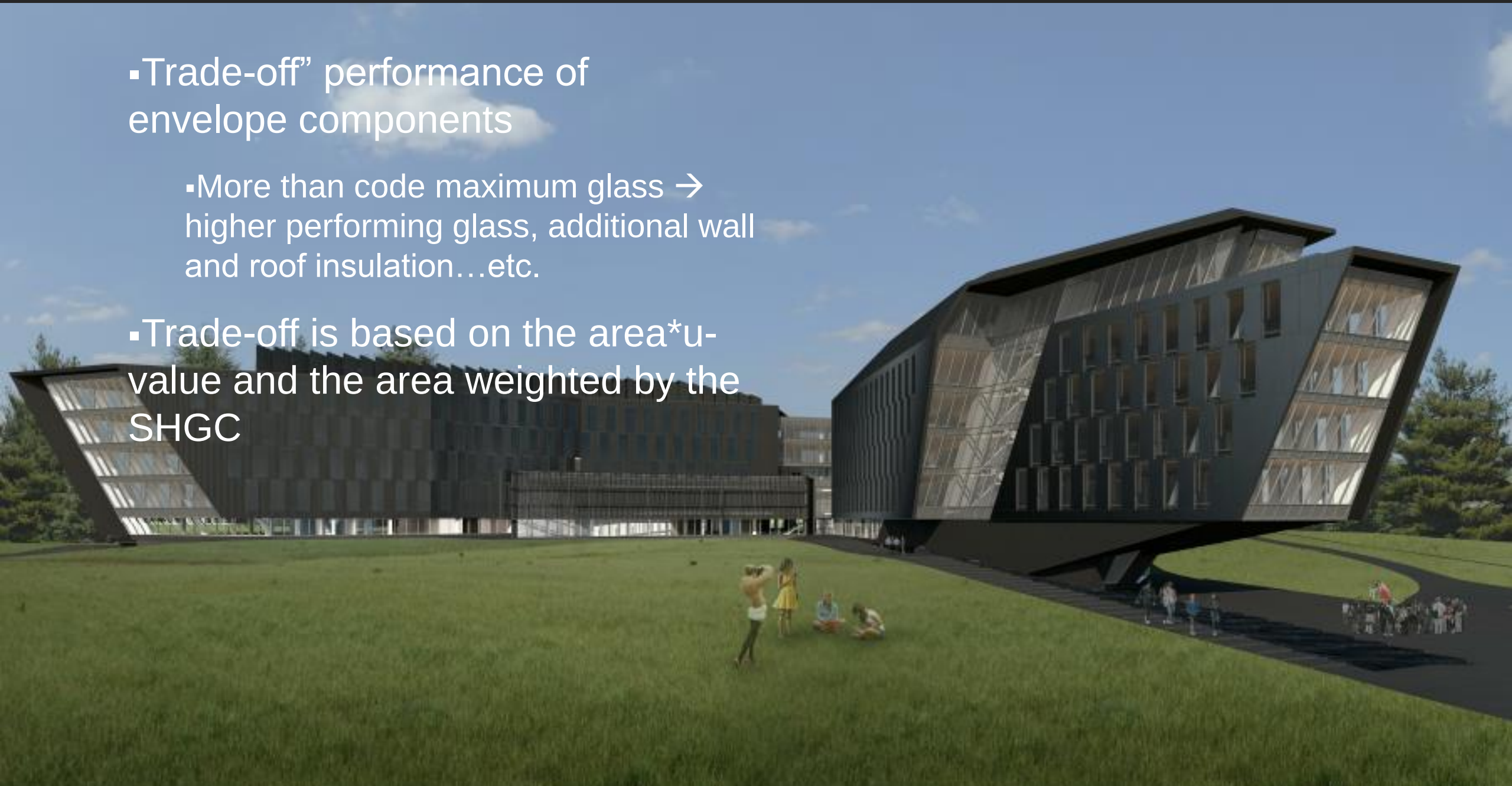


Curtain Wall
- Stick-Built
- Unitized



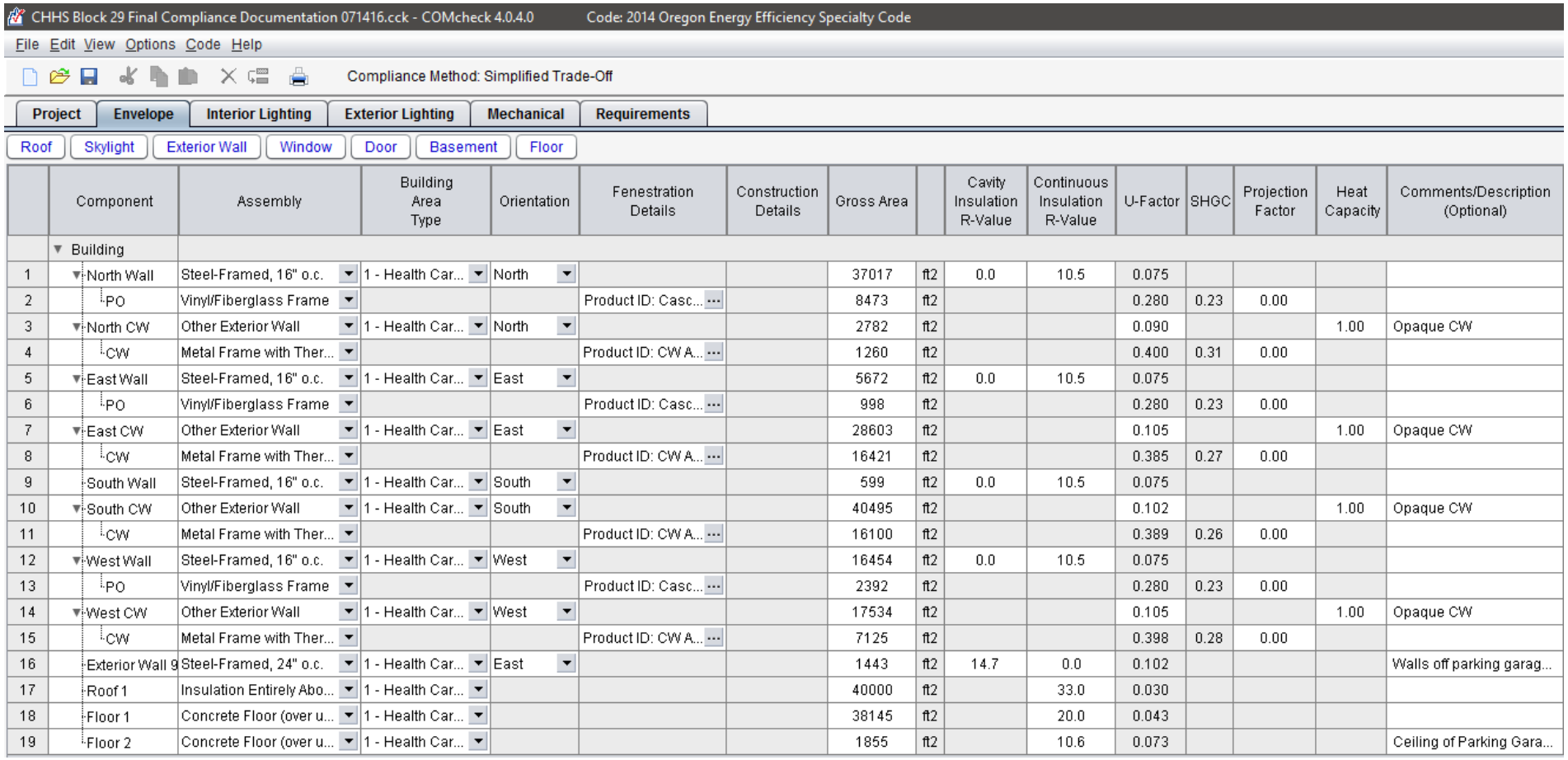
Other Systems
- Metal Shingle
- Precast Concrete
- Precast Concrete Sandwich
- Brick Breathable Rain Screen

Insulation Placement



- Trade-off" performance of envelope components
  - More than code maximum glass → higher performing glass, additional wall and roof insulation…etc.
- Trade-off is based on the area*u-value and the area weighted by the SHGC

COMcheck Sample



CHHS Block 29 Final Compliance Documentation 071416.cck - COMcheck 4.0.4.0 Code: 2014 Oregon Energy Efficiency Specialty Code

File Edit View Options Code Help

Compliance Method: Simplified Trade-Off

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

Roof | Skylight | Exterior Wall | Window | Door | Basement | Floor

	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	Heat Capacity	Comments/Description (Optional)
	▼ Building														
1	▼ North Wall	Steel-Framed, 16" o.c.	1 - Health Car...	North			37017	ft2	0.0	10.5	0.075				
2	PO	Vinyl/Fiberglass Frame			Product ID: Casc...		8473	ft2			0.280	0.23	0.00		
3	▼ North CW	Other Exterior Wall	1 - Health Car...	North			2782	ft2			0.090			1.00	Opaque CW
4	CW	Metal Frame with Ther...			Product ID: CW A...		1260	ft2			0.400	0.31	0.00		
5	▼ East Wall	Steel-Framed, 16" o.c.	1 - Health Car...	East			5672	ft2	0.0	10.5	0.075				
6	PO	Vinyl/Fiberglass Frame			Product ID: Casc...		998	ft2			0.280	0.23	0.00		
7	▼ East CW	Other Exterior Wall	1 - Health Car...	East			28603	ft2			0.105			1.00	Opaque CW
8	CW	Metal Frame with Ther...			Product ID: CW A...		16421	ft2			0.385	0.27	0.00		
9	South Wall	Steel-Framed, 16" o.c.	1 - Health Car...	South			599	ft2	0.0	10.5	0.075				
10	▼ South CW	Other Exterior Wall	1 - Health Car...	South			40495	ft2			0.102			1.00	Opaque CW
11	CW	Metal Frame with Ther...			Product ID: CW A...		16100	ft2			0.389	0.26	0.00		
12	▼ West Wall	Steel-Framed, 16" o.c.	1 - Health Car...	West			16454	ft2	0.0	10.5	0.075				
13	PO	Vinyl/Fiberglass Frame			Product ID: Casc...		2392	ft2			0.280	0.23	0.00		
14	▼ West CW	Other Exterior Wall	1 - Health Car...	West			17534	ft2			0.105			1.00	Opaque CW
15	CW	Metal Frame with Ther...			Product ID: CW A...		7125	ft2			0.398	0.28	0.00		
16	Exterior Wall 9	Steel-Framed, 24" o.c.	1 - Health Car...	East			1443	ft2	14.7	0.0	0.102				Walls off parking garag...
17	Roof 1	Insulation Entirely Abo...	1 - Health Car...				40000	ft2		33.0	0.030				
18	Floor 1	Concrete Floor (over u...	1 - Health Car...				38145	ft2		20.0	0.043				
19	Floor 2	Concrete Floor (over u...	1 - Health Car...				1855	ft2		10.6	0.073				Ceiling of Parking Gara...

- Demonstrate that the entire building (including MEP components) performs as well or better than a code minimum building
- May require additional review process

This is great… but what about Canada?

Eliminating the Patchwork:

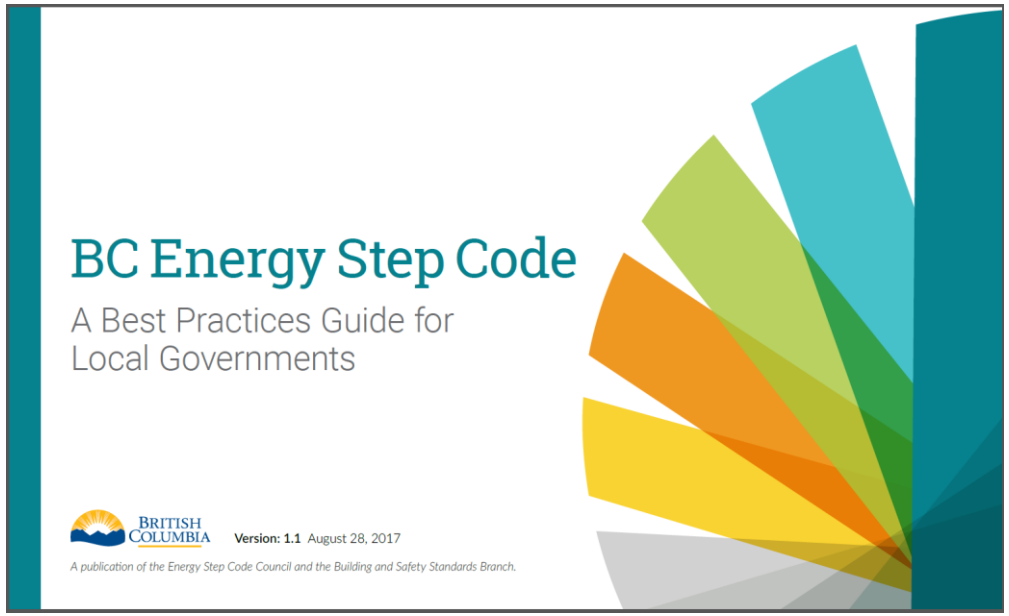
- Local government adopted a wide range of programs and approaches to address building energy efficiency.
- Development industry struggled to stay on top of these requirements.
- BC Energy Step Code offers a common standard for achieving building energy goals.

ENERGY STEPCODE

BUILDING BEYOND THE STANDARD

1. Regularize expectations in local municipalities

2. Prepare for goal to achieve Net Zero Ready by 2032



April 2017:

- Step Code introduced as voluntary guidelines for municipalities to adopt
- Local jurisdictions decide how to incentivize and/or mandate Steps

December 15, 2017:

- Existing programs in bylaw need to be transitioned
- New programs can be enforced

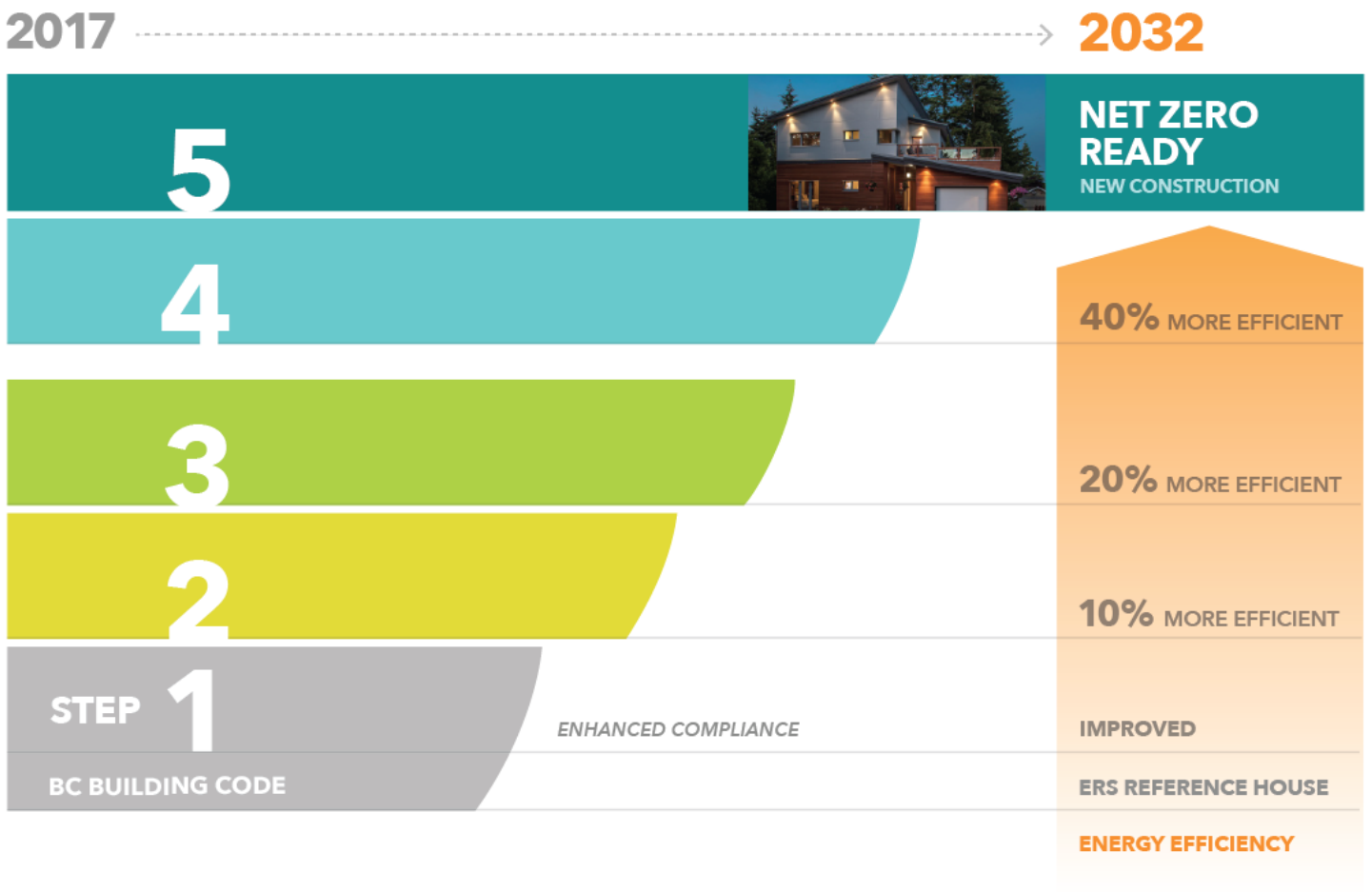
Sample Programs:

City of North Vancouver

City of Richmond
City of Surrey

Sparwood, Invermere, Kimberley
Langley, Saanich

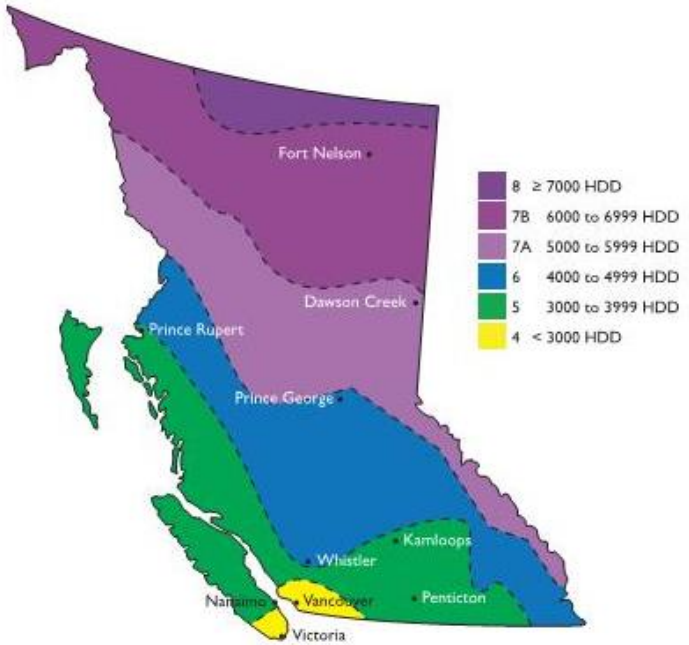
Resort Municipality of Whistler
City of New Westminster



Typology Specific

Figure 1: Definition of Lower and Upper Steps by building type (Part 9 and Part 3)

Climate Specific



Map of BC Climate Zones, where zones are defined by the number of Heating Degree Days (HDD) in one year. The BC Energy Step Code for Large and Complex Buildings (Part 3) is only available in Climate Zone 4.

Metrics + Technical Requirements

		PART 9	PART 3
Energy Model	Building envelope metrics	***Thermal Energy Demand Intensity (TEDI):*** The amount of annual heating energy needed to maintain a stable interior temperature, taking into account heat loss through the envelope and passive gains (i.e., the amount of heat gained from solar energy passing through the envelope or from activities in the home like cooking, lights, and body heat). It is calculated per unit of area of the conditioned space over the course of a year, and expressed in kWh/(m²·year).	
		Peak Thermal Load (PTL): The maximum amount of energy needed to heat a building on the coldest day of the year, expressed in W/m² of conditioned space. Energy modellers also refer to this as "Design Heat Loss."	
	Equipment and systems metrics	***Percent Lower than EnerGuide Reference House:*** An EnerGuide reference house establishes how much energy a home would use if it was built to base building code standards. This metric identifies how much less energy - stated as a percentage - the new home will require compared to the reference house. ***Mechanical Energy Use Intensity:*** The modelled amount of energy used by space heating and cooling, ventilation, and domestic hot water systems, per unit of area, over the course of a year, expressed in kWh/(m²·year).	***Total Energy Use Intensity:*** The modelled amount of total energy used by a building, per unit of area, over the course of a year, expressed in kWh/(m²·year). It includes plug loads - appliances, lighting, entertainment systems, and so on - and process loads, namely heating, cooling, fans, and other mechanical systems. Some exceptions for unique situations are permitted (for example, electric vehicle charging), as outlined in the modelling guidelines referenced in the ***BC Energy Step Code*** regulation. This metric may be challenging to achieve for specific buildings that have high process loads (for example, restaurants, hospitals, or large computer server farms).
On-site Testing	Airtightness metrics	***Air Changes per Hour at a 50 Pa Pressure Differential (ACH_{50}):*** The number of times the full volume of air in the building exchanges in an hour when a building is at a specified pressure, different than the outdoor air pressure, as measured by a "blower door test". This measures the airtightness of the building (or how much air leaks through the building envelope).	***Air Leakage Rate:*** A measure of the rate that air leaks through the building envelope per unit area of the building envelope, as recorded in L/(s·m²) at a 75 Pa pressure differential.

LEED PLATINUM TARGET

DOWNTOWN
DEVELOPMENT GROUP

11W

PORTLAND, OR

RESIDENTIAL: 253,000 GSF / 222 UNITS
OFFICE: 110,000 GSF
RETAIL: 7,800 GSF
AMENITY: 8,000 GSF
PARKING: 260 CARS

470,000 SF

SW WASHINGTON + SW 10TH

SW WASHINGTON + SW 11TH

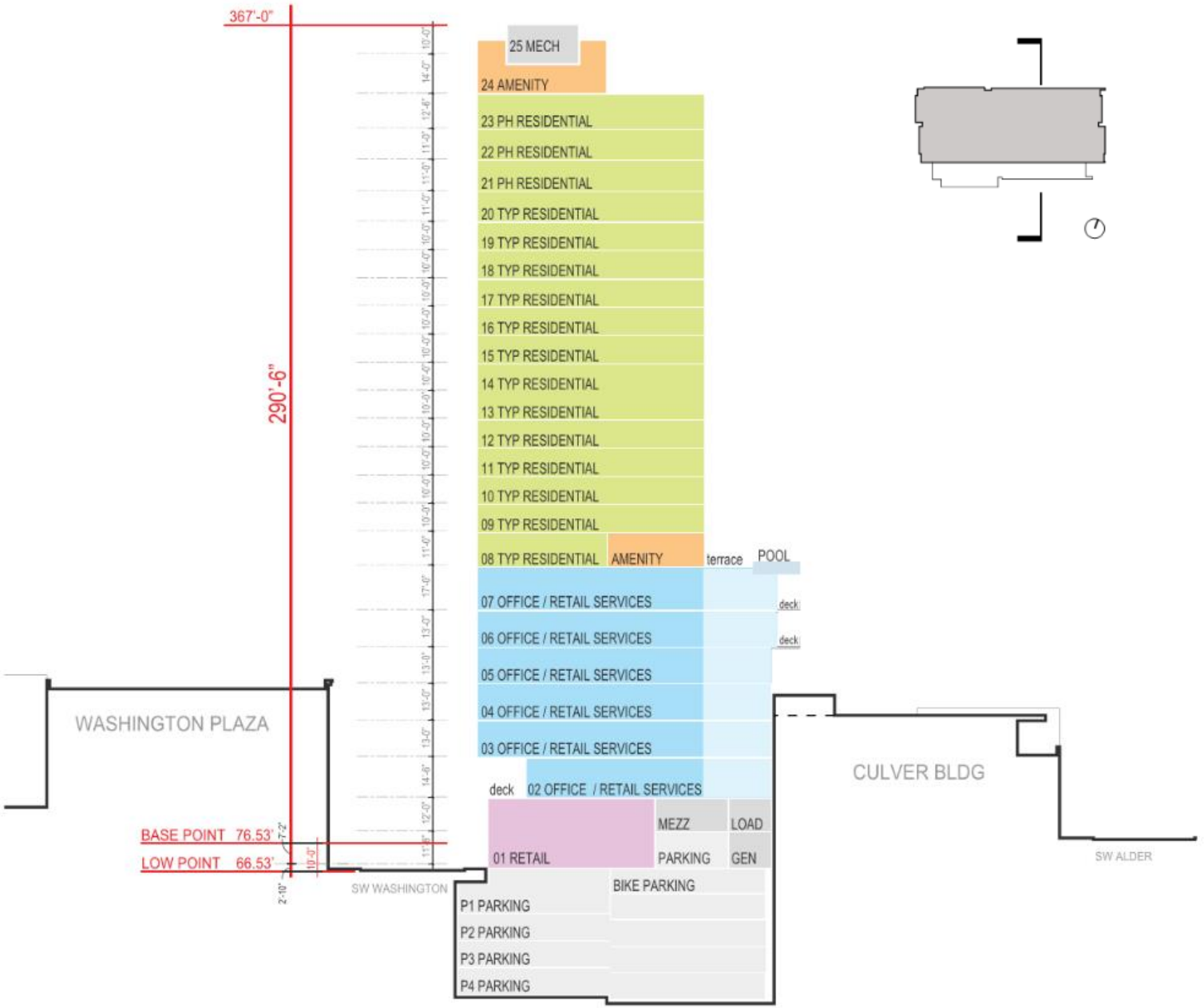
RESIDENTIAL:
_16 FLOORS
_222 UNITS
_86.1% EFF
_980 SF AVG UNIT

OFFICE:
_6 FLOORS

RETAIL:
_ACTIVE GROUND FLOOR

AMENITY:
_LEVEL 08 + LEVEL 24

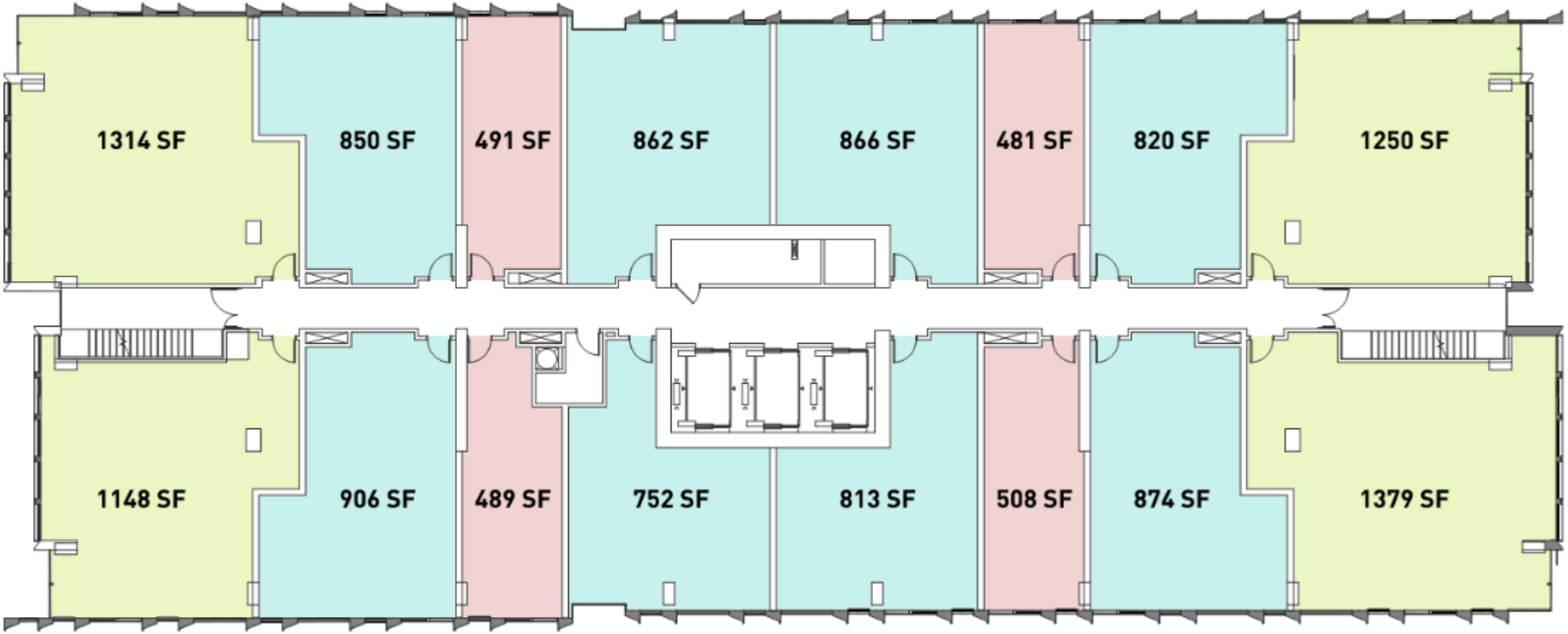
PARKING:
_4 FLOORS BELOW GRADE



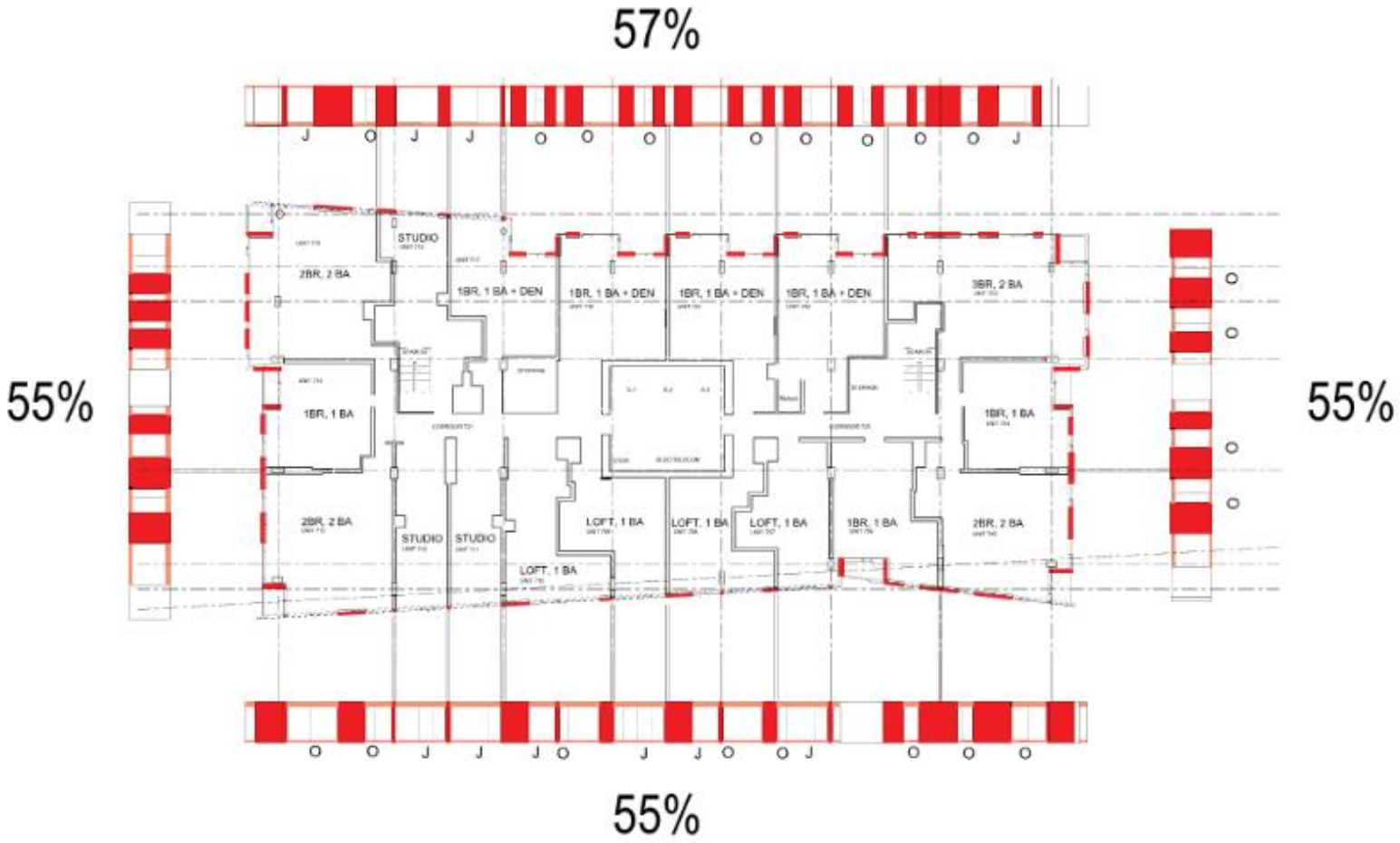
TYPICAL RESIDENTIAL LEVEL

RENTABLE AREA: 12,424 SF

FLOOR PLATE	16,004 GSF	UNITS/LEVEL	16 UNITS
CORE & CIRCULATION	2,250 GSF	AVERAGE UNIT SIZE	860 NSF
		EFFICIENCY	86.1%



Maximize Vision Glazing and Views – 12W Precedent

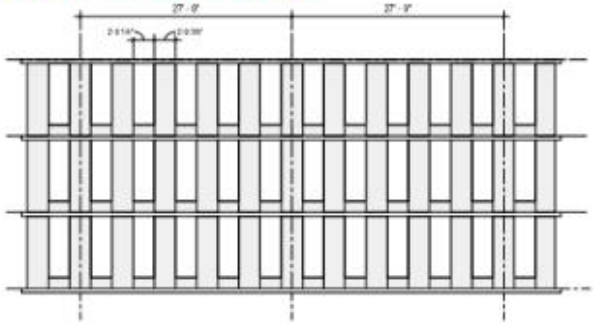


- 12W
  - Permitted under 2007 Energy Code
  - Performance Path for code compliance
  - LEED-NC v2.1 Platinum Certified

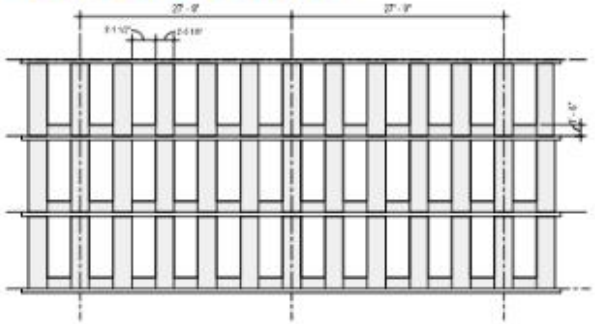
- 11W
  - To be permitted under 2014 Energy Code
  - Simplified Trade-off for code compliance
    - Trade of starts at 30% Glazing
    - Could not use performance path due to time needed for energy model review at state level. Would add ~2 months to permit process
  - LEED-Homes v3 Multifamily Midrise Platinum Target

Tune Envelope for Performance and Views

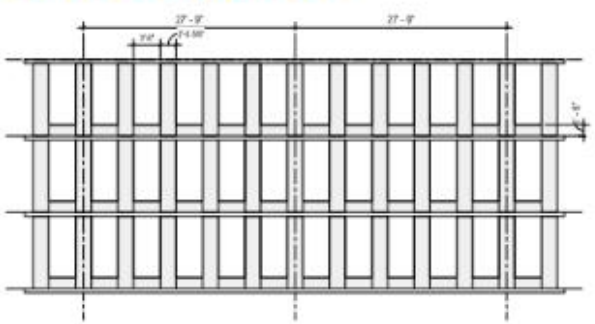
40% GLAZING



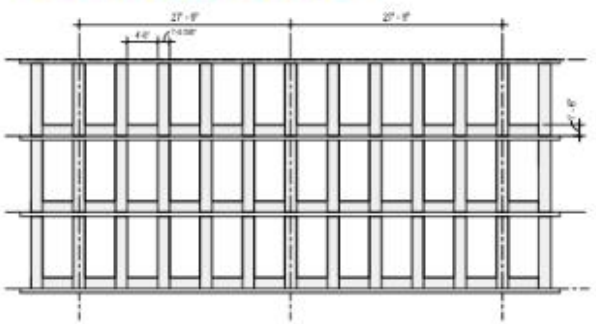
45% GLAZING



50% GLAZING



55% GLAZING

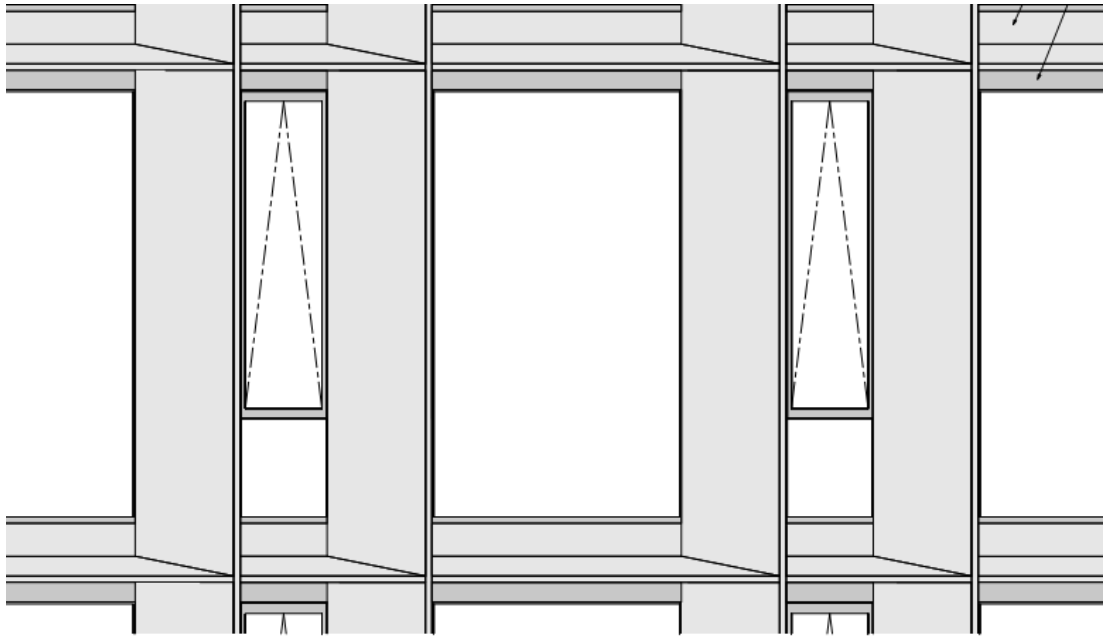


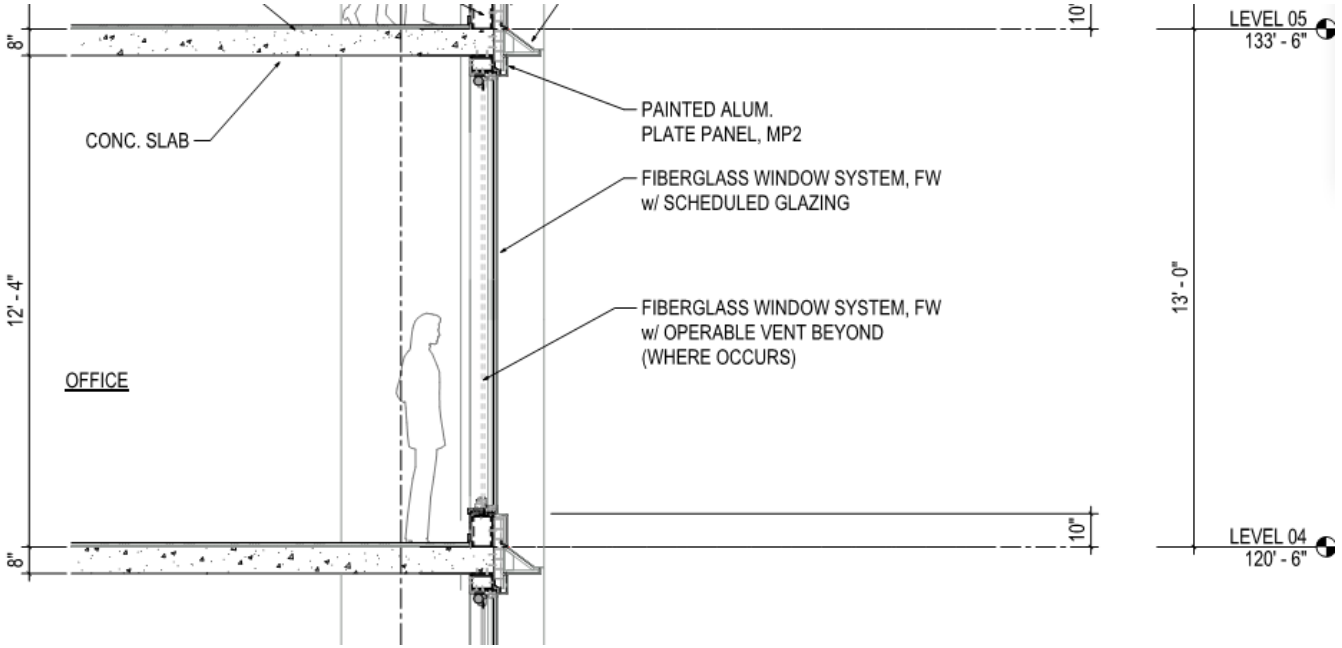
40% GLAZING

50% GLAZING

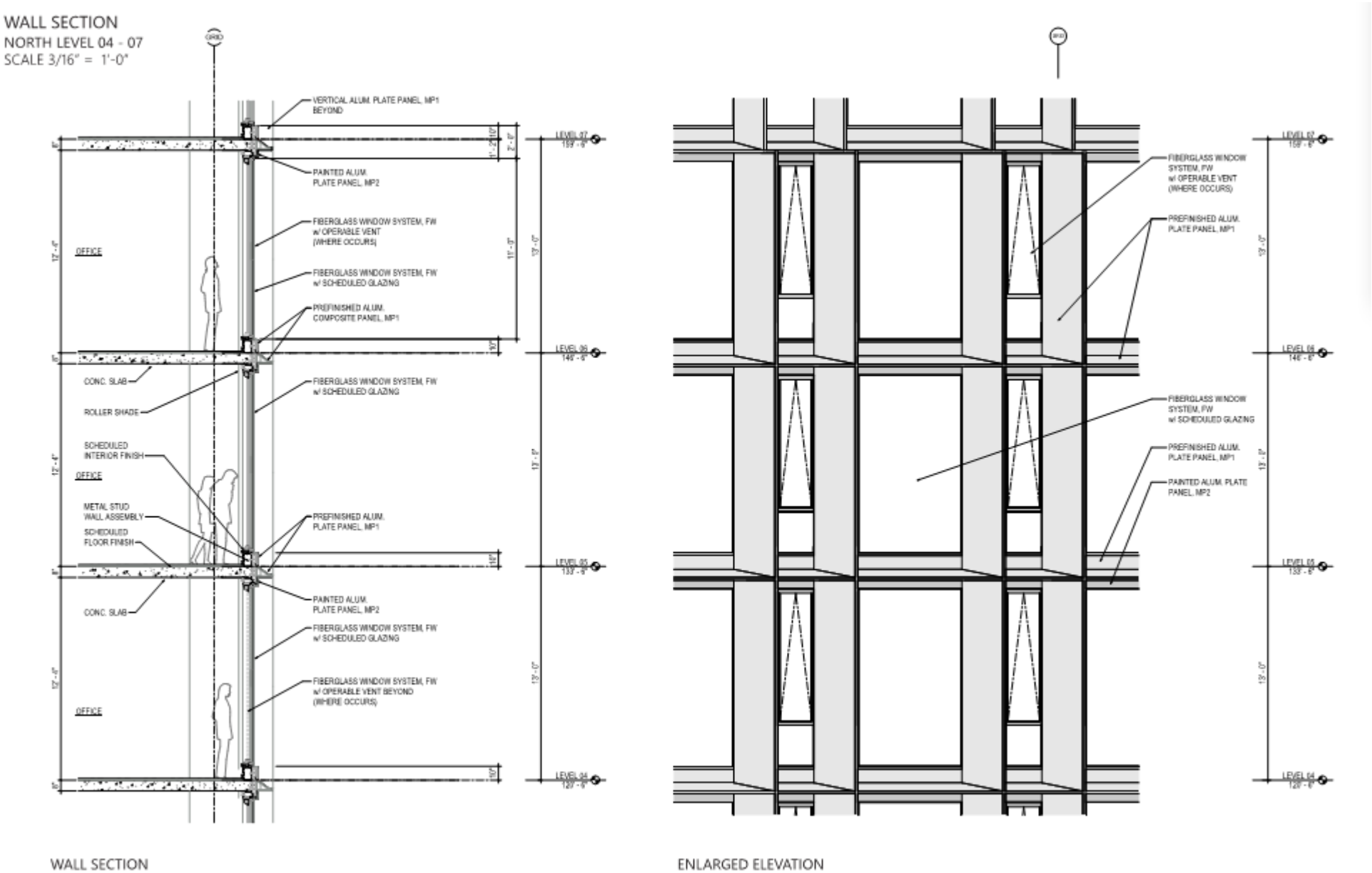
55% GLAZING

	40% VISION GLAZING	45% VISION GLAZING	50% VISION GLAZING	55% VISION GLAZING	55% VISION GLAZING
FRAME TYPE	• Metal Frames	• Metal Frames	• Fiberglass Frames - *North & South* • Metal Frames - *East & West*	• Fiberglass Frames - *North & South* • Metal Frames - *East & West*	• Fiberglass Frames - *North & South* • Metal Frames - *East & West*
GLASS PERFORMANCE	• U-value of 0.38 • SHGC of 0.23	• U-value of 0.38 • SHGC of 0.23	• U-value of 0.28, SHGC of 0.23 - *North & South* • U-value of 0.38, SHGC of 0.23 - *East & West*	• U-value of 0.28 and SHGC of 0.23 - *North & South* • U-value of 0.38 and SHGC of 0.23 - *East & West*	• U-value of 0.28 and SHGC of 0.17 - *North & South* • U-value of 0.38 and SHGC of 0.17 - *East & West*
SHADING	• None	• 14" overhang - *North & South* • None - *East & West*	• None	• 14" overhang - *North & South* • None - *East & West*	• None





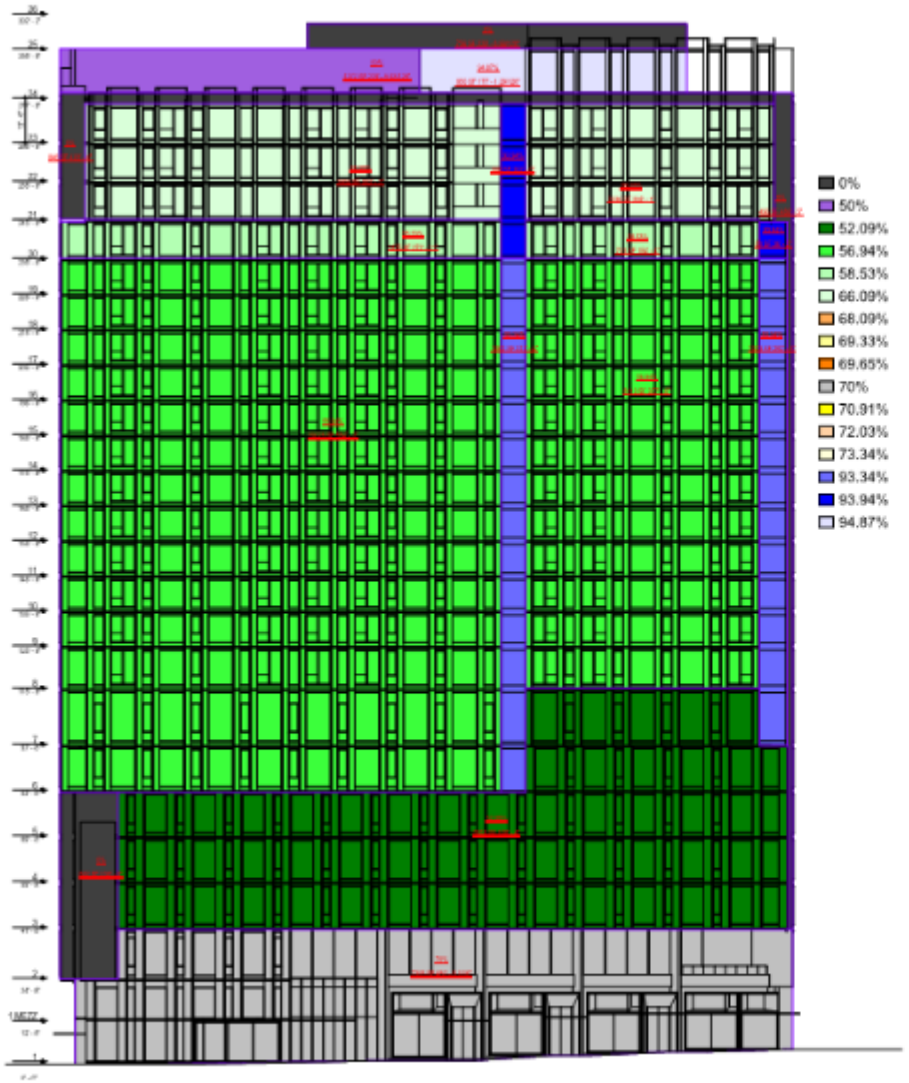
Wall Section



WALL SECTION

ENLARGED ELEVATION

Design Approach



GLAZING % ALIGNED WITH PROGRAM STACK

11W 051117 Option 1.cck - COMcheck 4.0.5.5 Code: 2014 Oregon Energy Efficiency Specialty Code

File Edit View Options Code Help

Compliance Method: Simplified Trade-Off

Project | Envelope | Interior Lighting | Exterior Lighting | Mechanical | Requirements

Roof | Skylight | Exterior Wall | Window | Door | Basement | Floor

	Component	Assembly	Building Area Type	Orientation	Fenestration Details	Construction Details	Gross Area		Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	SHGC	Projection Factor	Comments/Description (Optional)
	Building													
1	BASE-east	Steel-Framed, 16" o.c.	2 - Office (No...	East			2160	ft2	0.0	17.2	0.050			57.44% glass total
2	Storefront	Metal Frame Curtain W...			Product ID: Storef...		991	ft2			0.380	0.55	0.65	7'11" overhang above 1...
3	Storefront	Metal Frame Curtain W...			Product ID: Storef...		521	ft2			0.380	0.55	0.00	No overhang
4	BASE-south	Steel-Framed, 16" o.c.	2 - Office (No...	South			11190	ft2	0.0	17.2	0.050			includes solid wall to le...
5	2nd floor te	Metal Frame with Ther...			Product ID: Towe...		1485	ft2			0.380	0.55	0.44	12' overhang above 27' ...
6	Storefront	Metal Frame Curtain W...			Product ID: Storef...		380	ft2			0.380	0.55	1.42	17' overhang above 12'...
7	BASE-west	Steel-Framed, 16" o.c.	2 - Office (No...	West			5081	ft2	0.0	17.2	0.050			70% glass
8	Storefront	Metal Frame Curtain W...			Product ID: Storef...		1667	ft2			0.380	0.55	0.00	No shading
9	2nd floor te	Metal Frame with Ther...			Product ID: Towe...		1890	ft2			0.380	0.55	0.92	25' deep overhang over ...
10	BASE-north	Steel-Framed, 16" o.c.	2 - Office (No...	North			4859	ft2	0.0	17.2	0.050			70% glass
11	Storefront	Metal Frame Curtain W...			Product ID: Storef...		864	ft2			0.380	0.55	0.00	no overhang
12	Storefront	Metal Frame Curtain W...			Product ID: Storef...		1071	ft2			0.380	0.55	0.50	8' overhnag above 16' g...
13	2nd floor te	Metal Frame with Ther...			Product ID: Towe...		1326	ft2			0.380	0.55	1.23	21' overhang above 17' ...
14	TOWER_east	Steel-Framed, 16" o.c.	1 - Multifamily ...	East			26772	ft2	0.0	17.2	0.050			
15	CW	Metal Frame with Ther...			Product ID: Curta...		3486	ft2			0.380	0.27	0.00	CW
16	FG	Metal Frame with Ther...			Product ID: Fiber...		13000	ft2			0.280	0.27	0.00	FG
17	TOWER_sou	Steel-Framed, 16" o.c.	1 - Multifamily ...	South			48651	ft2	0.0	17.2	0.050			
18	CW	Metal Frame with Ther...			Product ID: Curta...		3738	ft2			0.380	0.27	0.00	CW
19	Res Fiberg	Metal Frame with Ther...			Product ID: Fiber...		14000	ft2			0.280	0.27	0.13	14" overhang abve 8'2" ...
20	PH Fibergl	Metal Frame with Ther...			Product ID: Fiber...		3939	ft2			0.280	0.27	0.12	14" overhang above 9' 2...
21	Office Fiber	Metal Frame with Ther...			Product ID: Fiber...		5557	ft2			0.280	0.27	0.14	14" overhang above 7' 1...
22	TOWER_west	Steel-Framed, 16" o.c.	1 - Multifamily ...	West			26329	ft2	0.0	17.2	0.050			
23	CW	Metal Frame with Ther...			Product ID: Curta...		2983	ft2			0.380	0.27	0.00	CW
24	FG	Metal Frame with Ther...			Product ID: Fiber...		11000	ft2			0.280	0.27	0.00	FG
25	TOWER_north	Steel-Framed, 16" o.c.	1 - Multifamily ...	North			55464	ft2	0.0	17.2	0.050			
26	CW	Metal Frame with Ther...			Product ID: Curta...		3834	ft2			0.380	0.27	0.00	CW
27	Res Fiberg	Metal Frame with Ther...			Product ID: Fiber...		18000	ft2			0.280	0.27	0.13	14" overhang abve 8'2" ...
28	PH Fibergl	Metal Frame with Ther...			Product ID: Fiber...		3766	ft2			0.280	0.27	0.12	14" overhang above 9' 2...
29	Office Fiber	Metal Frame with Ther...			Product ID: Fiber...		5710	ft2			0.280	0.27	0.09	14" overhang above 11' ...
30	ROOF	Insulation Entirely Abo...	1 - Multifamily ...				20592	ft2		33.0	0.030			
31	First floor over	Concrete Floor (over u...	2 - Office (No...				20592	ft2		25.8	0.035			

Envelope +1% | Interior Lighting TBD | Exterior Lighting TBD

FACADE ELEMENTS ANALYZED COLLECTIVELY - DEPTH ALLOWS MORE VISION

- Key elements of energy codes are consistent
- It is critical to determine appropriate requirements for your project and location
- Proactive analysis is essential to ensuring code considerations are addressed


QUESTIONS?

LUNCH & LEARN

Thursday Nov 16, 2017

Energy Code Compliance: Tips, Tricks and Case Studies

Amy Jarvis | Portland| ZGF Architects

Josh Peacock | Portland | ZGF Architects