1

Before we Begin…

During the Webinar

- Attendees will be muted
- Please use the chat feature in the control panel to submit questions to LDL staff
- The presenter will pause to address questions periodically.
- Please participate in the online polls.

Following the Webinar

- Please take the short survey
- A recording and the slide deck will be posted on LDL's webpage
- Reach out to LightingDesignLab@seattle.gov with comments or questions.

2

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Ben Roush, Principal, PE-ME, FPE, LEED AP BD+C, ASHRAE BEMP & BEAP, Certified Commissioning Professional

Mechanical & FP Engineer
Board Chair Emeritus, USGBC-MD
AIA MD COTE Chair
Sustainable Mechanical Engineering
Energy Modeling and Auditing
130+ LEED Projects
2 Certified Living Buildings
9 current projects targeting Net Zero
Code Nerd

4

Duane Jonlin, FAIA

- 30 years as technical architect
- 10 years as Energy Code guy
- 4th generation Seattleite

Transitions are difficult, but those who've already shifted are doing fine.

5

Shaun Darragh LC, MIES

- More than 30 years in the industry as a studio leader, award winning architectural lighting designer, instructor, daylighting and sustainability specialist, lighting control system consultant, and theatrical designer.
- Teaches and consults on sustainability issues, lighting, and daylighting for the Lighting Design Lab and University of Washington Architecture Department

When I'm not looking serious for headshots, I can usually be found skiing, cycling, kayaking, or breathing underwater….

6

These targets are much trickier for existing buildings

Washington state:
45% reduction in GHG emissions by 2030

- 95% by 2050

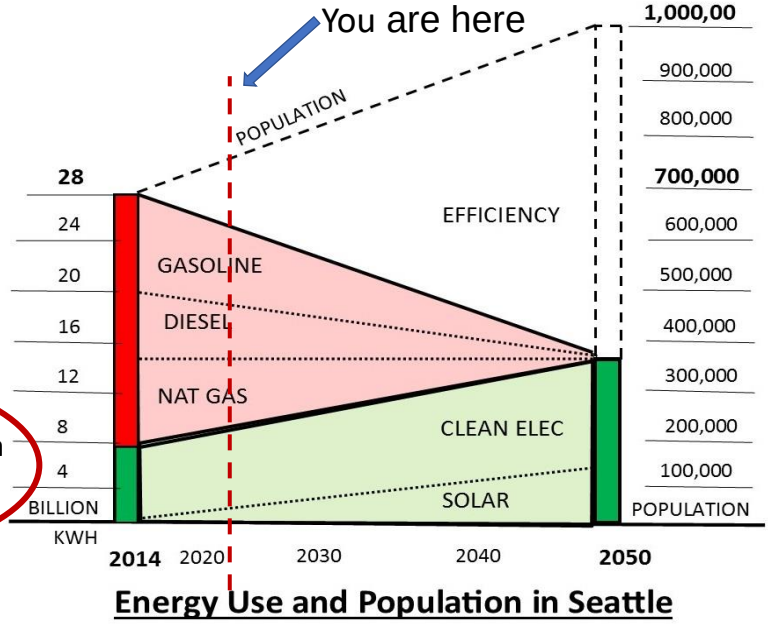
Seattle: Carbon-neutral building & vehicle operations by 2050

- 45% GHG reduction by 2030
- …or sooner with Green New Deal?

The big picture

- Shrink fossil fuel use
- Grow renewables
- Absorb population growth
- **Close the gap with efficiency**

Between now & 2030, we might get 10% of progress from new construction, but need 90% from **existing** buildings



Energy Use and Population in Seattle

Seattle Climate Action Plan

- Seattle GHG emissions *per person* have declined, but building sector emissions went <u>up</u> 8.3% 2016 - 2018
- Seattle CAP <u>2030 emissions</u> target: 45% below 2008
- Seattle CAP <u>2030 energy use</u> target: 10% below 2008
- Seattle CAP <u>2050 emissions</u> target: 82% below 2008

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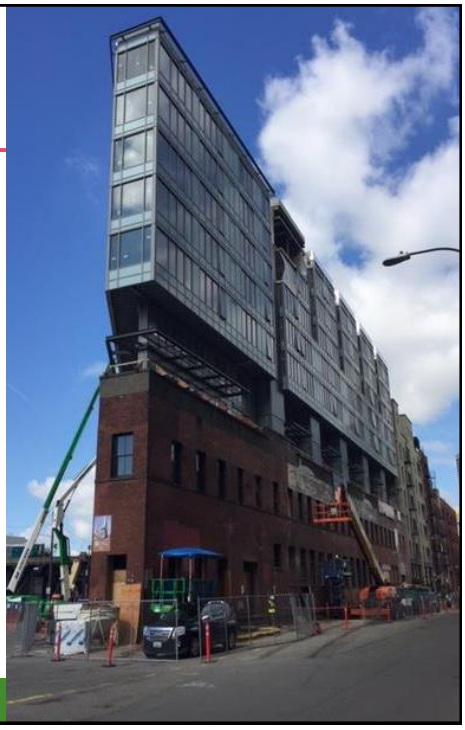
Additions C502

- Addition alone can comply
- <u>or</u> (existing + addition)
- Prescriptive projects also follow C502.2 rules
  - Fenestration area, skylight area, etc.
- Additions <u>over 500 sf</u> require C406 options



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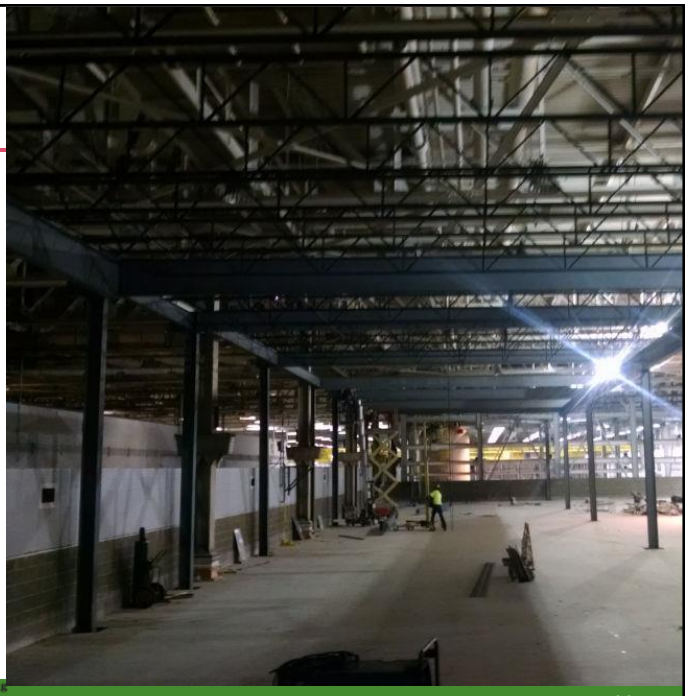
Alterations C503



General principles:

- Existing (untouched) can remain as-is
- Service and repairs OK
- But, any *new* equipment and new systems must meet code
- Don't harm anything protected by Landmarks
- Code official discretion if full compliance is physically or economically "impractical"
  - …so come talk with us

Bring the *whole building* up to code for:

1. Seattle only: "**Substantial Alterations**"
2. **Change of space conditioning**
   - *From:* low-energy space (C402.1.1.1)
   - *To:* conditioned space
   - *From (Seattle only):* heated only ***
   - *To:* heated and cooled
3. **Change of occupancy**
   - *from*: S – storage, F – factory, or U – utility
   - *to:* Anything else
   - *From:* not a dwelling unit
   - *To:* dwelling unit
   - *From:* pre-2009 code dwelling unit
   - *To:* not a dwelling unit

Important exceptions for all 3:

- Envelope UxA can be **10% higher** than for new code
  - If everything inside meets code
  - **15%** for "substantial alterations"

or…

- C407 carbon emissions can be **10% higher** than for new code

NOTE: C406 credits are required

- For impacted building area only

Minimum Energy Performance for "Substantial Alterations" C503.8

- Once in a generation opportunity for "deep green" retrofit
- For major alterations (like complete gut-and-remodel) nearly full compliance required
  - "*…substantially extend the useful physical or economic life of the building*"
  - Vacant for > 24 months
  - "Impracticality" clause

Substantial Alterations Exceptions & Options C503.8

- Exceptions
  - Building features protected by Landmarks
  - URM (only) projects
  - Recently-constructed vacant buildings
  - "Impractical" (building official call)
- Options
  1. Full prescriptive code compliance
  2. UxA 15% higher than code
  3. TBP 10% more energy use than allowed by code
  4. Target Performance Path option

Tenant Improvements

- First construction of new TI space within 18 months of Certificate of Occupancy can use shell & core code edition
- C406 credits from shell & core HVAC system can apply to TI space
- Substantial alterations doesn't apply to "typical tenant improvements"

***Seattle interpretation: Upgrade to "heated and cooled"

Where triggered by SEC 503.2, a full energy code upgrade of the rest of the building is not required under these conditions:

1. The existing heated but not cooled space is altered to become both heated and cooled by replacement of the existing heating-only HVAC system with an electric heat pump HVAC system; and
2. The annual carbon emissions from heating and cooling of the new HVAC system is less than the annual heating-only carbon emissions of the existing HVAC system. SDCI will accept energy modeling complying with SEC Section C407 or another calculation method approved by the code official to demonstrate the reduced annual carbon emissions.

2021 WA code: HVAC heat pumps in alterations
(There's almost always an exception)

- Heat pump not required unless heating equipment being replaced
- Exceptions to heat pump requirements for alterations:
  - If electrical service upgrade would be required
  - Terminal units
  - Air handling units with hydronic coils
  - Air handling units with 100% OSA, but not subject to DOAS
  - Oil-fired boilers, steam boilers
- "Alternate mechanical designs" OK if constraints in:
  - Available mechanical space
  - Limitations of existing structure
  - Too close to existing air intakes or exhausts
  - (The alternate should include some energy savings)

Replacement heating equipment

- New HVAC work must comply with all of Section C403
- **Seattle: Replacement <u>central</u> heating must be heat pump**
  - Distributed fan coils not affected
  - District energy OK
- **Exception**: One (only) failing boiler or furnace can be replaced like for like. **Not** for planned replacements or as part of a larger project

But, how else can Seattle get to carbon-neutral?

We recognize that upgrade to heat pumps is expensive & disruptive.

- The most economical timing is at equipment replacement
  - Could be time of sale instead?
  - Future date certain deadline?
- PACE financing now available in King County & others
  - Only for $250,000 + loans
- Gas cost increase may make heat pumps more cost-effective

- Larger equipment space
- Structural support for heavy equipment and tanks
- Potential new electrical service and main panel
- Pathway for substantial supply and exhaust of outside air
- Noise and vibration control
- For hospital and other critical facilities, backup heat source for power outages

Cooling system alterations C503.4.1

- When adding cooling to an "uncool" space, must provide either DOAS or economizer, both at the individual equipment level and the total system level
- Alteration or replacement of cooling system: Table C503.4 - Economizers

TABLE C503.4

ECONOMIZER COMPLIANCE OPTIONS FOR MECHANICAL *ALTERATIONS*

	Option A	Option B (alternate to A)	Option C (alternate to A)	Option D (alternate to A)
Unit Type	Any *alteration* with new or replacement equipment	Replacement unit of the same type with the same or smaller output capacity	Replacement unit of the same type with a larger output capacity	New equipment added to existing system or replacement unit of a different type
1. Packaged Units	Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: CC403.5[b]	Efficiency: min.[a] Economizer: C403.5[b]
2. Split Systems	Efficiency: min.[a] Economizer: C403.5[b]	For units ≤ 60,000 Btuh, comply with two of two measures: 1. Efficiency: + 10%[e] 2. Economizer: shall	For units ≤ 60,000 Btuh replacing unit installed prior to 1991, comply with at least one of two measures:	Efficiency: min.[a] Economizer: C403.5[b]

(Note some corrections to footnotes in Seattle code)

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TSPR = $\frac{\text{Heating + Cooling Loads}}{\text{Carbon Emissions}}$ (annual)

TSPR not required for alterations except:

- "Substantially replace" the HVAC system
- Change of occupancy
- Change of space conditioning
- Substantial alterations

TSPR: Total System Performance Ratio

Office, Retail, Library, Education
Seattle: Multifamily, Med office

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Commissioning for existing buildings

- Cx required when addition/alteration to a system exceeds "new construction" thresholds:
  - HVAC if:
    - System has economizer, or
    - Heating >600 kBTU/H, or
    - Cooling >480 kBTU/H
  - Water heating - 200 BTUH
  - Lighting and controlled outlets, if
    - 20 kW total new + altered, or
    - 10 kW on occ sensors or daylight sensors
- Applies to added/altered portion of the system, plus any other portions *impacted*
- Must be PE or qualified Cx
- Conflict of interest disclosure if commissioning your own stuff

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WA law 2019: Building performance standards

WA "below-average" buildings:

- 50,000 sf threshold (later, 20,000 sf)
- Meet **EUI** target, or
- Pay: $1.00/sf/year penalty
- Starting 2026 – 2028

Conversion to heat pumps reduces both EUI *and* carbon emissions

Seattle building CO_2 emissions (?):

20,000 sf threshold

2030: 39% below 2008 baseline

2050: Zero carbon emissions

Seattle: Periodic "Building Tune-ups"

Q: Is your economizer working?

Seattle Building Tune-up Ordinance:

- Every 5 years
  - Or demonstrate alternate compliance
- Required "tune-up" of energy systems
  - You *must* fix the easy and obvious stuff
  - Listing of more expensive stuff
- Dwelling units excluded
- Starts phasing in with largest buildings in 2018

And now, a word from your engineer

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Washington and Seattle Energy Codes, back to the future

What I'm excited about

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Agenda for system retrofit

Air side:

- VAV changeout, DOAS not required (by occupancy) Assume gas pack RTU and electric reheat boxes.
- VAV changeout, DOAS required (by occupancy) Assume gas pack RTU and electric reheat boxes. Move on to boiler heat (waterside below)
- Special note on Ch 5 economizer exceptions
- Four pipe fan coil or VRF with DOAS, without ERV (airside, see water side below)
- Four pipe fan coil or VRF with DOAS, with ERV (airside, see water side below)
- Water source heat pump (WSHP, airside, see waterside below)
- Dual duct changeout (you could be so lucky, two big ducts up to the mechanical loft)
- Special note on potentially difficult occupancies (labs, hospitals, manufacturing, laundries), heat recovery possible additions.

Water side:

- Chiller
- Low temp boiler changeout 140 and less (typically condensing boiler systems or WSHP)
- Medium temp boiler changeout up to 180 (old school hot water)
- Note on end terminal air handler coil sizing, some math
- High temp boilers and steam boiler changeout
- Combo chiller and boiler systems changeout (aka two pipe changeover, often for WSHP)

Special note on ground source heat pumps (aka Geothermal) and wastewater heat recovery

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C403, the broad overview

C503.4 Mechanical Systems—break it you buy it.

Side note on TSPR and existing buildings

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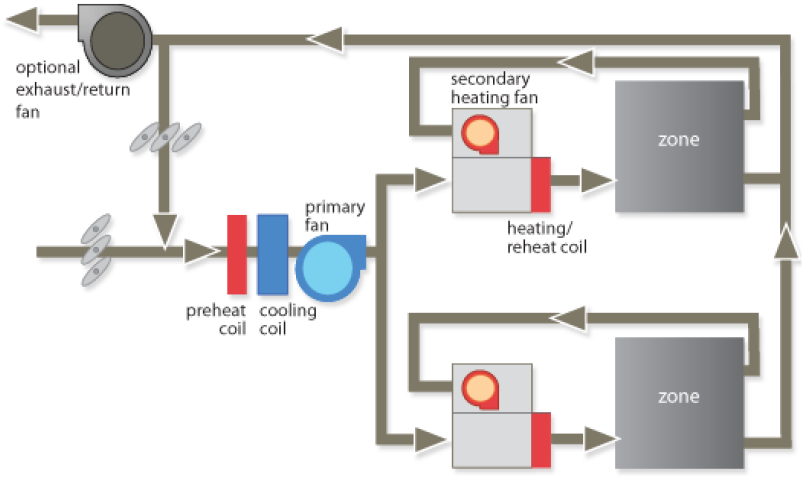
VAV, DOAS C403.3.5.1 NOT required



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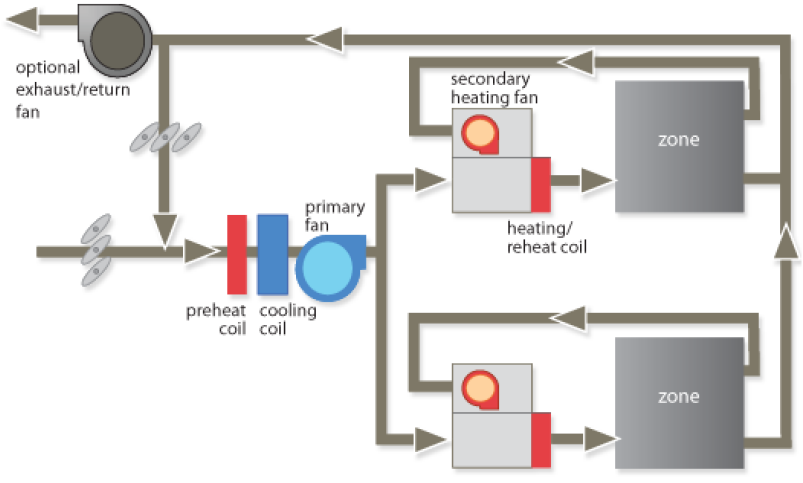
VAV, DOAS C403.3.5.1 required



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VAV—to economize or not economize, that is the question

Economizer, did you have it before? How about DOAS with heat or energy recovery?

TABLE C503.4
ECONOMIZER COMPLIANCE OPTIONS FOR MECHANICAL ALTERATIONS

Unit Type	Option A Any alteration with new or replacement equipment	Option B (alternate to A) Replacement unit of the same type with the same or smaller output capacity	Option C (alternate to A) Replacement unit of the same type with a larger output capacity	Option D (alternate to A) New equipment added to existing system or replacement unit of a different type
1. Packaged Units	Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: CC403.5[b]	Efficiency: min.[a] Economizer: C403.5[b]
2. Split Systems	Efficiency: min.[a] Economizer: C403.5[b]	For units ≤ 60,000 Btuh, comply with two of two measures: 1. Efficiency: + 10%[e] 2. Economizer: shall not decrease existing economizer capability For all other capacities: Efficiency: min.[a] Economizer: C403.5[b]	For units ≤ 60,000 Btuh replacing unit installed prior to 1991, comply with at least one of two measures: 1. Efficiency: + 10%[e] 2. Economizer: 50%[f] For all other capacities: Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: C403.5[b]
3. Water Source Heat Pump	Efficiency: min.[a] Economizer: C403.5[b]	For units ≤ 72,000 Btuh, comply with at least two of three measures: 1. Efficiency: + 10%[e] 2. Flow control valve[g] 3. Economizer: 50%[f] For all other capacities: Efficiency: min.[a] Economizer: C403.5[b]	For units ≤ 72,000 Btuh, comply with at least two of three measures: 1. Efficiency: + 10%[e] 2. Flow control valve[g] 3. Economizer: 50%[f] (except for certain pre-1991 systems[h]) For all other capacities: Efficiency: min.[a] Economizer: C403.5[b]	Efficiency: min.[a] Economizer: C403.5[b] (except for certain pre-1991 systems[h])

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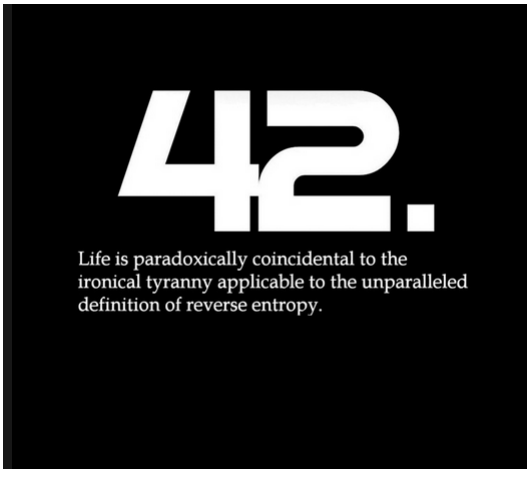
Fan Coils, VRF, and the meaning of life

42, obviously

Do you need DOAS, C403.3.5?

TSPR?



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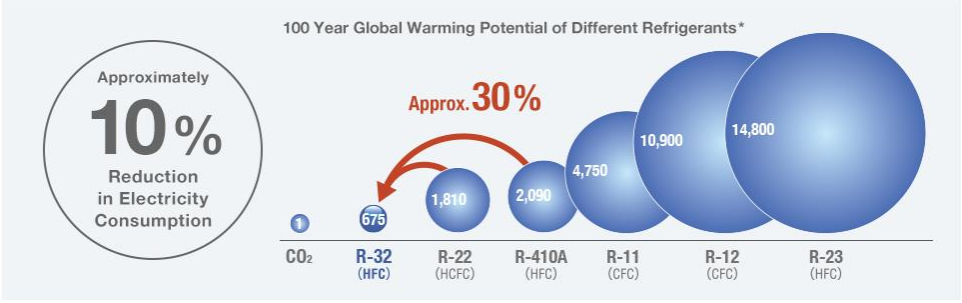
VRF, side note

Refrigerant ASHRAE 15, WA Phaseout of GWP>600



*Source: Values for 100 year global warming potential (GWP) from IPCC Fourth Assessment Report. Comparative 100 year GWP: HFC410A, 2,090; HFC32, 675.

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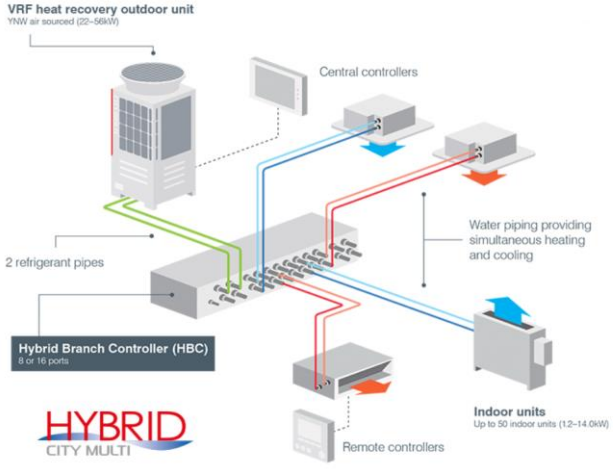
VRF, side note



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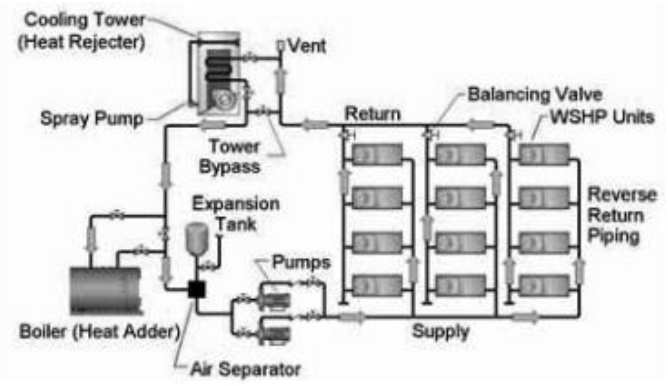
WSHP

Gas or electric boiler?

ERV required?

TSPR?



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Dual duct changeout

Simultaneous heating and cooling?

Big ducts to the air handler, 3 of them?

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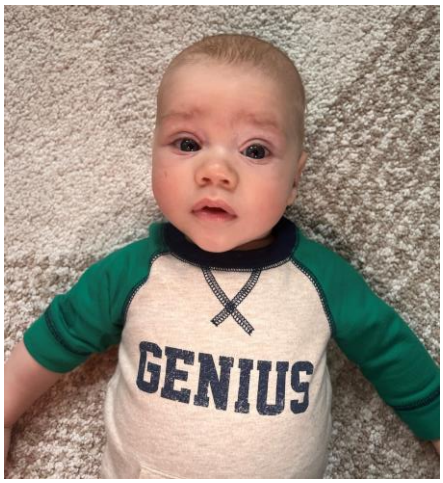
Being Difficult



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Keep it chill

Chillers

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Boilers <140 degrees

Why are you already replacing your condensing boiler?

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180 degree boilers

Cascading loops!

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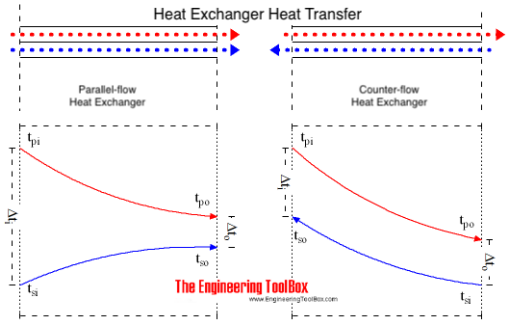
Note on heat exchangers

Remember LMTD?



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High temp water and steam

Steam generating heat pump

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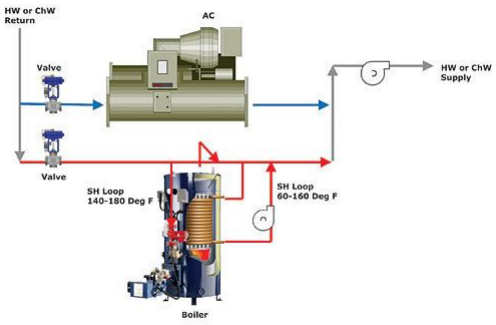
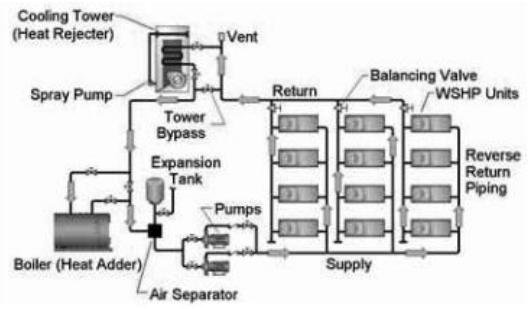
Two pipe changeover

Getting cheap,

or sometimes WSHP





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Special notes on GSHP, sewer heat, other sources

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Special notes on heat recovery chillers

Envelope dragging you down?

TSPR, what TSPR?

Exceptions:

1. Buildings with *conditioned floor area* less than 5,000 square feet.
2. HVAC systems using district heating water, chilled water or steam.
3. HVAC systems not included in Table D601.11.1.
4. HVAC systems with chilled water supplied by absorption chillers, heat recovery chillers, water to water heat pumps, air to water heat pumps, or a combination of air and water cooled chillers on the same chilled water loop.
5. HVAC system served by heating water plants that include air to water or water to water heat pumps.
6. Underfloor air distribution HVAC systems.
7. Space conditioning systems that do not include *mechanical cooling*.
8. Alterations to existing buildings that do not substantially replace the entire HVAC system.
9. HVAC systems meeting all the requirements of the *standard reference design* HVAC system in Table D602.11, Standard Reference Design HVAC Systems.

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Service Water Heating changeout

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C406 Credits, Popularity Contest

Table C406.1
Efficiency Package Credits

Code Section	Commercial Building Occupancy					
	Group R-1	Group R-2	Group B	Group E	Group M	All Other
	Additional Efficiency Credits					
1. More efficient HVAC performance in accordance with Section C406.2	2.0	3.0	3.0	2.0	1.0	2.0
2. Reduced lighting power: Option 1 in accordance with Section C406.3.1	1.0	1.0	2.0	2.0	3.0	2.0
3. Reduced lighting power: Option 2 in accordance with Section C406.3.2[a]	2.0	3.0	4.0	4.0	6.0	4.0
4. Enhanced lighting controls in accordance with Section C406.4	NA	NA	1.0	1.0	1.0	1.0
5. On-site supply of renewable energy in accordance with C406.5	3.0	3.0	3.0	3.0	3.0	3.0
6. Dedicated outdoor air system in accordance with Section C406.6[b]	4.0	4.0	4.0	NA	NA	4.0
7. High performance dedicated outdoor air system in accordance with Section C406.7	4.0	4.0	4.0	4.0	4.0	4.0
8. High-efficiency service water heating in accordance with Sections C406.8.1 and C406.8.2	4.0	5.0	NA	NA	NA	8.0
9. High performance service water heating in multi-family buildings in accordance with Section C406.9	7.0	8.0	NA	NA	NA	NA
10. Enhanced envelope performance in accordance with Section C406.10[c]	3.0	6.0	3.0	3.0	3.0	4.0
11. Reduced air infiltration in accordance with Section C406.11[c]	1.0	2.0	1.0	1.0	1.0	1.0
12. Enhanced commercial kitchen equipment in accordance with Section C406.12	5.0	NA	NA	NA	5.0	5.0 (Group A-2 Only)

[a] Projects using this option may not use Item 2.
[b] This option is not available to buildings subject to the prescriptive requirements of Section C403.3.5.
[c] Buildings or building areas that are exempt from the thermal envelope requirements in accordance with Sections C402.1.1 and C402.1.2, do not qualify for this package.

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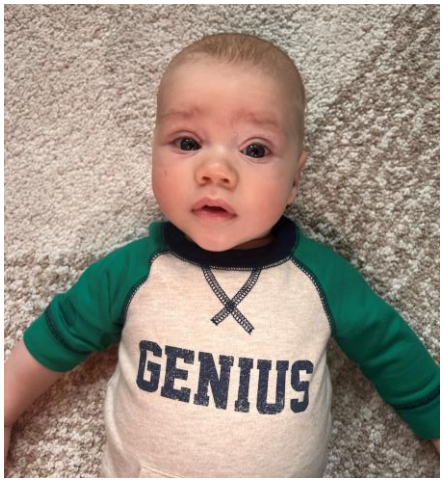
The “Genius Bar” will see you now



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Lighting Alterations C503.6

- Bring buildings closer to current code, one project at a time.
- Proportionate to scale of work

Stage 1: Fixture Replacement only

- If you replace 20% of the light fixtures* in any space or on the building exterior, meet the LPA or exterior lighting allowance
  - *or just the lamps and ballasts in existing fixtures

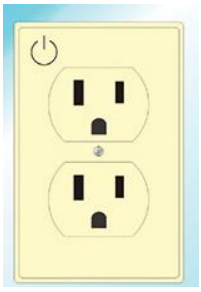
Stage 2: New Fixtures or Re-Circuiting Existing

- If new fixtures are wired or existing fixtures are being re-circuited, controls must have:
  - Manual controls (usually switches)
  - Light reduction controls (50% switching)
  - Automatic daylight zone controls
  - Specific application controls (display lights, under-counter lights, stairwell lights, etc.)
  - Occupancy sensors wherever required by C405.2.2.2

Stage 3: New or Relocated Panel

- A new or moved lighting panel, with new raceway and wiring to the fixtures, must conform to the rest of C405.2.2. Therefore:
  - Automatic time switch for rooms that don't have occupancy sensors, with manual override

Controlled Receptacles C503.6.6



- Office, classroom, break room, etc:
- Control 50% of <u>new</u> outlets with time clock or occupancy sensor, <u>except</u>:
  - Alterations smaller than **5000 sf**
  - Systems furniture or office cubicle partitions reconfigured or relocated within the same area
  - Existing outlets in existing walls
  - Outlets for safety, security, maint, 24-hour

Metering for major HVAC alterations

- For <u>full HVAC replacement</u> (or more than half of heating & cooling capacity):
  - Meter incoming gas & electric
  - Sub-meter HVAC
  - Data acquisition & display

Metering for HVAC equip replacement

- "Local" meter required for:
  - Branch circuit over 50 kVA serving new HVAC equipment
  - New HVAC equipment on variable speed drive
- Gas metering required for new gas connection over 1,000 kBTU

Metering for complete new electrical system

- Provide complete metering

Meeting New LPD with Lighting Retrofits

Meeting LPD with modern LED luminaires is usually not a significant technical issue.

- Simple replacement
- Lighting Redesign
  - Is your space overlighted?
  - Is the lighting distribution right?
  - Is it doing what you need it to do?

Questions:

- Shaun.Darragh@Seattle.gov
- LightingDesignLab@Seattle.gov

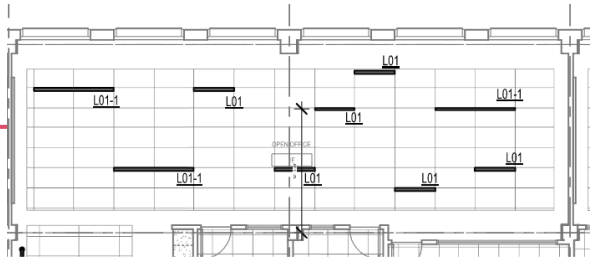
LDL Recorded Video Classes Resources:

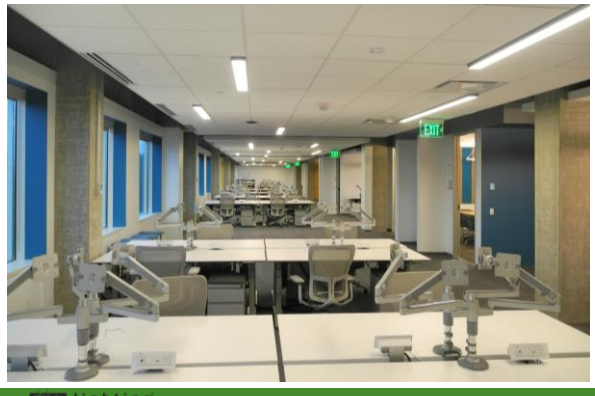
https://www.lightingdesignlab.com/course-recordings-and-handouts

- Lighting Audit & Retrofit Techniques
- Cost Effective Code Compliance Series
- Light Sources and Luminaires
- Lighting Design Process

Office Example

- Allowed LPD 0.55 w/sf
- Actual LPD: 0.42 w/sf
- Target Light Level: 25fc
- Measured: ~ 30 fc
- Controls:
  - Occupancy Sensing
  - Daylight Harvesting
  - Task Tuning
- Completed: 2016

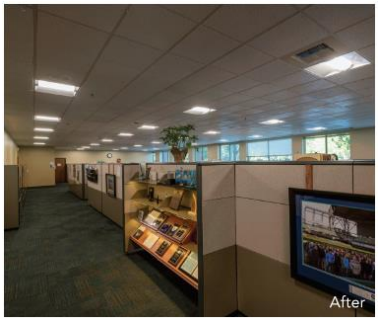




PSE LLLC Pilot

- 2015 retrofit study ~11,000 SF Office
- Replace 67 T8 parabolic with 100 LED smart troffers
- Connected load: 6,062 w / LPD: 0.56 w/sf
- Troffers equipped with dimming and LLLC
  - Occupancy Vacancy
  - Daylight Harvesting
  - Task Tuning

- Better Lighting – Happier Staff
- 35% Energy Savings – Luminaires
- 72% Energy Savings – Luminaires and LLLC Controls
- PSE.com/businesslighting



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Lighting Controls – Don't need to be scary…..

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Lighting Controls

Typical Control Strategies

- Manual Switching
- Manual Dimming
- Scene / Preset Control
- Occupancy Sensing
- Vacancy Sensing
- Daylight Harvesting
- Task Tuning
- Time Scheduling
- Astronomic Scheduling

LDL Recorded Video Classes Resources:

https://www.lightingdesignlab.com/course-recordings-and-handouts

- Fundamentals of Networked Lighting Controls
- NLC Value Proposition
- NLC for Healthcare
- NLC for Schools

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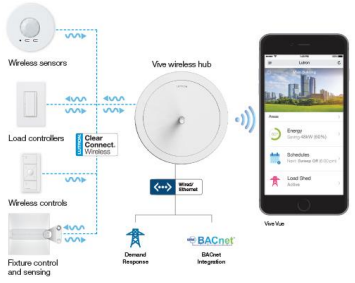
Networked Lighting Controls Today

- Distributed
- Wireless
- More Capable
- More Complex
- Less Complicated
- Less Costly
- Easier to Install / Commission
- Compatible
- Integrated
- Better!



Courtesy: Lutron, Cooper

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Mid Level Systems – Great for retrofit projects

Kit of Parts Approach

- Scalable
- Occupancy/Vacancy Sensors
- Daylight Sensors
- Switches / Dimmers
- Wireless Communications
- Program via Smart Device APP

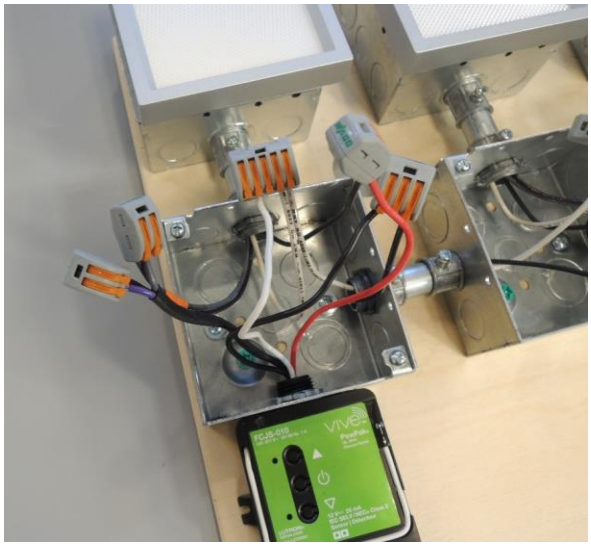
Frequently able to use existing wiring with minimal alteration.

Courtesy: Lutron, Cooper, Crestron, Osram

Load Controllers

Typically mount to luminaire directly or to junction box.

- Line Voltage
  - Black = Hot / Line
  - Red = Switched Hot / Load
  - White = Neutral
  - Green = Ground
- Low Voltage Control
  - Purple | Grey



Wireless Communications

- Zigbee
- Bluetooth
- BLE
- Enocean
- Zwave
- WiFi
- IEEE 802 Networks
- Proprietary
- Others

Courtesy: Leviton

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Luminaire Level Lighting Controls

- Wrap all of the sensors and most of the logic into the luminaire itself
- Simple to specify and install
- Will require startup to function most effectively.
- May be capable of all control strategies
- May be capable of only OS/VS and Daylight harvesting
- Smarter systems will be more capable

Courtesy: Acuity, Cree

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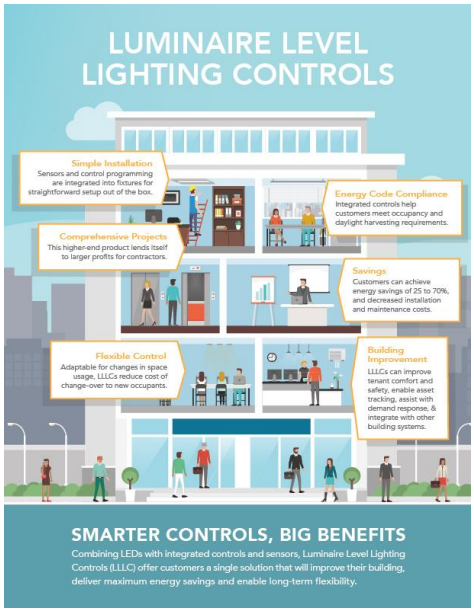
LLLC – Easy Compliance

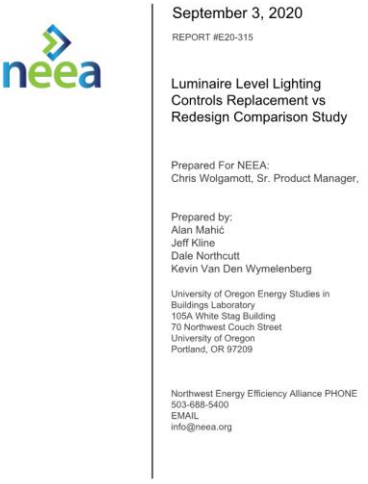
- Using LLLC luminaires basically guarantees energy code compliance.
- Some jurisdictions allow LLLC use to eliminate the need for further controls documentation.
- www.lightingdesignlab.com/resources
  - Videos
  - Learning Guides
  - Best Practice Guides



Courtesy: NEEA

Late Breaking News

- Report commissioned by NEEA on replacement vs redesign with LLLC
- Included in the downloadable handouts
- Also available from NEEA:
- https://neea.org/resources/lllc-replacement-vs-redesign-comparison-study



September 3, 2020

REPORT #E20-315

Luminaire Level Lighting Controls Replacement vs Redesign Comparison Study

Prepared For NEEA:
Chris Wolgamott, Sr. Product Manager,

Prepared by:
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Plug Load Controls

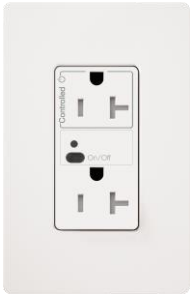
Smart Receptacles

- Wireless Communications to NLC system

Load control modules

- Wired or Wireless communication with system or Occupancy Sensor

Controlled receptacles must be labelled – please don't plug CPU in controlled receptacle….



Courtesy: Cooper, Lutron, Echoflex

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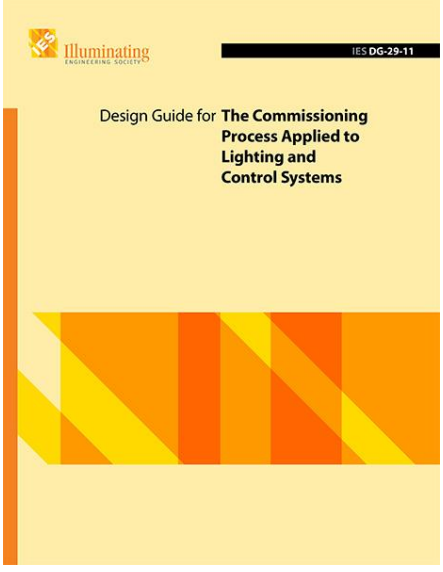
Commissioning

Startup / Programming and Commissioning are not the same thing

- Commissioning Plan
- Certified Commissioning Professional
- Functional Testing
- Final Report



Courtesy: Illuminating Engineering Society

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Sequence of Operations

A sequence of operations is required to tell the contractor, startup technician, and commissioning agent how the system is supposed to function.

- What are the time and astronomic schedules
- Which sensors are vacancy and which are occupancy?
- What is the vacancy timeout?
- What are the target light levels for task tuning?
- What switches or dimmers are tied to which zones?
- What zones are included in each preset and at what levels?
- What are the daylight zone dimming thresholds?
- Are there any specialty programming tasks like partition controls?

Utility Rebate Programs

How can my utility help me to effectively sell and implement advanced lighting controls projects?

- Incentives
- Training
- Case Studies
- Knowledgebase

Metering - C409 Energy Metering and Energy Consumption Management

- On site renewables
- HVAC
- Gas
- Electrical
- Lighting
- Plug Loads

- Data Aggregation
- Data Storage
- Dashboarding

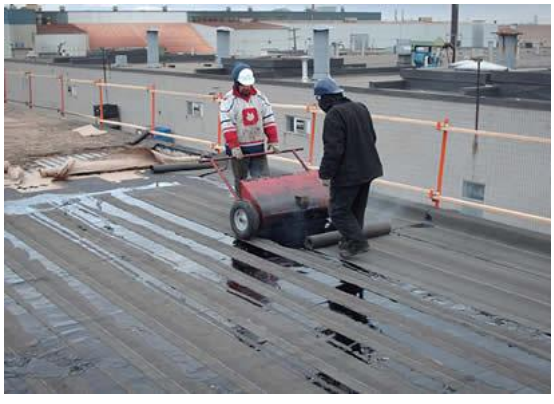
Exceptions: Exceptions for smaller spaces; e.g. , <20,000sf tenant spaces with utility metering

You do need a permit for reroofing…

(Seattle used to allow a blanket exemption)

Exceptions:

1. Single family, duplex & townhouse
2. If less than 500 sf sheathing or insulation exposed



Roof insulation? Depends

Existing Conditions	Sheathing or Insulation Exposed		Sheathing and insulation NOT exposed
	Existing insulation in attic or cavity	No existing insulation in attic or cavity	
Framing cavity exposed during demolition or construction	**Fill framing cavity with insulation**	**Full code-required insulation, above or below sheathing**	**Fill framing cavity with insulation**
Framing cavity NOT exposed during demolition or construction	**No additional insulation required**	**Full code-required insulation, above or below sheathing**	**No additional insulation required**

Envelope exceptions to alteration rules

The following don't have to comply with code
(…although pretty much everything else does)

- Storm windows, replacement glass
- Cavities exposed (just fill with insulation)
- Cavities not exposed
- Simple door replacement: vestibule not required
- Air leakage testing not required unless
  - substantial alteration
  - Change of use
  - Change of space conditioning

Air Barrier Testing

- *Not* typically required for alterations, except:
  - Change of occupancy
  - Change of space conditioning
  - Seattle: Substantial alterations

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(But wait, there's more!)

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Upcoming LDL Online Events

LDL Course	Delivery Date	Time
NLC for Healthcare	May 12	10:00 - Noon
Commercial Heat Pump Water Heaters: Hospitals and Clinical Settings	May 19	10:00 - Noon
Energy Management Systems Part 1	May 26	10:00 – Noon
Energy Management Systems Part 2	June 2	10:00 – Noon
Commercial Refrigeration Part 1	June 14	10:00 – Noon
Commercial Refrigeration Part 2	June 16	10:00 – Noon
Adjustable Speed / Variable Frequency Drives Part 1	June 21	10:00 - Noon
Adjustable Speed / Variable Frequency Drives Part 2	June 23	10:00 - Noon

Today's slide deck and previous online courses can be found on our website

Click – Call – Connect

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- Shaun Darragh
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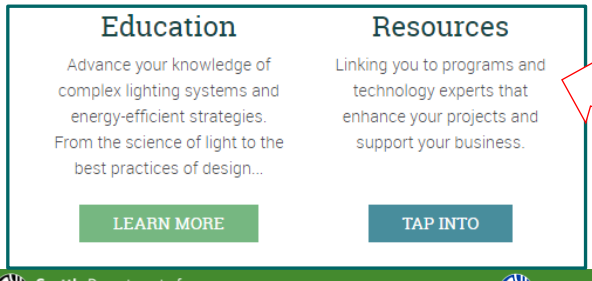
Visit us online



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lightingdesignlab@seattle.gov

Todays slide deck will be posted here!

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