



GREEN TI

speakers*



City of Seattle – City Green Building

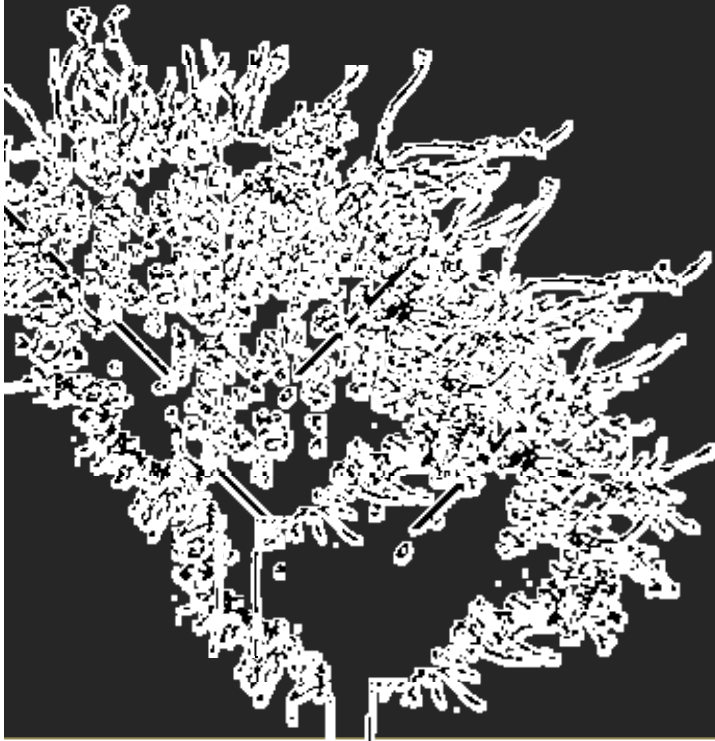
Rebecca Baker, Green Building Coordinator



IA Interior Architects - Consultant Lead

Kim Parsley, Principal, Assoc. IIDA, LEED® AP BD+C

Nancy Heywood, Associate, Assoc. IIDA, LEED® AP BD+C



project*
goal

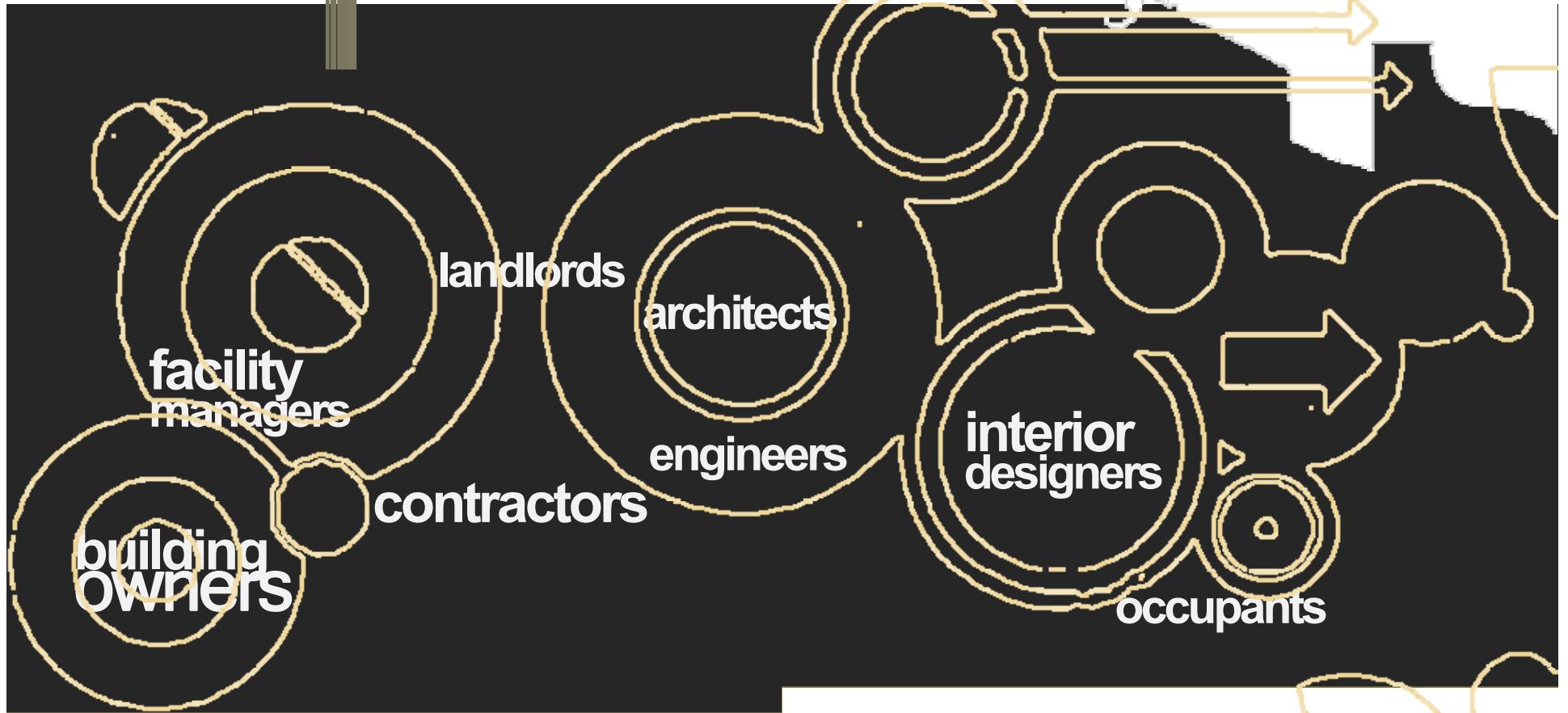
Simple. Implementable.

Sustainable strategies to incorporate into every corporate tenant improvement.

Whether first generation or renovation of existing space.



target*
audience



**quick guide
informers**

City of Seattle – City Green Building

Rebecca Baker

Lucia Athens

IA Interior Architects - Consultant Lead

Kim Parsley

Nancy Heywood

Elsa Allen

PAE Engineers – Mechanical, Electrical, Lighting

Paul Schwer

Zach Suchara

Lighting Design Lab - Lighting

city green building

Our **mission** is to make green buildings standard practice in Seattle through education, technical assistance, and incentives.



what's in a name?



- 01 **Green Lease**
- 02 **Adaptable Design**
- 03 **Biophilic Design**
- 04 **Energy Efficiency - Lighting**
- 05 **Energy Efficiency - HVAC**
- 06 **Energy Efficiency - Equipment**
- 07 **Healthy Building Materials**
- 08 **Employee Well-Being**
- 09 **Regional Resources**
- 10 **The Green Economy**
- 11 **Construction Waste Management**
- 12 **Performance Building Systems & Occupants**
- 13 **The Project Cycle**

what's in a name?

names floated for the product - iTab, iSlate or iTablet - would have been far worse. ITablet has too many syllables. ISlate is too ancient. ITab is too confusing

"Are there NO women in the Marketing or Biz Dev department of Mac?" speculating that "iPad" would pass muster only with a man. No women were present on Apple's panel at the San Francisco announcement

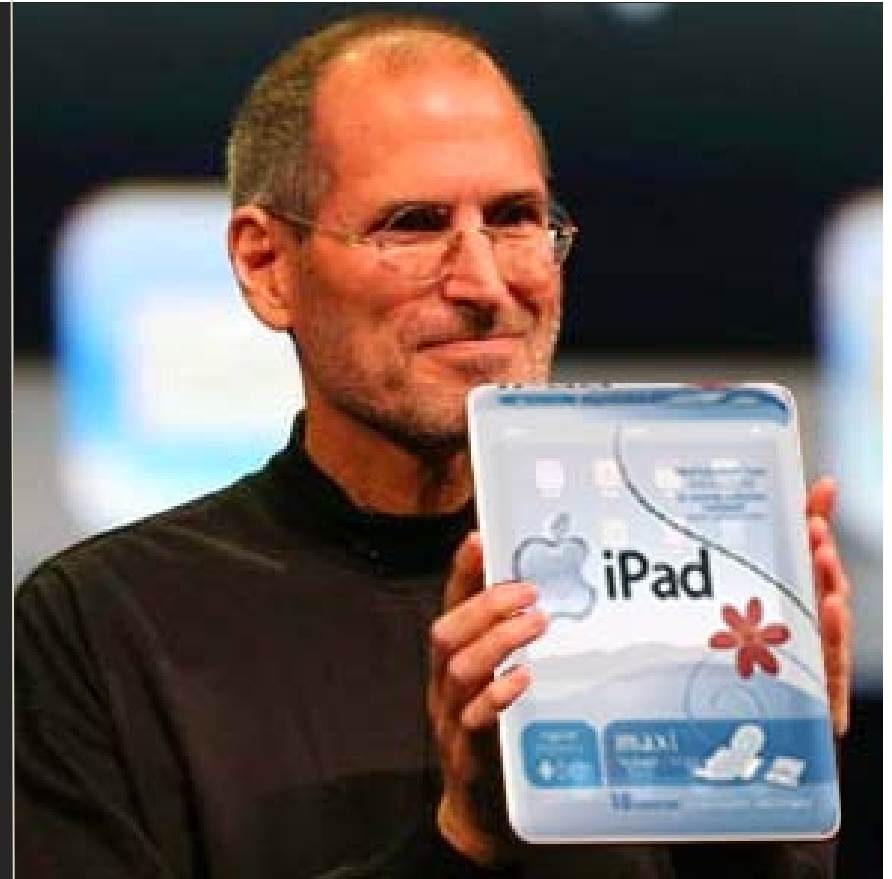
"I'm not buying an iPad. Period."

What's in a name? If the name is iPad, a great big joke.

It's so beautiful when an electronics company finally becomes a woman

Good news for Apple – they have such strong brand that most of the criticism will have no long term effects on the sales of the product, but if a weaker brand had released this, it would probably have sunk the product before it went out the door.

Steve Jobs helped menstrual humor go mainstream. That's probably not what you're looking for when you launch a new product.



what's in a name?

The City of Seattle Department of Planning and Development, City Green Building, announces the release of the Quick Guide to Green Tenant Improvement (TI) series. **Thirteen green guides** Ten topics illustrate how to sustainable implement commercial **13 Sustainable task guides** improvements. The Green TI Guides are designed to help project managers, owners, interior designers and architects apply **Green TI FACT SHEETS** sustainable building practices to commercial remodel projects. The guides work equally well for new interior construction or renovation. Each guide includes an overview of a topic, key **What's in a name? Quick Guide to Green TI** benefits and strategies, quick facts, a case study, an implementation checklist, additional resources and **Guides to sustainable design Sustainable task guides for Seattle** potential LEED-CI credits. By incorporating multiple strategies from a number of TI guides, owners, tenants and occupants alike will accrue the wide reaching benefits of a high-performance green project. **Green Guide Task thirteen Guides** Green building design practices and management principles can reduce building operating expenses, increase worker productivity and asset value. **Green Guide Task Force Sustainable Guides**



quick guide
to green ti

QUICK GUIDE
TO GREEN TI
Sustainable Tenant Improvements

01 GREEN
LEASE

GREEN LEASE

02 CONNECTING
WITH NATURE

03 ADAPTABLE
DESIGN

04 OFFICE
EQUIPMENT

05 HVAC
HEATING, VENTILATION
& AIR-CONDITIONING

06 LIGHTING

07 EMPLOYEE
WELL-BEING

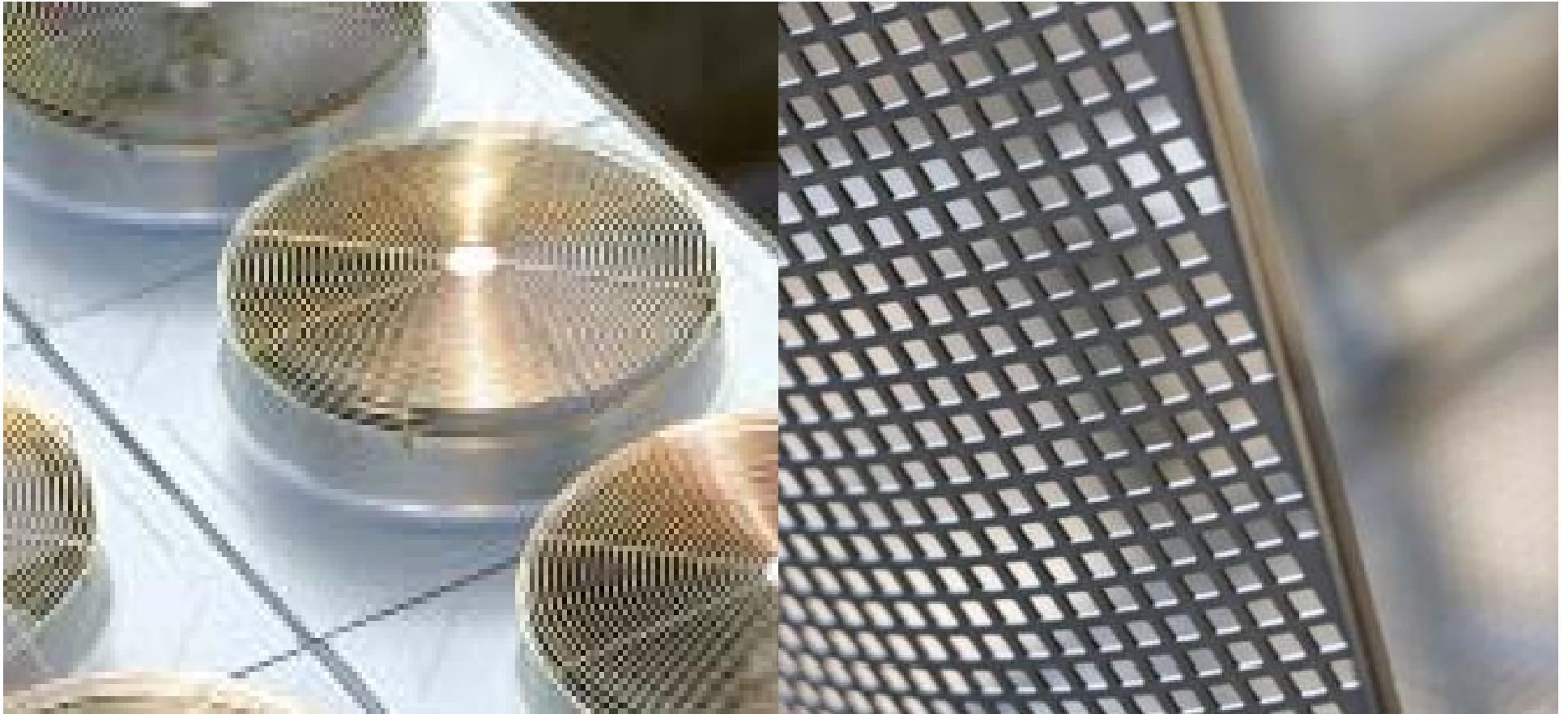
HEALTHY BUILDING
MATERIALS

09 REGIONAL
RESOURCES

10 CONSTRUCTION
WASTE MANAGEMENT

HVAC HEATING, VENTILATION & AIR-CONDITIONING

LIGHTING



HVAC
HEATING, VENTILATION
& AIR-CONDITIONING

Simple. Implementable.

HVAC

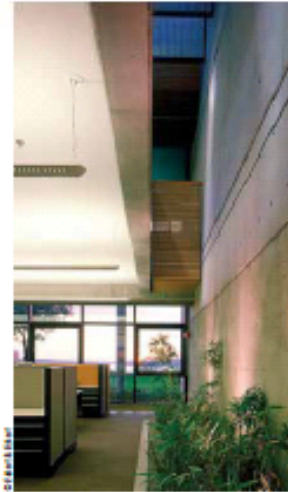
HEATING, VENTILATION
& AIR-CONDITIONING

QUICK GUIDE TO GREEN TI

Sustainable Tenant Improvements

05 HVAC

HEATING, VENTILATION
& AIR-CONDITIONING



Overview

Heating, ventilation and air-conditioning (HVAC) systems impact the comfort and health of building occupants, the cost to operate buildings and energy use. HVAC controls help determine how efficiently these systems operate.

HVAC accounts for approximately 40% of the energy used in U.S. commercial and residential buildings, roughly twice the energy used for lighting systems. Since heating and cooling equipment consume the most energy in leased spaces, energy-efficient HVAC systems provide an excellent opportunity to control costs. An evaluation of the condition and efficiency of existing HVAC systems should factor into leasing decisions given that tenants typically have little or no control over their operation.

Strategy

If a new HVAC system is being considered, engage the mechanical and electrical engineers early in the design process. Their expertise will help optimize the selection of efficient and cost-effective mechanical and ventilation systems. On existing retrofits, perform an energy analysis during the schematic design phase. This will help predict the energy behavior of the building's structure, HVAC systems, and central plant equipment. When possible, the engineer should work with the building's facility staff to calculate the building's "Energy Use Index" (EUI). This data can then be input into the EPA Energy Star "Target Finder" which will compare it to the average building in that zip code. The technology/solution chosen for energy efficiency depends on the building type and tenant usage requirements.

Benefits

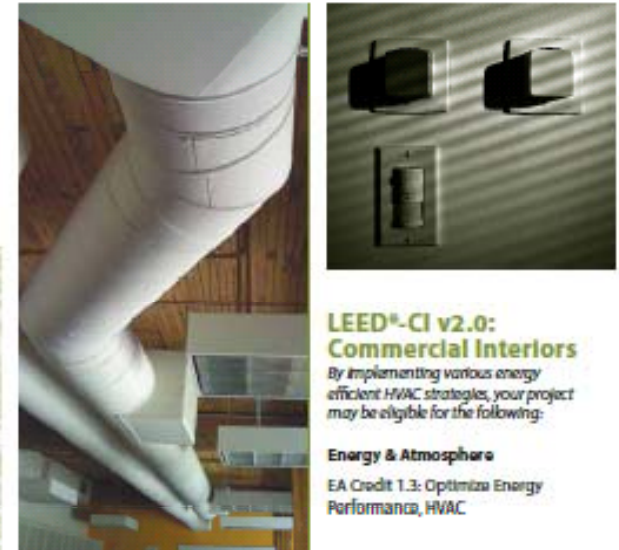
- Reduces energy consumption
- Reduces greenhouse gas emissions
- Reduces utility costs
- Increases thermal comfort
- Improves indoor air quality

Money Back

Seattle City Light has a variety of incentive programs that can help pay for a portion of the up-front costs for efficiency upgrades to HVAC equipment. Reimbursements are offered on:

- Chillers
- Air conditioners
- Air-to-air heat pumps
- Hydronic heat pumps
- Variable speed fan drives

Call (206) 684-3800 or visit seattle.gov/light/conservation/business



LEED®-CI v2.0: Commercial Interiors

By implementing various energy efficient HVAC strategies, your project may be eligible for the following:

Energy & Atmosphere

EA Credit 1.3: Optimize Energy Performance, HVAC

Simple. Implementable.

HVAC

HEATING, VENTILATION
& AIR-CONDITIONING

05 HVAC

HEATING, VENTILATION
& AIR-CONDITIONING

QUICK GUIDE TO GREEN TI

Sustainable Tenant Improvements

CASE STUDY

Pierce County Environmental Services

The building employs a relatively simple mechanical concept incorporating several sustainable design features. Delivering supply air through a raised-floor plenum allows cool air to be supplied at higher temperatures and lower velocities, resulting in smaller HVAC equipment and lower energy costs. This system also significantly improves indoor air quality, as exhaust air is not mixed with fresh supply air, as it is in a conventional ceiling-supplied ventilation system. The raised-floor air distribution system also provides for future flexibility and gives individuals direct control over the immediate environment.

Nighttime flushing moves cool night air through the raised floor plenum, lowering the temperature of the concrete structure by several degrees. This concept, called fabric energy storage, provides "free" cooling at the beginning of the day, resulting in significant energy savings over the life of the building. Through modeling of the raised-floor system, the design team was able to reduce the design cooling load from 150 tons to 90 tons when compared to a conventionally designed facility. Designing around 63-degree supply air allows for greater airside economizer usage, providing additional energy savings and prolonging the life of the refrigeration equipment.

Checklist

- ❑ **Zone the system** to serve different functions and solar conditions. This can prevent the system from overheating or overcooling select areas.
- ❑ **Install occupancy sensors** tied to the existing HVAC system to reduce airflow when spaces are not occupied.
- ❑ **Deliver only the volume of air needed** for conditioning the actual load by using local variable air volume (VAV) diffusers for individual temperature control. VAVs consume less energy by reducing unnecessarily high fan speeds. Ceiling diffusers ducted from the VAV box into individual rooms give occupants comfort control, helping to eliminate overheating or overcooling.
- ❑ **Increase duct size** to reduce the required pressure and fan speed. In addition, avoid sharp turns in duct routing to increase efficiency. Small increases in duct diameter can yield large pressure drops and fan energy savings.
- ❑ **Specify low-face-velocity air handlers** to reduce air velocity across coils. When air travels at a lower velocity, it remains in contact with cooling coils longer. This can yield additional savings realized by using a smaller chilled water plant.
- ❑ **Replace oversized fans** with units that match the load. If the speed and power of the fan motor are electronically controlled to continually match fan speed with the building-load conditions, inefficient mechanical controls can be eliminated.
- ❑ **Consider a raised access flooring system**, which permits air distribution to occur below the floor, provides each occupant with their own HVAC controls and increases energy efficiency. Raised access flooring reduces fan energy, increases ventilation effectiveness and provides more hours of economizer operation. See the Tenant Improvement Guide for Adaptable Design for more information on raised access floors.
- ❑ **Consider a 'mixed mode' system** with operable windows, under-floor air supply, thermal mass, and nighttime flushing—a strategy well-suited for Seattle's temperate climate.
- ❑ **Consider systems that allow users to control space temperatures** within a pre-set range (± 3 degrees F) of the building's set temperature.
- ❑ **Consider establishing a broader comfort range** for occupants. Allowing for slightly warmer temperatures in summer and cooler temperatures in winter is possible if occupants are educated regarding the reason for this, and encouraged to dress appropriately for the seasons.

Resources

- www.seattle.gov/light Search for financial incentives.
- www.betterbricks.com Search in "Building Operations" for "Tools and Technical Advice."
- www.energystar.gov Click on "Building & Plants," then "Purchasing & Procurement" for guides and resources on energy efficient buildings.
- www.newbuildings.org/mechanical Review studies and reports on HVAC efficiency.
- www.buildinggreen.com Search for HVAC to view articles, relevant product specifications and case studies.



www.seattle.gov/dpd/greenbuilding

overview

Impacts to:

Comfort & Health of Occupants

Cost to Operate

Energy Use

Accounts for 40% of Energy Used in U.S. Commercial & Residential Buildings

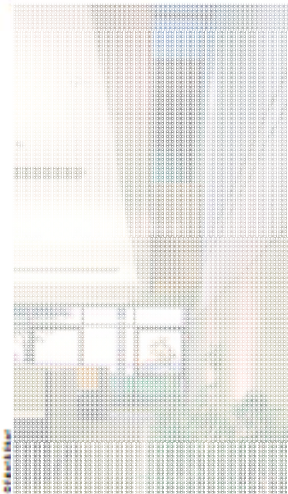
HVAC
HEATING, VENTILATION
& AIR-CONDITIONING

QUICK GUIDE TO GREEN TI

Sustainable Tenant Improvements

05 HVAC

HEATING, VENTILATION
& AIR-CONDITIONING



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Benefits

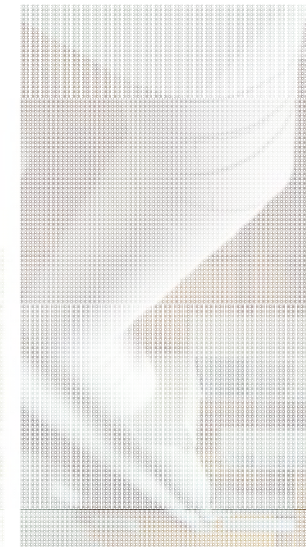
- Reduces energy consumption
- Reduces greenhouse gas emissions
- Reduces utility costs
- Increases thermal comfort
- Improves indoor air quality

Money Back

Seattle City Light has a variety of incentives programs that can help pay for a portion of the up-front costs for a variety of eligible residential equipment and improvements to your electrical system.

- CFLs
- Air conditioning
- Air treatment devices
- Fresh air heat pumps
- Water saving fixtures

Call 206-464-3800 or visit seattle.gov/light/conservation/business



LEED®-CI v4.0: Commercial Interiors

By implementing various energy efficient HVAC strategies, your project may be eligible for the following:

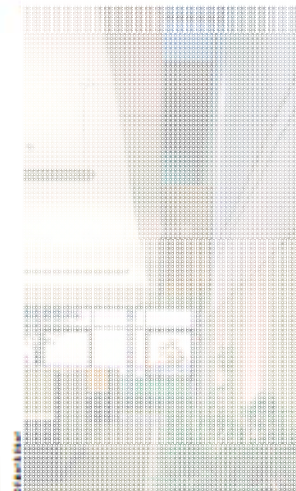
Energy & Atmosphere
EA Credit 1.3: Optimize Energy Performance, HVAC

Engage Mechanical & Electrical Engineers
 Perform an Energy Analysis
 Benchmark Energy Usage by Bldg Type

HVAC HEATING, VENTILATION & AIR-CONDITIONING

QUICK GUIDE TO GREEN TI Sustainable Tenant Improvements

05 HVAC HEATING, VENTILATION & AIR-CONDITIONING



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Benefits

- Reduce energy consumption
- Reduce greenhouse gas emissions
- Reduce utility costs
- Increase thermal comfort
- Improve indoor air quality

Money Back

Leads to significant savings of tenant programs that can help pay for a portion of the up-front costs for efficiency upgrades to HVAC equipment. Return on investment (ROI) includes:

- Chiller
- Air conditioning
- Air-to-air heat pumps
- Hydronic heat pumps
- Variable speed fans/ drives

Cost: 2000-5000-30000 or more
 as little as 10% to 20% of new or replacement



LEED®-CI v2.0: Commercial Interiors

By implementing various energy-efficient HVAC strategies, your project may be eligible for the following:

Energy & Atmosphere

EA Credit 1.3: Optimize Energy Performance, HVAC

benefits

Reduce Energy Consumption

Reduce Utility Costs

Increase Thermal Comfort

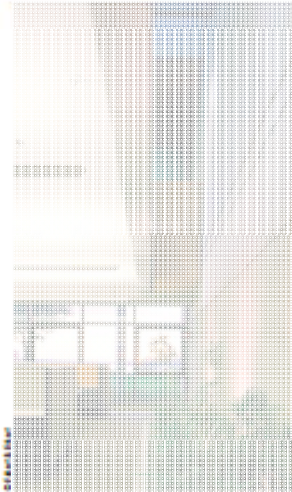
Money-back Programs

HVAC HEATING, VENTILATION & AIR-CONDITIONING

QUICK GUIDE TO GREEN TI

Sustainable Tenant Improvements

05 HVAC HEATING, VENTILATION & AIR-CONDITIONING



Overview

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Benefits

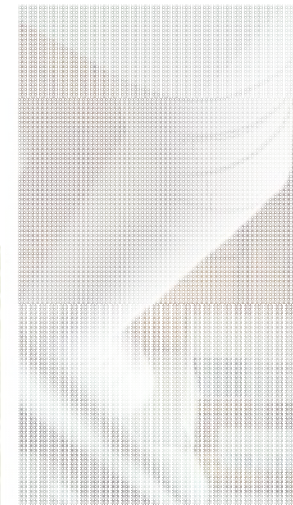
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Money Back

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- Chillers
- Air conditioners
- Air-to-air heat pumps
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- Variable speed fan drives

Call (206) 684-3800 or visit seattle.gov/light/conserve/business



LEED®-CI v4.0:
Commercial Interiors
By implementing various energy efficient HVAC strategies, your project may be eligible for the following:

Energy & Atmosphere
EA Credit 1.3: Optimize Energy Performance, HVAC



checklist

- Deliver Only Air Needed
- Replace Oversized Fans
- Consider Mixed Mode System
- Allow Users to Control Temperature

HVAC HEATING, VENTILATION & AIR-CONDITIONING

05 HVAC HEATING, VENTILATION & AIR-CONDITIONING

QUICK GUIDE TO GREEN TI Sustainable Tenant Improvements

CASE STUDY

Pierce County Environmental Services

The building employs a relatively simple mechanical concept incorporating several sustainable design features. Delivering supply air through a raised-floor plenum allows cool air to be supplied at higher temperatures and lower velocities, resulting in smaller HVAC equipment and lower energy costs. This system also significantly improves indoor air quality, as outdoor air is not mixed with fresh supply air, as it is in a conventional ceiling-supplied ventilation system. The raised-floor air distribution system also provides for future flexibility and gives individuals direct control over the immediate environment.

Nighttime flushing moves cool night air through the raised-floor plenum, lowering the temperature of the concrete structure by several degrees. This concept, called fabric energy storage, provides "free" cooling at the beginning of the day, resulting in significant energy savings over the life of the building. Through modeling of the raised-floor system, the design team was able to reduce the design cooling load from 150 tons to 94 tons when compared to a conventionally designed facility. Designing around 63-degree supply air allows for greater outside air consideration, providing additional energy savings and prolonging the life of the refrigeration equipment.

Checklist

- Zone the system** to serve different functions and solar conditions. This can prevent the system from overheating or overcooling select areas.
- Install occupancy sensors** tied to the existing HVAC system to reduce airflow when spaces are not occupied.
- Deliver only the volume of air needed** for conditioning the actual load by using local variable air volume (VAV) diffusers for individual temperature control. VAVs consume less energy by reducing unnecessarily high fan speeds. Ceiling diffusers ducted from the VAV box into individual rooms give occupants comfort control, helping to eliminate overheating or overcooling.
- Increase duct size** to reduce the required pressure and fan speed. In addition, avoid sharp turns in duct routing to increase efficiency. Small increases in duct diameter can yield large pressure drops and fan energy savings.
- Specify low-face-velocity air handlers** to reduce air velocity across coils. When air travels at a lower velocity, it remains in contact with cooling coils longer. This can yield additional savings realized by using a smaller chilled water plant.
- Replace oversized fans** with units that match the load. If the speed and power of the fan motor are electronically controlled to continually match fan speed with the building-load conditions, inefficient mechanical controls can be eliminated.
- Consider a raised access flooring system**, which permits air distribution to occur below the floor, provides each occupant with their own HVAC controls and increases energy efficiency. Raised access flooring reduces fan energy, increases ventilation effectiveness and provides more hours of economizer operation. See the Tenant Improvement Guide for Adaptable Design for more information on raised access floors.
- Consider a 'mixed mode' system** with operable windows, under-floor air supply, thermal mass, and nighttime flushing—a strategy well-suited for Seattle's temperate climate.
- Consider systems that allow users to control space temperatures** within a pre-set range (± 3 degrees F) of the building's set temperature.
- Consider establishing a broader comfort range** for occupants. Allowing for slightly warmer temperatures in summer and cooler temperatures in winter is possible if occupants are educated regarding the reason for this, and encouraged to dress appropriately for the seasons.

Resources

- www.seattle.gov/night Search for financial incentives.
- www.betterbrides.com Search in "Building Operations" for "Tools and Technical Advice."
- www.energystar.gov Click on "Building & Plants," then "Purchasing & Procurement" for guides and resources on energy efficient buildings.
- www.newsbldingt.org/mechanical Review studies and reports on HVAC efficiency.
- www.buildinggreen.com Search for HVAC to view articles, relevant product specifications and case studies.



case study

Raised Floor Plenum
Deliver Air with Lower Energy Costs
Improved Indoor Air Quality
Reduction of Cooling Load

HVAC
HEATING, VENTILATION
& AIR-CONDITIONING

05 HVAC HEATING, VENTILATION & AIR-CONDITIONING

QUICK GUIDE TO GREEN TI Sustainable Smart Improvements

CASE STUDY

Pierce County Environmental Services

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Resources

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- www.betterbuildings.com Search in "Building Operations" for "Tools and Technical Advice"
- www.energytie.gov Click on "Building & Plants" then "Purchasing & Procurement" for guides and resources on energy efficient buildings.
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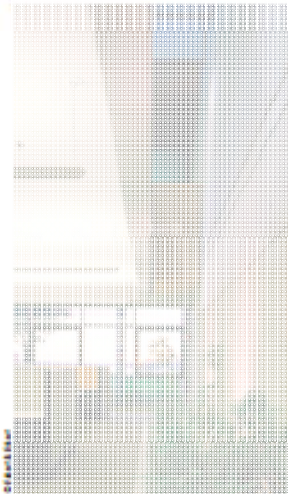
Relevant Credits

Tied to Specific Strategies

HVAC HEATING, VENTILATION & AIR-CONDITIONING

QUICK GUIDE TO GREEN TI Sustainable Tenant Improvements

05 HVAC HEATING, VENTILATION & AIR-CONDITIONING



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Benefits

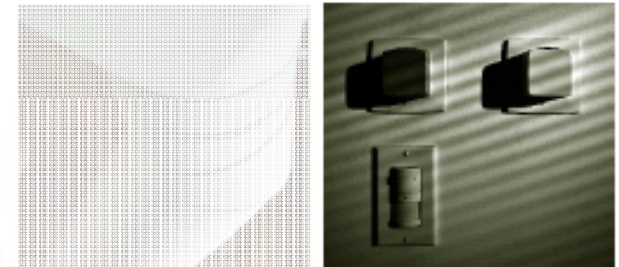
- Reduce energy consumption
- Reduce greenhouse gas emissions
- Reduce utility costs
- Increase thermal comfort
- Improve indoor air quality

Money Back

Lease the EPA Energy Star 2013 or 2014 certified program that can help pay for a portion of the up-front costs for efficiency upgrades to HVAC equipment. Rebate amounts vary by state.

- Chiller
- Air conditioning
- Air-to-air heat pumps
- Hydronic heat pumps
- Variable speed fans/blowers

Use the EPA Energy Star 2013 or 2014 certified program to help pay for a portion of the up-front costs for efficiency upgrades to HVAC equipment.



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Checklist

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- ❑ Deliver only the volume of air needed for conditioning the actual load by using local variable air volume (VAV) diffusers for individual temperature control. VAVs consume less energy by reducing unnecessarily high fan speeds. Ceiling diffusers ducted from the VAV box into individual rooms give occupants comfort control, helping to eliminate overheating or overcooling.
- ❑ Increase duct size to reduce the required pressure and fan speed. In addition, duct routing to increase efficiency. Small increases in duct size pressure drops and fan energy savings.

duct routing to increase efficiency. Small increases in duct size pressure drops and fan energy savings. Select air handlers to reduce air velocity across coils. When velocity, it remains in contact with cooling coils longer. This savings realized by using a smaller chilled water plant.

fans with units that match the load. If the speed and power electronically controlled to continually match fan speed and conditions, inefficient mechanical controls can be replaced with a raised access flooring system, which permits air distribution to each occupant with their own HVAC controls to improve efficiency. Raised access flooring reduces fan energy effectiveness and provides more hours of economizer operation. See the Green Building Institute's Guide for Adaptable Design for more on raised access floors.

mode" system with operable windows, under-floor air delivery, and nighttime flushing—a strategy well-suited for climate.

that allow users to control space temperatures within a range of the building's set temperature.

allowing a broader comfort range for occupants. Allowing higher temperatures in summer and cooler temperatures in winter. Occupants are educated regarding the reason for this, and encouraged to adjust temperatures appropriately for the seasons.

www.seattle.gov/light Search for financial incentives.

www.betterbricks.com Search in "Building Operations" for "Tools and Technical Advice."

www.energystar.gov Click on "Building & Plants," then "Purchasing & Procurement" for guides and resources on energy efficient buildings.

www.newbuildings.org/mechanical Review studies and reports on HVAC efficiency.

www.buildinggreen.com Search for HVAC to view articles, relevant product specifications and case studies.

Resources

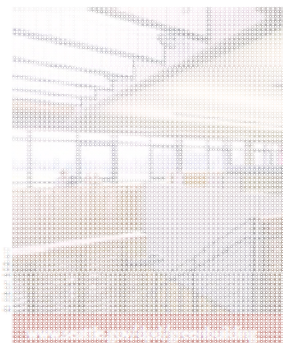
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**GREEN
LEASE**

stakeholders affected by green lease

Green Lease is a legal tool designed to help a building owner, manager and its tenants maintain and operate a more sustainable building.

Reducing the consumption of energy, water and raw materials.

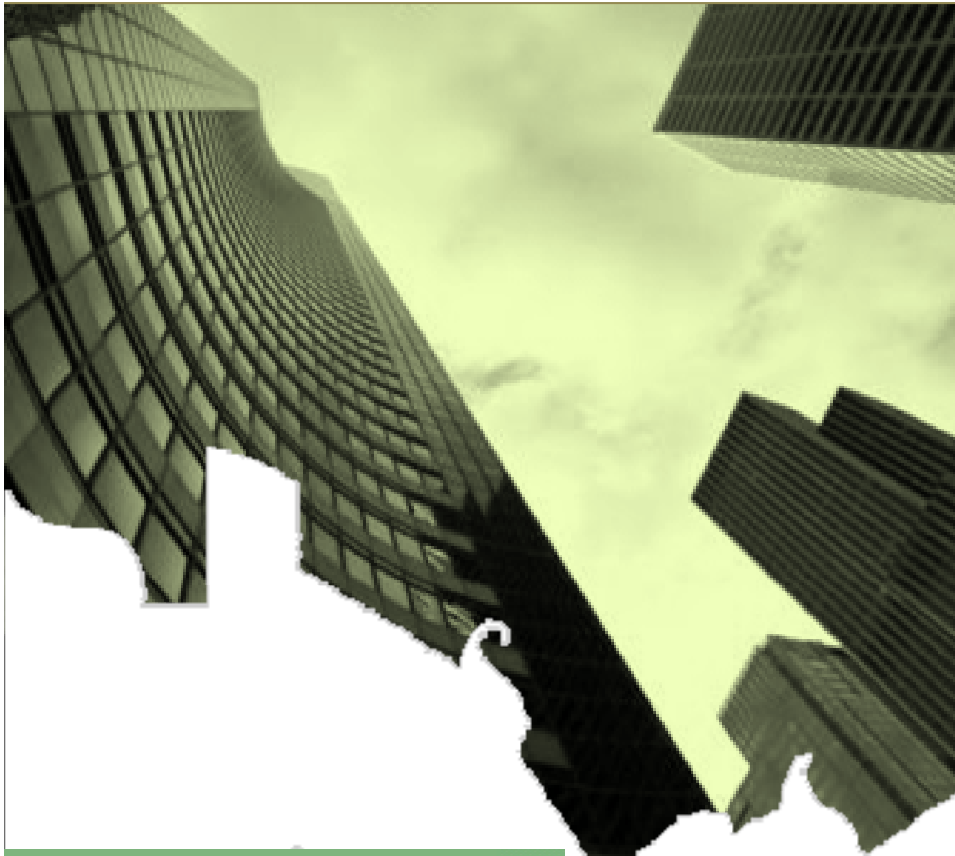
Encouraging recycling & composting.

Increasing the use of sustainable products.

Promoting practices that will lessen the adverse impact on our environment.

**GREEN
LEASE**

who is embracing green in our region?



**GREEN
LEASE**

GSA Leading Green Lease
Tenant's Market is Encouraging
LEED AP Lawyers & Brokers

what green lease incentives can be shared?



**GREEN
LEASE**

- Occupancy Sensors
- Energy Analysis
- Energy Efficient HVAC
- Energy Efficient Lighting
- Appliances and Equipment

checklist

Energy Use

Waste Management

Cleaning Practices

Water Use

Building Management

Daylight & Views

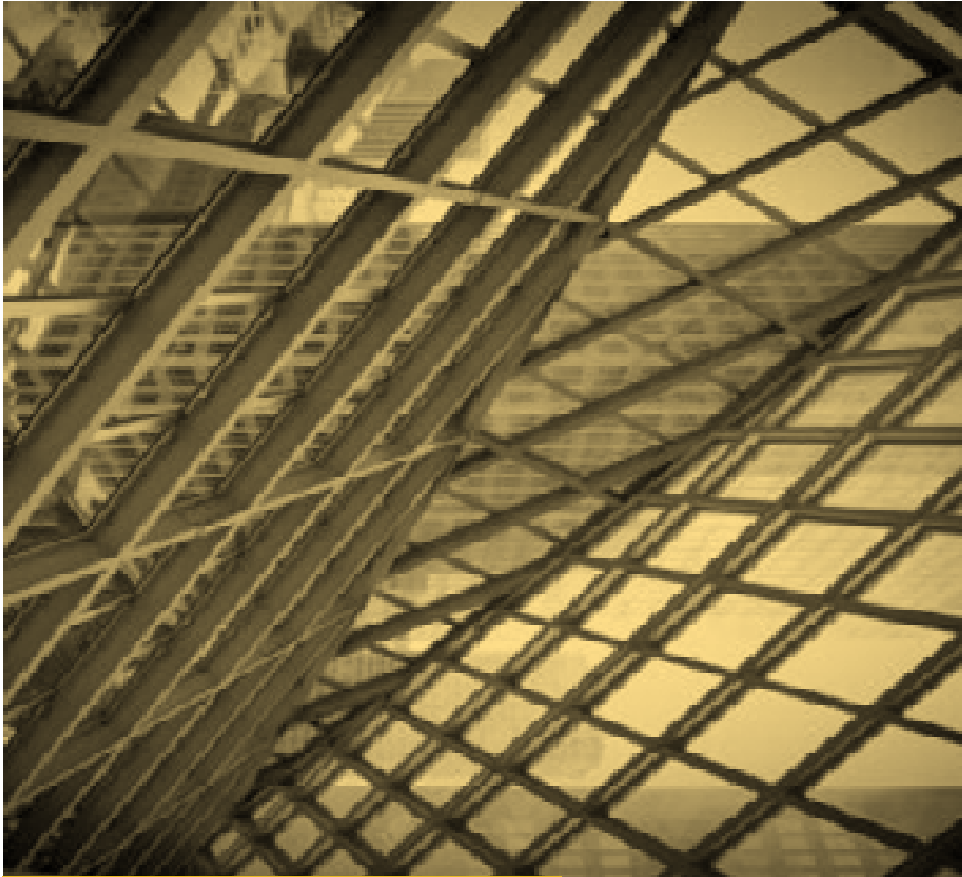
**GREEN
LEASE**

Site Selection

- Building awarded LEED® certification.
- Building awarded Energy Star rating.
- Building is within 1/4 mile of public transportation.
- Building has operable windows.
- Building core depth is not prohibitive of maximizing daylight.
- Building has Energy Star compliant roof.
- Building provides bicycle storage and shower rooms.
- Building provides submetering for individual tenant spaces.
- Building provides collection and removal of recycling.
- Building utilizes water efficient low-flow fixtures.
- Building meets minimum indoor air quality performance per ASHRAE 62.1-2004.
- Building provides HVAC system which performs at least 15% better than those in minimum compliance with ANSI/ASHRAE/IESNA 90.1-2004.
- Building standard light fixtures will allow the lighting power density achieved to be at least 25% better than ANSI/ASHRAE/IESNA 90.1-2004.

Lease Considerations

- A net lease with utility costs paid by the tenant (not included in the base rent).
- A net lease with utility providers selected by the tenant, providing the option to choose a renewable energy source.
- A tenant improvement allowance that encompasses task lighting, demountable walls and moveable millwork.
- Environmentally friendly cleaning products and practices certified by Green Seal or similar party.



LIGHTING

benefits



Low Risk Investment

Improved Productivity - Less Fatigue on Eyes

T-12 to T-8 : Cut Energy Use by 17% – 48%

Best Practice for Task

User Controlled Task Lights

Impact on HVAC

Utilization of Daylight can **Reduce** Total Lighting Energy Loads by up to 50%

LIGHTING

rebates



LIGHTING

Energy Efficient **Lighting** Solutions

Fixture Retrofits

Lighting Controls

Occupancy Sensors

Daylighting Controls

2030 challenge

A Path Towards Reduction of GHG Emissions

Supported by City of Seattle

Incentivized with Priority Green Permitting

2030

C

daylighting

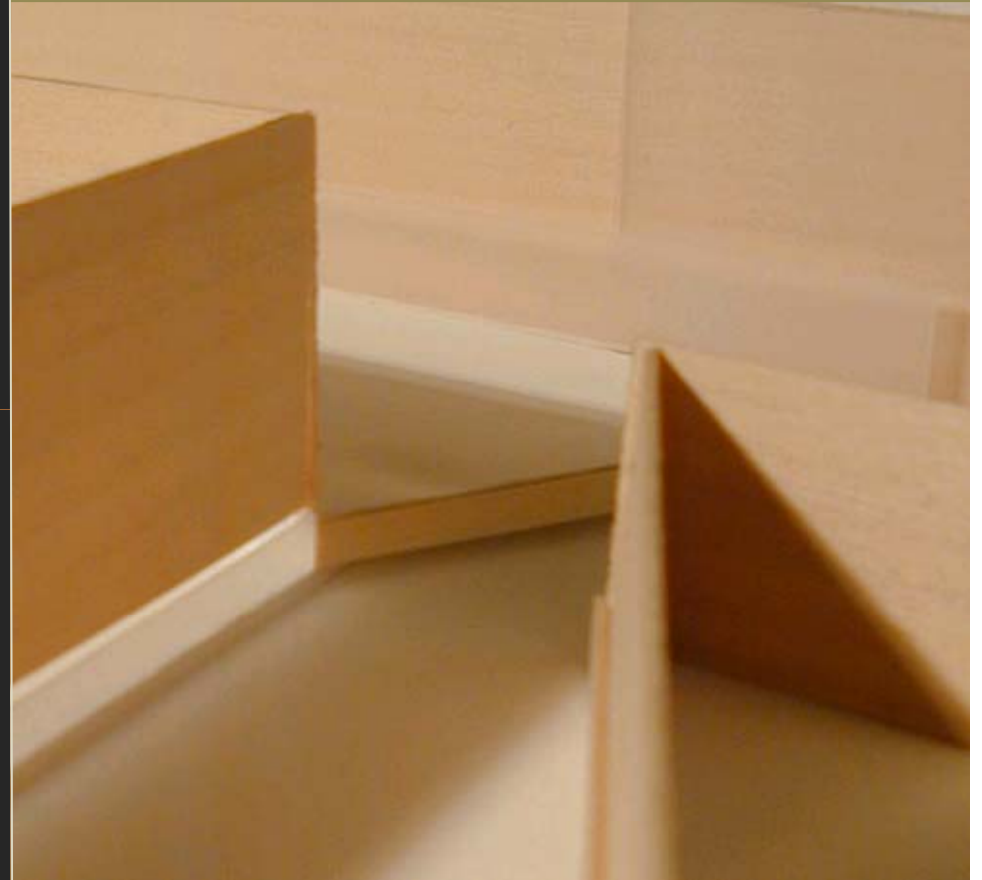
Lighting Design Lab

Latest Technology

Workshops & Consultation

Mock-up

Online Resources



LIGHTING

guide practice

To Inform Building Standards
Most Requested Guides
Platform for Other Cities



next steps

Indoor Air Quality

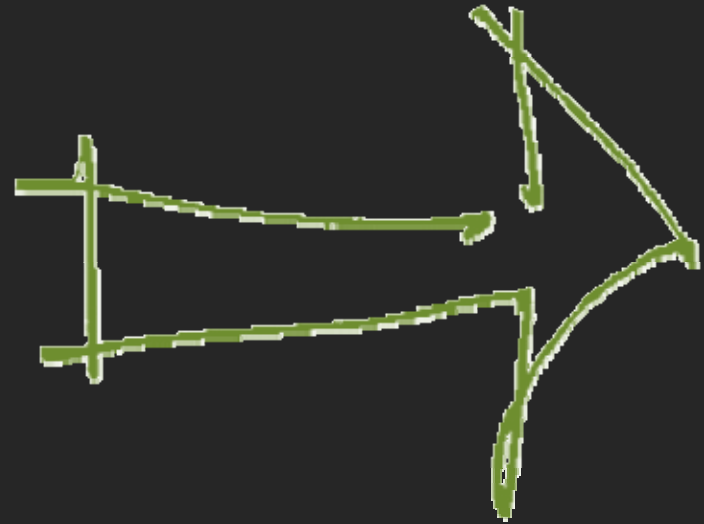
Occupant Recycling

Furniture Design

Operations & Maintenance

Post Occupancy Evaluation

Commissioning



thank
you

City of Seattle – City Green Building

Rebecca Baker

IA Interior Architects

Kim Parsley

Nancy Heywood