

01 Sustainability & Green Building

02 • Sites, Water & Materials

- 03 Energy & Indoor Environment
- 04 Safety and Green Building Employment



# SESSION Sustainable Sites, Water & Materials

# **SESSION 2: AGENDA**

Sellen

# Design & Construction Process

- Sustainable Sites
- Water Efficiencies
- Materials & Resources
- Employment Opportunities







# **SESSION 2: AGENDA**

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Sustainable Sites

- Water Efficiencies
- Materials & Resources
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# SUSTAINABLE SITES

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# Goals:

- Develop the least impactful sites
- Reuse existing buildings and/or sites
- Protect natural and agricultural areas
- Reduce need for automobile use
- Protect and/or restore developed sites
- Minimize light pollution
- Mimic natural conditions

# Facts:

 Vehicles are responsible for nearly 20% of annual greenhouse gas emissions

 The Federal Bureau of Transportation Statistics estimates vehicle use in America has nearly tripled from 1.1 to 3.0 trillion miles per year, between 1970 to 2007





# SUSTAINABLE SITES Sellen



design/construction - submittal phases

Yes	? No					Yes ? No	
		Sustainable	e Site	s		14 Points Materials & Resources	13 Points
Y		C Prereq 1 d Credit1 d Credit2 d Credit3 d Credit4.1 d Credit4.2 d Credit4.3 d Credit6.1 c Credit6.1 d Credit6.1 d Credit6.1	Con Site Dev Bro Alte Alte Alte Site Site Stor	structionstructionstructionstructions selections wonfield mative mative mative pevelo bevelo mw ate mw ate	on Activity Pollution Prevention on nt Density & Community Connectivit Redevelopment Transportation, Public Transportation Transportation, Bicycle Storage & Ch Transportation, Low-Emitting & Fuel-I Transportation, Parking Capacity pment, Protect of Restore Habitat pment, Maximize Open Space r Design, Quantity Control r Design, Quality Control	Required   Y   d   Prereq 1   Storage & Collection of Recyclables     1   c   C credt 1.1   Building Reuse, Maintain 75% of Existing Walls, Floo     y   1   c   C credt 1.2   Building Reuse, Maintain 100% of Existing Walls, Floo     1   c   C credt 1.3   Building Reuse, Maintain 50% of Interior Non-Structu     Access   1   c   C credt 2.1   Construction Waste Management, Divert 50% from I     anging Rooms   1   c   C credt 2.1   Construction Waste Management, Divert 75% from I     ifficient Vehicles   1   c   C credt 3.1   Materials Reuse, 5%     1   c   C credt 3.2   Materials Reuse, 10%     1   c   C credt 4.1   Recycled Content, 10% (post-consumer + ½ pre-con     1   c   C credt 4.2   Recycled Content, 20% (post-consumer + ½ pre-con     1   c   C credt 5.1   Regional Materials, 10% Extracted, Processed & Maintain     1   c   C credt 5.2   Regional Materials, 20% Extracted, Processed & Maintain	Required       rs & Roof     1       ors & Roof     1       ral Elements     1       Disposal     1       Disposal     1       sumer)     1       sumer)     1       nufactured Regi     1
$\pm$		d Credit 7.1	He	0	- 4 - !·· -  ·   - <b>0</b> !4		
		d Credit 8	Lig	Su	stainable Sites		14 Points
Yes	? No	Water Effic	iency	С	Prereq 1	Construction Activity Pollution Prevention	Required al
Ŧ	Ħ	Credit 1.1	Wa	d	Credit 1	Site Selection	1 red
1		d Credit 2 d Credit 2 1	Inn	d	Credit 2	Development Density & Community Connectivity	1
		d Credit 3.2	Wa	d	Credit 3	Brownfield Redevelopment	1
Yes	? No	Eporav & A	tmos	d	Credit 4.1	Alternative Transportation, Public Transportation Acce	1
v			Eur	d	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing	1
Y		d Prereq 2	Mir	d	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficie	1
		d Credit 1	Op	d	Credit 4.4	Alternative Transportation, Parking Capacity	1
		d	149	С	Credit 5.1	Site Development, Protect of Restore Habitat	1
		d	219	С	Credit 5.2	Site Development, Maximize Open Space	1
		d	24.3	d	Credit 6.1	Stormwater Design, Quantity Control	1 at
		d	31.8 359	d	Credit 6.2	Stormwater Design, Quality Control	1 <sup>πs</sup>
		d d	38.§ 429	С	Credit 7.1	Heat Island Effect, Non-Roof	1
		Credit 2	0n- 2.5	d	Credit 7.2	Heat Island Effect, Roof	1
		d d	7.5 12.	d	Credit 8	Light Pollution Reduction	1
		C Credit 3	Enl			-	al
		C Credit 4	Enh	a	nt & Verification		
		C Credit 5 C Credit 6	Gre	en Pow	er a vermaaion	1	



# **STORMWATER MANAGEMENT**

# Approach & Implementation

Reducing the impervious area is the most effective method.

Minimize or mitigate impervious surfaces:

- •Smaller building footprint
- Pervious paving materials
- Stormwater harvesting for site reuse
- •Green roofs
- •Bio-swales /vegetated filter strips
- •Retention ponds
- •Clustering development to reduce paved surfaces



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# **STORMWATER MANAGEMENT**

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#### Stabilization Measures

- Temporary Seeding
- Permanent Seeding
- Mulching

#### Structural Control Measures

- Earth Dike
- Silt Fence
- Sediment Trap
- Sediment Basin



# **STORMWATER MANAGEMENT**

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# Stormwater - Quality Control

#### Cleaning the water before it gets to the Puget Sound





### **PERVIOUS SURFACES**



**Bioswales:** are landscape elements designed to remove silt & pollution from surface water.

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Pervious / porous concrete sidewalks

Rainstore - temporary rainwater detention system

# **ALTERNATIVE TRANSPORTATION**

\$598 million awarded to state for high speed train from Seattle to Portland

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Heat Island Effects occur when warmer temperatures are experienced in urban landscapes compared to adjacent rural areas as a result of solar energy retention on constructed surfaces. (photo: http://www.epa.gov/heatisld/)



# HEAT ISLAND EFFECT

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#### Solar Reflectance Index (SRI)

A measure of a material's ability to reject solar heat, as shown by a small temperature rise.

The higher SRI value the better.



# **SESSION 2: AGENDA**

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Sustainable Sites

# Water Efficiencies

- Materials & Resources
- Employment Opportunities



# WATER EFFICIENCY

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# Goals:

- Reduce the quantity of water needed for the building
- Reduce municipal water supply and treatment burden

# Facts:

- 340 billion gallons of fresh water withdrawn every day from rivers, streams and lakes for commercial, industrial, residential, agricultural and recreational activities.
- This accounts for nearly ¼ the nation's total supply of renewable fresh water
- Only 65% of this water gets discharged back to the rivers, streams and lakes after use (including treatment).
- Annual 3,700 billion gallon water deficit in the US; in other words Americans use 3,700 billion gallons more than they return to the natural water systems to re-charge aquifers

# **Homework Project 1**

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Using the table below, find how much water you use per day in your home. http://ga2.er.usgs.gov/edu/sq3action.cfm

Use	Cost/use	Your expense
Shower	2 gal/min	
Bath	30 gal	
Handwashing/tooth- brushing	2 gal/min	
Dishwashing (hand)	5 gal/load	
Dishwasher	15 gal/load	
Toilet flush (standard)	3.6 gal per flush	
Clothes washing	20 gal/load	
Drinking water	8 oz/glass	
Shaving	1 gal	



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## WATER EFFICIENCY



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design/construction - submittal phases

Yes	? N	No	Yes ? No
		Sustainable Sites 14 Points	Materials & Resources 13 Points
		c   Prereq 1   Construction Activity Pollution Prevention   Bequired     d   Credit 1   Site Selection   1     d   Credit 2   Development Density & Community Connectivity   1     d   Credit 3   Brownfield Redevelopment   1     d   Credit 4.1   Alternative Transportation, Public Transportation Access   1     d   Credit 4.1   Alternative Transportation, Bicycle Storage & Changing Rooms   1     d   Credit 4.2   Alternative Transportation, Develoting & Fuel-Efficient Vehicles   1     d   Credit 4.3   Alternative Transportation, Parking Capacity   1     c   Credit 6.1   Site Development, Protect of Restore Habitat   1     c   Credit 6.1   Stormwater Design, Quantity Control   1     d   Credit 6.1   Stormwater Design, Quality Control   1     d   Credit 7.1   Heat Island Effect, Non-Roof   1     d   Credit 7.2   Heat Island Effect, Roof   1     d   Credit 7.2   Light Pollution Reduction   1	V   d   Prereq 1   Storage & Collection of Recyclables   Required     C   Credt 1.1   Building Reuse, Maintain 75% of Existing Walls, Floors & Roof   1     C   Credt 1.2   Building Reuse, Maintain 100% of Existing Walls, Floors & Roof   1     C   Credt 1.3   Building Reuse, Maintain 50% of Interior Non-Structural Elements   1     C   Credt 2.1   Construction Waste Management, Divert 50% from Disposal   1     C   Credt 3.2   Materials Reuse, 5%   1     C   Credt 4.1   Recycled Content, 10% (post-consumer + ½ pre-consumer)   1     C   Credt 4.1   Recycled Content, 20% (post-consumer + ½ pre-consumer)   1     C   Credt 5.1   Regional Materials, 10% Extracted, Processed & Manufactured Regi   1     C   Credt 5.2   Regional Materials, 20% Extracted, Processed & Manufactured Regi   1     C   Credt 5.2   Regional Materials, 10% Extracted, Processed & Manufactured Regi   1     C   Credt 5.2   Regional Materials, 20% Extracted, Processed & Manufactured Regi   1     C   Credt 6.2   Regional Materials, 20% Extracted, Processed & Manufactured Regi   1     C   Credt 7   Certif
Yes	? !	No Total	Yes ? No Total
		Water Efficiency 5 Points	Indoor Environmental Quality 15 Points
		d Credit 1.1 Water Efficient Landscaping, Reduce by 50% 1	Y d Prereq 1 Minimum IAQ Performance Required
	-+	Credit 1.2 Water Efficient Landscaping, No Potable Use or No Imgation	C Prereq 2 Environmental Tobacco Smoke (ETS) Control Required
	-+	d Credit 2 Innovative wastewater rechnologies	d Credit 2 Increased Ventilation 1
		d Credit 3.2 Water Use Reduction, 30% Reduction	c Credit 3.1 Construction IAQ Management Plan, During Construction 1
			C Credt 3.2 Construction IAQ Management Plan, Before Occupancy
Y Y Y		Water Efficiency d Credit 1.1 Water Efficient Landscaping,	5 PointsReduce by 50%1
		Credit 1.2 Water Efficient Landscaping.	No Potable Use or No Irrigation 1
			1
		🔤 👩 Credit 2 👘 Innovative Wastewater Techn	ologies 1
		d Oradito (	duration d
		Credit 3.1 Water Use Reduction, 20% Re	eduction 1 Total
		Credit 2.2 Weter Llee Beduction 200/ D/	Points
			1
		Credit 2 On-Site Renewable Energy 1 to 3   d 2.5% Renewable Energy 1   d 7.5% Renewable Energy 2	cl     cl <thcl< th="">     cl     cl     cl<!--</th--></thcl<>
		c Credit 3 Enhanced Commissioning 1	Yes ? No <b>Total</b>
		d Credit 4 Enhanced Refrigerant Management	Totals Possible Points 69
		C Credit 5 Measurement & Verification 1	
		c Credit 6 Green Power 1	
	-		Certified: 26-32 points, Silver: 33-38 points, Gold: 39-51 points, Platinum: 52-69 points

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# **SESSION 2: AGENDA**

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- Design & Construction Process
- Sustainable Sites
- Water Efficiencies

Materials & Resources

Employment Opportunities



# **MATERIALS & RESOURCES**

# Goals:

- Reduce the amount of materials needed
- Use materials with less environmental impact
- Reduce and manage waste

# Facts:

- Construction and demolition wastes make up about 40% of the total solid waste stream in the US
- Recycling facilities in certain areas can divert 80% or more of waste from going to landfills





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#### MATERIALS & RESOURCES



Yes

Yes

# LEED**-NC**

# **MATERIALS & RESOURCES**



design/construction - submittal phases

?	No				Yes	?	No				
	5	Sustainable	Sites	14 Points				Ma	terials 8	Resources	13 Points
		C Prereq 1	Construction Activity Pollution Prevention	Required	Y			d	Prereq 1	Storage & Collection of Recyclables	Required
		cl Credit 1	Site Selection	1				с	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1
		cl Credit 2	Development Density & Community Connectivity	1				С	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1
		cl Credit 3	Brownfield Redevelopment	1				с	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
		cl Credit 4.1	Alternative Transportation, Public Transportation Access	1				С	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
		cl Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1				С	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
		cl Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1				С	Credit 3.1	Materials Reuse, 5%	1
		cl Credit 4.4	Alternative Transportation, Parking Capacity	1				С	Credit 3.2	Materials Reuse,10%	1
		C Credit 5.1	Site Development, Protect of Restore Habitat	1				С	Credit 4.1	Recycled Content, 10% (post-consumer + 1/2 pre-consumer)	1
		C Credit 5.2	Site Development, Maximize Open Space	1				С	Credit 4.2	Recycled Content, 20% (post-consumer + ½ pre-consumer)	1
		cl Credit 6.1	Stormwater Design, Quantity Control	1				С	Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regi	1
		Credit 6.2	Stormwater Design, Quality Control	1				С	Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regi	1
		C Credit 7.1	Heat Island Effect, Non-Roof	1				С	Credit 6	Rapidly Renewable Materials	1
		cl Credit 7.2	Heat Island Effect, Roof	1				С	Credit 7	Certified Wood	1
		cl Credit 8	Light Pollution Reduction	1							
2	No			Total	Man	0	110				Total

Mat	terials &	Resources	13 Points	15 P Rec
d	Prereq 1	Storage & Collection of Recyclables	Required	Rec
С	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors & Roof	1 <sub>ion</sub>	
vc C	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls, Floors & Roof	1 <sup>y</sup>	
С	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1	
С	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1 <sup>roduc</sup>	ts
С	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1	
С	Credit 3.1	Materials Reuse, 5%	1	
C	Credit 3.2	Materials Reuse,10%	1	
c	Credit 4.1	Recycled Content, 10% (post-consumer + ½ pre-consumer)	1	
С	Credit 4.2	Recycled Content, 20% (post-consumer + 1/2 pre-consumer)	1	5 6
С	Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regi	1	
С	Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regi	1	
- c	Credit 6	Rapidly Renewable Materials	1	
С	Credit 7	Certified Wood	1	

Certified: 26-32 points, Silver: 33-38 points, Gold: 39-51 points, Platinum: 52-69 points

# **BUILDING REUSE** Sellen

# WASTE RECYCLING

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#### Identify and reduce our largest environmental impacts



# WASTE RECYCLING

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BUILDING									
	LEED-NC						S	ellen	
PscBC .									
PROJEC	T NAME (JOB NUMBE		CONSTRUCTION WASTE MANAGEMENT						
						L	EED MRc	2.1-2.2	
				Recycled?			Percentage	Total	
				(Yes or	Quantity of		of Waste	Diverted	
Date	Subcontractor	Facility Used	Material Type	No)	Waste	Units	Diverted	Waste [tons]	
		-							
7/9/07	Recovery 1	Recovery 1 Tacoma	Commingle	yes	83.68	Tons	98.00%	82.01	
7/9/07	Seattle Iron & Metals Corp	Seattle Iron & Metals Corp	Steel	yes	2.74	Tons	98.00%	2.69	
7/9/07	Squak Mountain Materials LLC	Squak Mountain	Concrete	yes	24.1	Tons	99.00%	23.86	
7/10/07	Recovery 1	Recovery 1 Tacoma	Commingle	yes	63.25	Tons	98.00%	61.99	
7/10/07	Squak Mountain Materials LLC	Squak Mountain	Concrete	ves	23.5	Tons	99.00%	23.27	
7/24/08	WM	Waste Management	Waste	no	1.05	Tons	0.00%	0.00	
7/31/08	Renu	CDL Recycle	Concrete	ves	9	Tons	99.00%	8.91	
7/31/08	Renu	CDL Recycle	Commingle	ves	42.36	Tons	93.32%	39.53	
8/24/08	WM	Waste Management	Waste	no	1.05	Tons	0.00%	0.00	
			TOTAL QUANTITY C	F WASTE	888.89	Tons	DIVERTED	833.70	
			PERCENTAGE	OF WAS	TE DIVER	TED	93.79%		

ON WORKERS. SAFI

CONSTRUCT











# **REGIONAL MATERIAL**

# **Submittal Documentation**

✓Provide Project's Total Project Cost (Default or Actual)

- ✓ Complete regional materials calculation. Information required:
  - Product name
  - Material manufacturer
  - Total product cost
  - Percentage of product, by weight
  - Distance between the project site & extraction/harvest/recovery site







Pacific Lutheran University...... CONSTRUCTION WORKERS, SAFETY & HEALTH

# **SESSION 2: HOMEWORK**

Seller

- Pick a green building system, prepare to answer the following questions:
  - What is it and how does it work?
  - Are there any local, built examples?
  - How does it reduce our environmental impact (in terms of budget, savings)?
  - Are there new jobs created?
  - Are there any safety concerns?

# **DUE NEXT SESSION**

# **SESSION 2: AGENDA**

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- Design & Construction Process
- Sustainable Sites
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Employment Opportunities

# **EMPLOYMENT OPPORTUNITIES**

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# QUESTIONS?