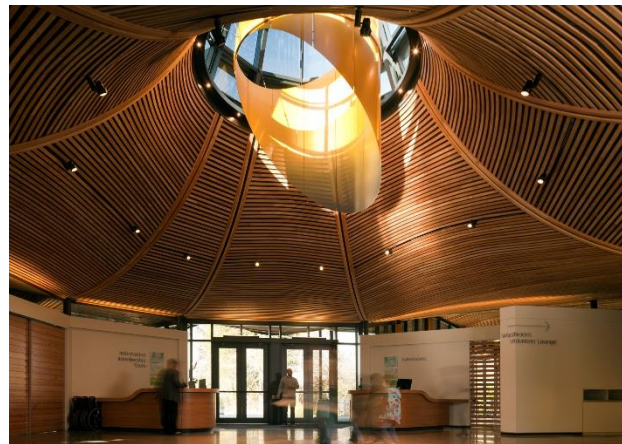


LIVING BUILDING CHALLENGE APPLIED: VANDUSEN BOTANICAL GARDEN VISITOR CENTRE



AGENDA

- Welcome and Introductions
- The Living Building Challenge (Abridged)
- Vandusen Botanical Garden Visitor Centre
- Design Approach
- The Lessons



THE LIVING BUILDING CHALLENGE



The Living Building Challenge
In Pursuit of True Sustainability in the Built Environment



Draft Version 1.2
April 2007



The Living Building Challenge
In Pursuit of True Sustainability in the Built Environment



Version 1.3
August 2008

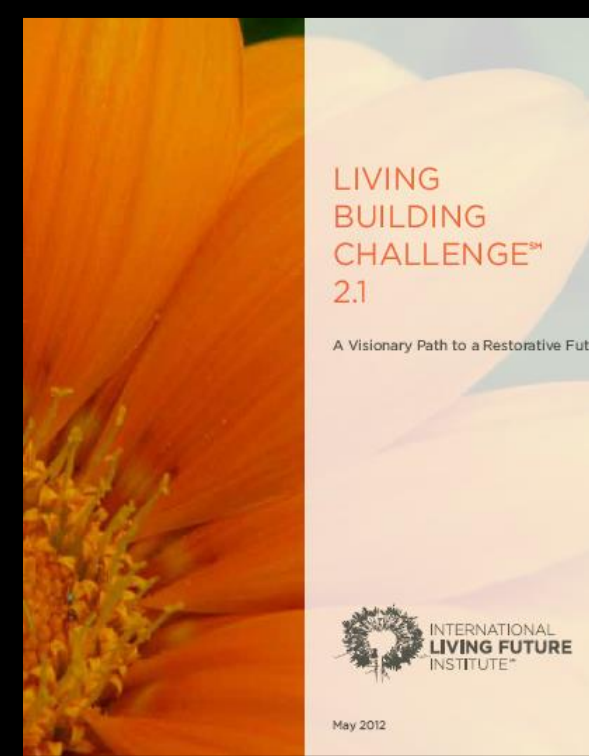


LIVING BUILDING CHALLENGE™
2.0

A Visionary Path to a Restorative Future



April 2010



LIVING BUILDING CHALLENGE™
2.1

A Visionary Path to a Restorative Future



May 2012



LIVING BUILDING CHALLENGESM
3.0

A Visionary Path to a
Regenerative Future

THE METAPHOR

- Nature as a measure
- Place-based philosophy
- Balanced approach



WHY A CHALLENGE?

- Codify performance standard
- Marry technical and philosophical considerations
- Pull the market forward and inspire transformational change



THE RULES OF ENGAGEMENT

- All imperatives (requirements) must be met
- Actual performance verification





© 2011 Int'l Living Future Institute

SITE



© 2011 Int'l Living Future Institute

WATER



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ENERGY



© 2011 Int'l Living Future Institute

MATERIALS



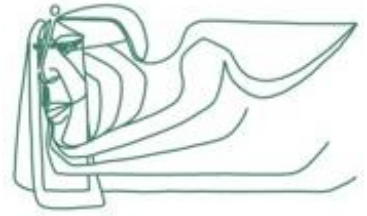
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HEALTH



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EQUITY

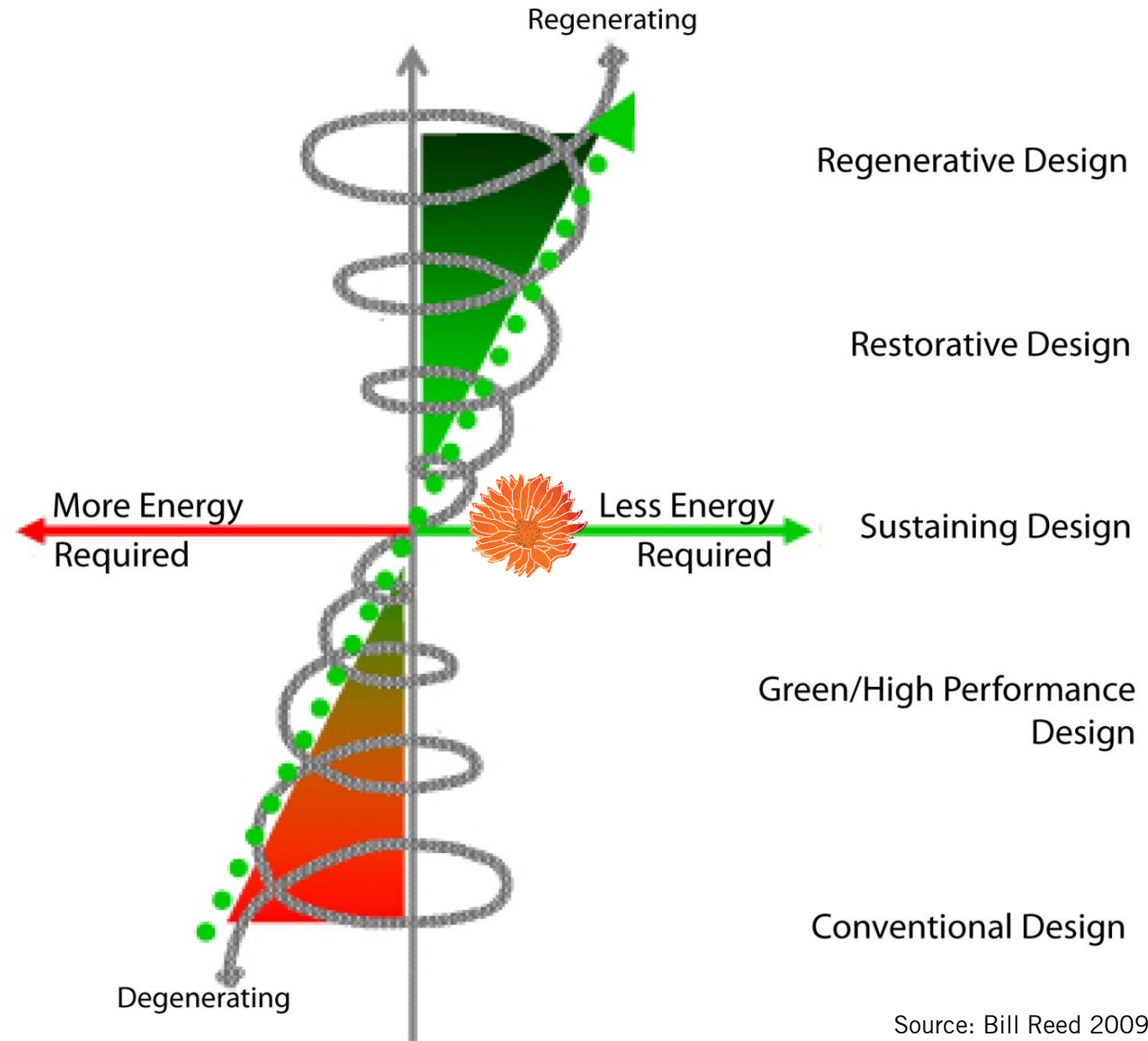


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BEAUTY

THE SPECTRUM OF SUSTAINABLE DESIGN

- Sustainable, Restorative, Regenerative



VANDUSEN
BOTANICAL GARDEN
VISITOR CENTER



Location: Vancouver, BC

Client: Vancouver Parks Board

Completed: 2011

Construction Cost: \$14.4

Project Budget: \$21.9 M

Garden Area: 22 ha

Site Area: 17,500 sm

Program Area: 1,765 sm

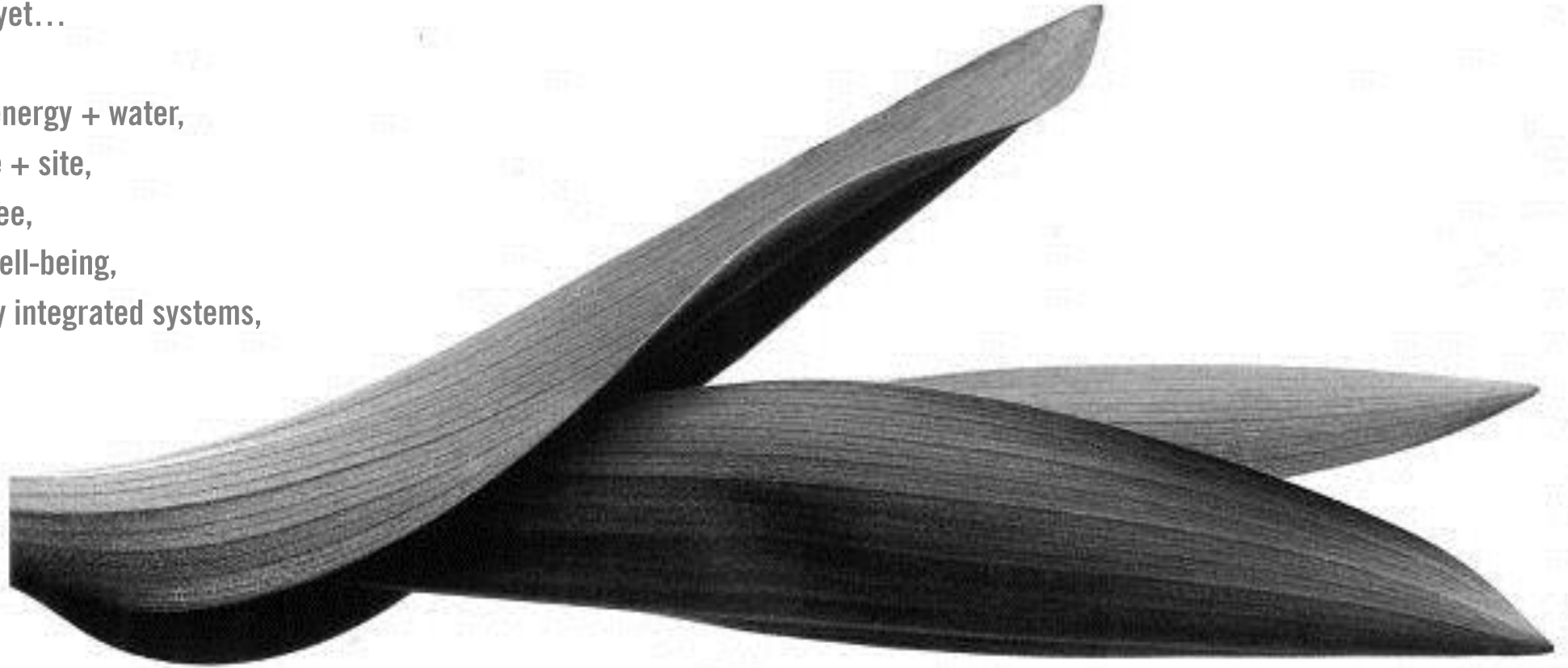
LEED Canada NCv1.0

Certified Platinum

Living Building Challenge
Registered

Rooted in place and yet...

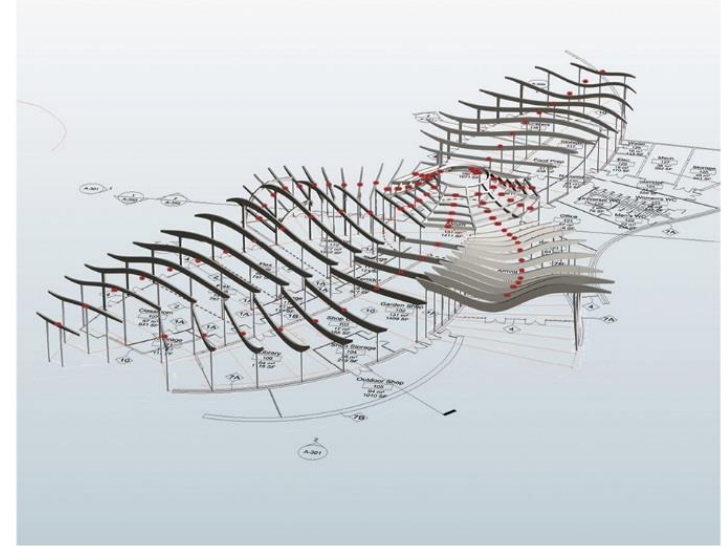
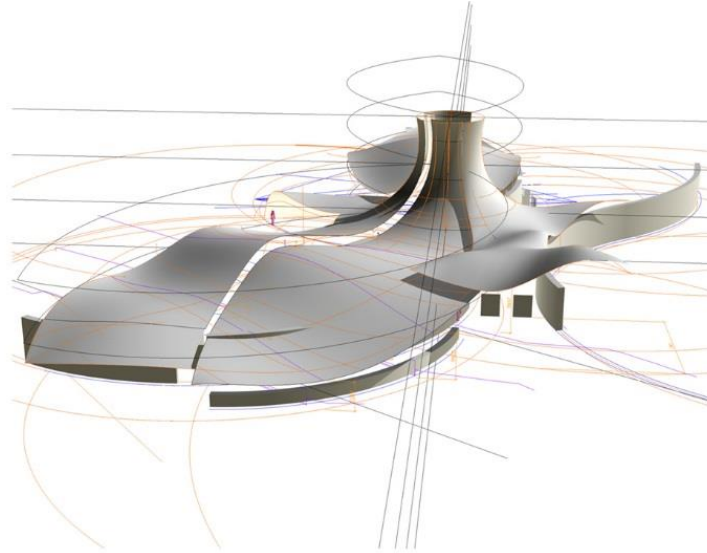
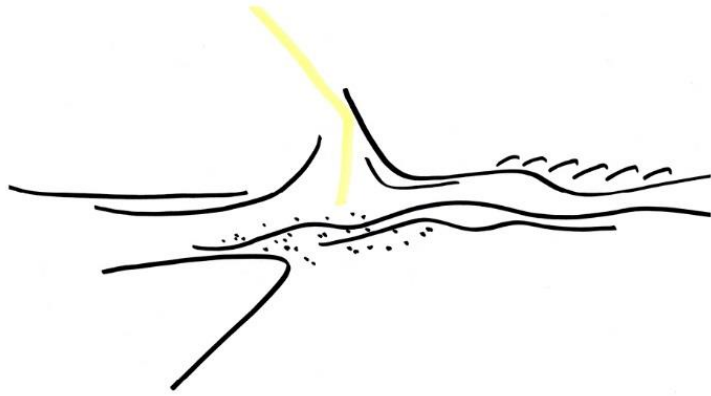
harvests all its own energy + water,
is adapted to climate + site,
operates pollution free,
promotes health + well-being,
comprised of entirely integrated systems,
is beautiful.



Karl Blossfeldt Orchidaceae (orchid shoot)

Construction Innovation

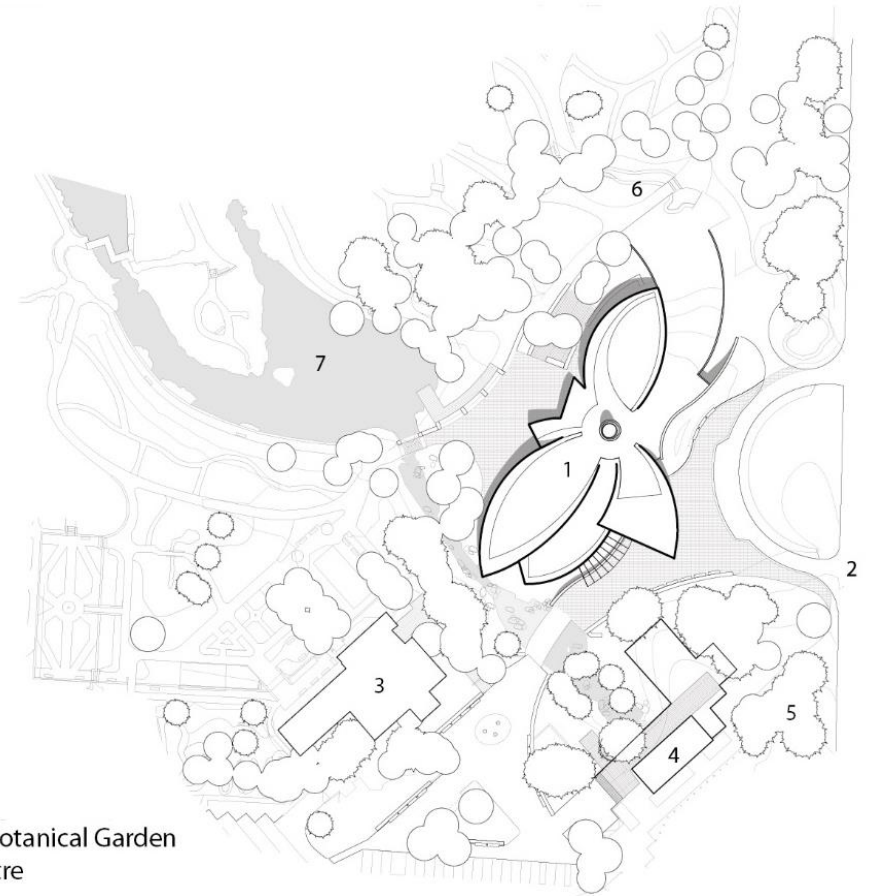
Developed with Rhino and Revit software, the roof includes more than 50 different pre-fabricated roof panels composed of unique curved glulam beams.



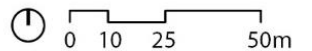


Site Plan: Public Identity

Located on the prominent southeast corner of the Garden, the Visitor Centre transforms the entrance to heighten public awareness of the Garden and nature. By merging building and nature, the project is integrated into natural and human systems



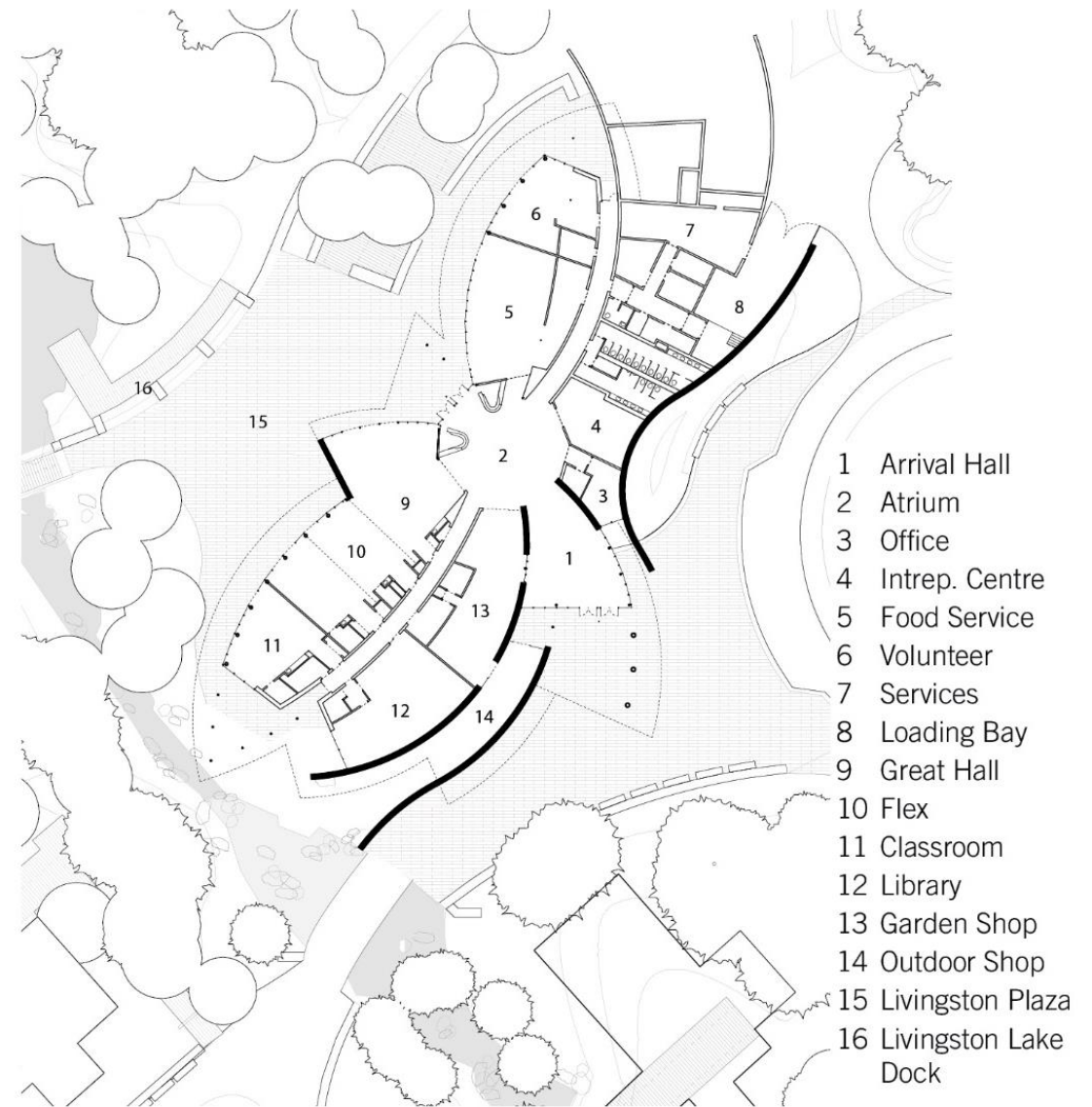
- 1 Vandusen Botanical Garden Visitor Centre
- 2 Oak Street
- 3 Administration Building
- 4 Floral Hall
- 5 Forest System
- 6 Meadow System
- 7 Water System





Building Organization: Natural Inspiration

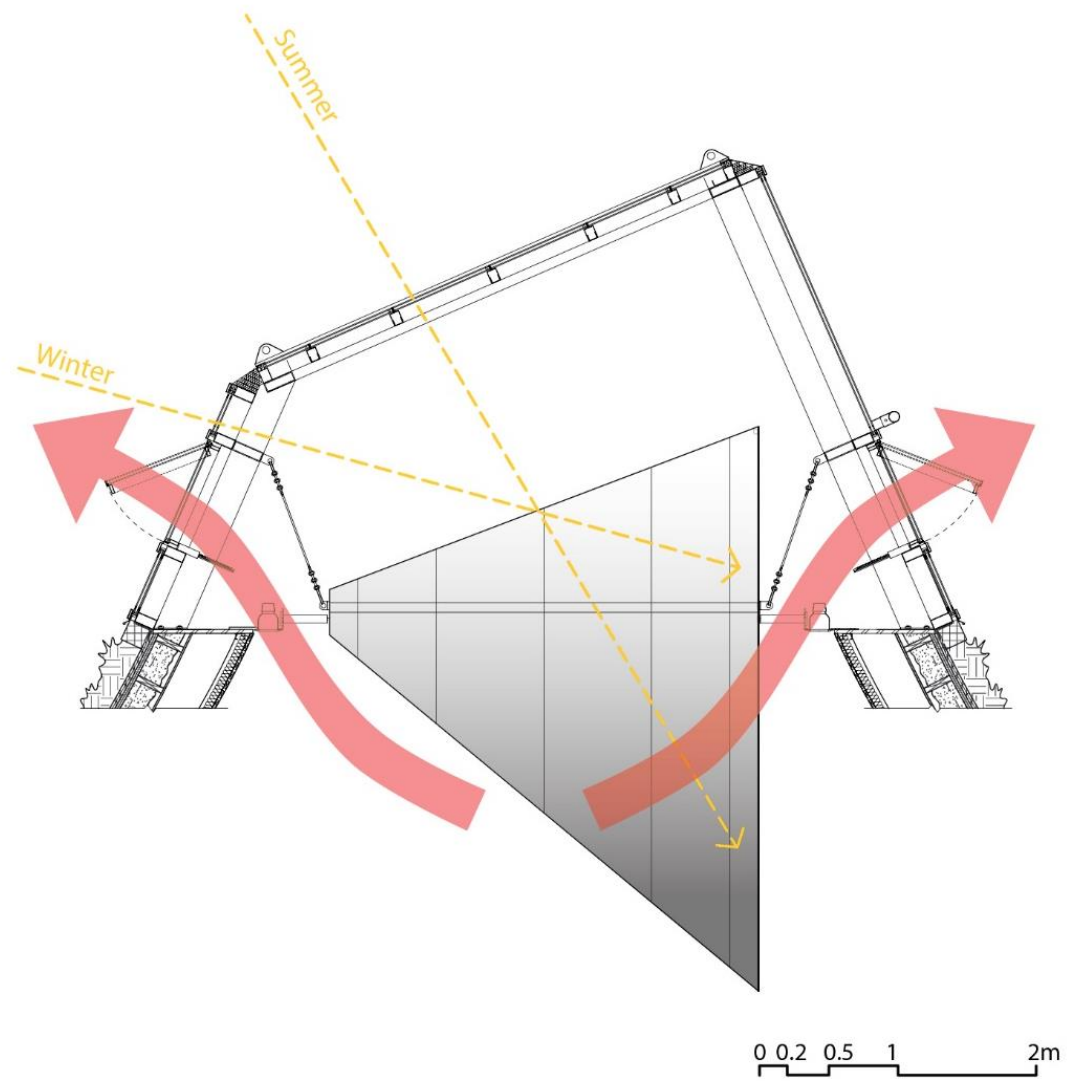
Inspired by organic forms and natural systems, the building is organized under undulating green roof 'petals' and along rammed earth and concrete walls.

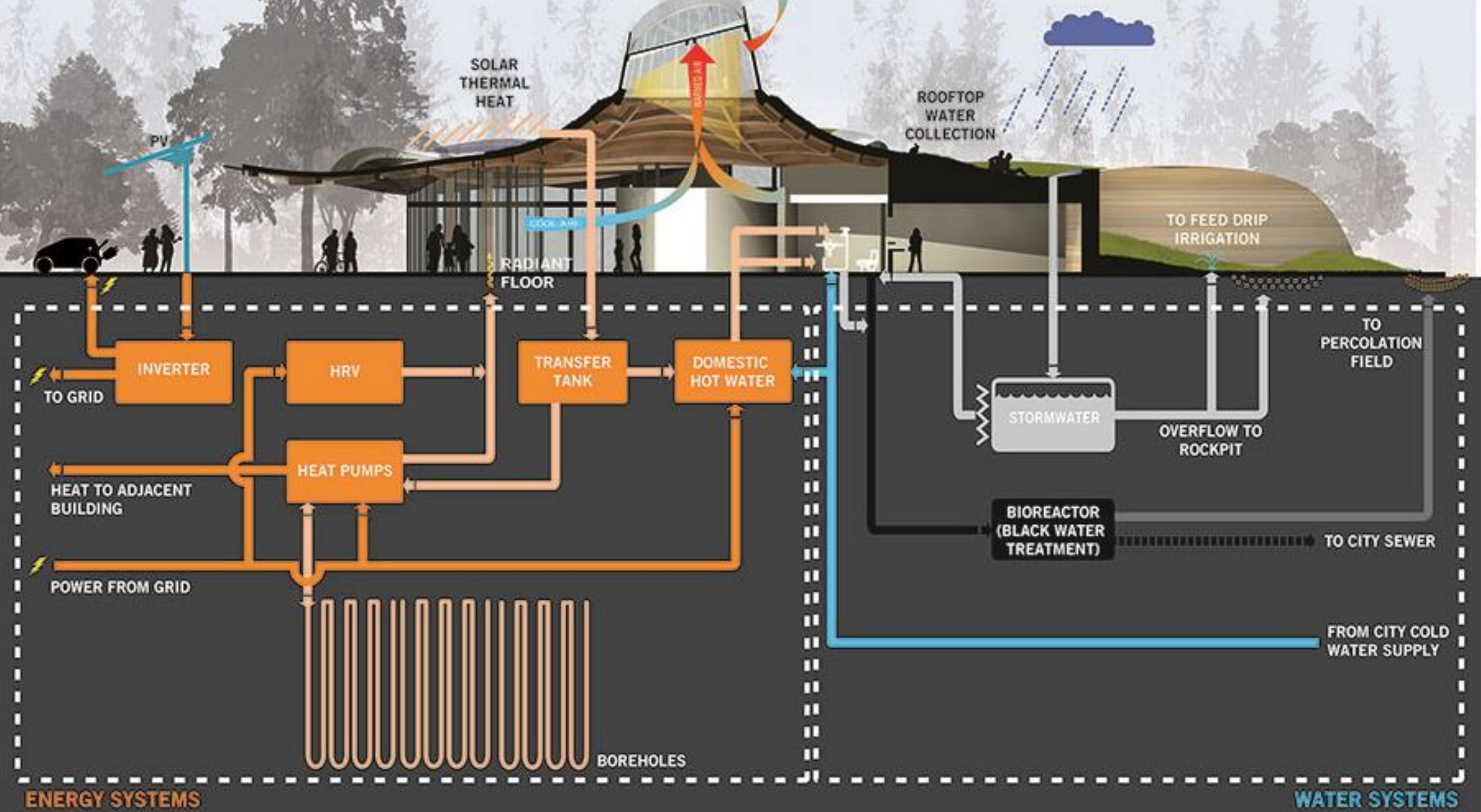




Detailing: Oculus

Natural ventilation is assisted by a solar chimney, composed of an operable glazed oculus and an aluminum heatsink, which converts the sun's rays to convection energy. Summer sun shines on darker surfaces to enhance ventilation further.





DESIGN APPROACH

DESIGN APPROACH

- Beauty as Petal
- Connecting to nature
- Performance vs Aesthetic
- Transparency vs Opacity



THE MYSTERY OF MATERIALS

- Minimize material palette
- Monolithic through-body
- Robust and hard-wearing
- Search for local inspiration



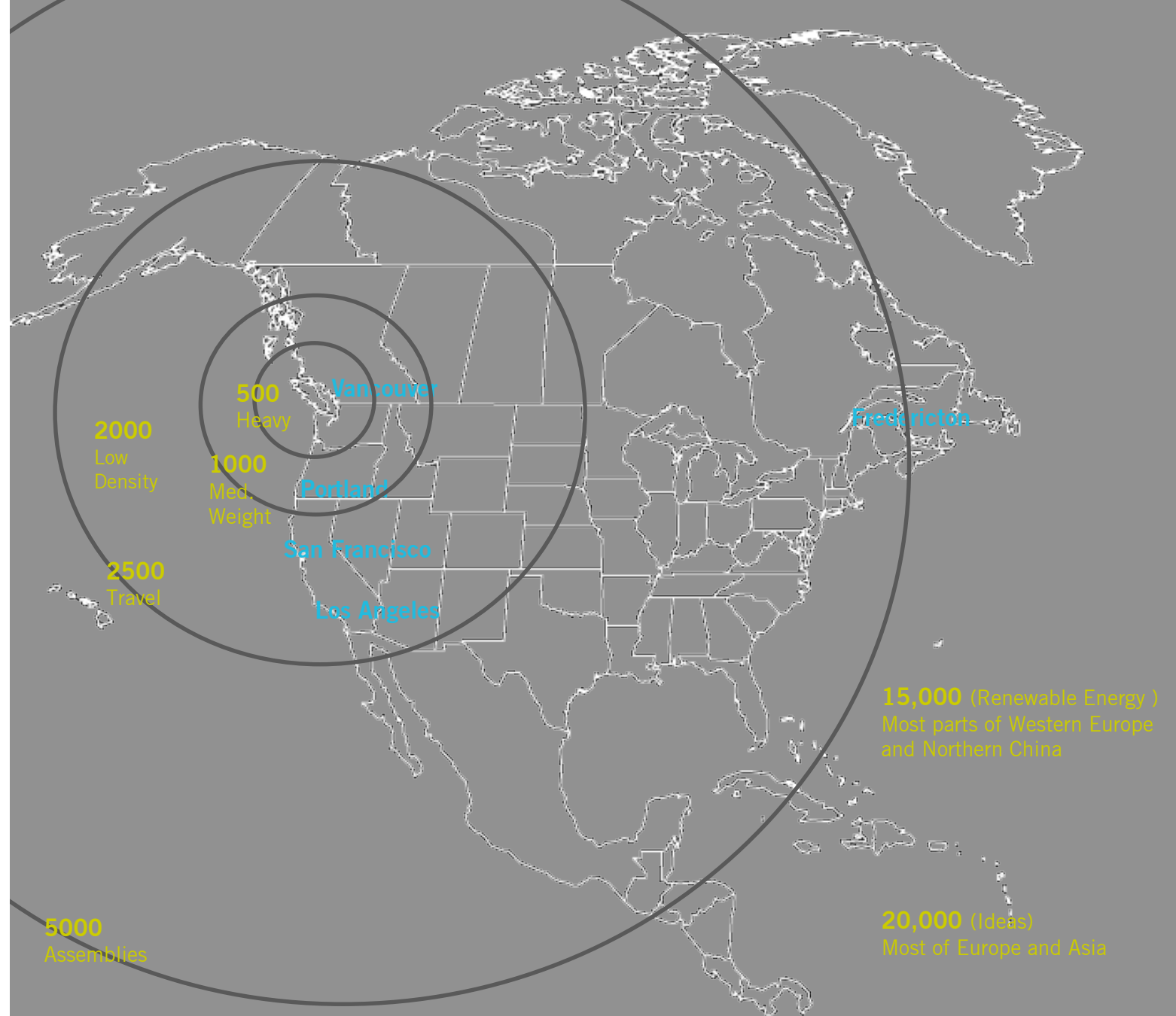
THE RED LIST

- Asbestos
- Cadmium
- Chlorinated Polystyrene Chlorosulfonated Polyethylene⁴³
- Chlorofluorocarbons (CFCs)
- Chlorophrene (Neoprene)
- Formaldehyde (added)
- Halogenated Flame Retardants⁴⁴
- Hydrochlorofluorocarbons (HCFCs)
- Lead (added)
- Mercury
- Petrochemical Fertilizers and Pesticides
- Polyvinyl Chloride (PVC)
- Wood treatments containing Creosote and Arsenic



RESPONSIBLE SOURCING

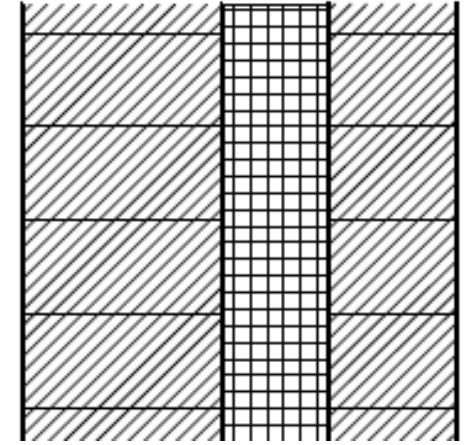
- Sourcing restricted by weight
- Local imperative
- Innovation





	TEST REF.	F.R.R.	STC
W4 TYPICAL RAMMED EARTH WALL	--	--	--

- RAMMED EARTH WALL (REFER TO STRUCTURAL)
- 150MM RIGID INSULATION WITH STEEL HSS (refer to Structural)
- RAMMED EARTH WALL (REFER TO STRUCTURAL)



TEST REF. F.R.R. STC

E3 BRICK CLADDING of STRUCTURE

-- -- --

TEST REF. F.R.R. STC

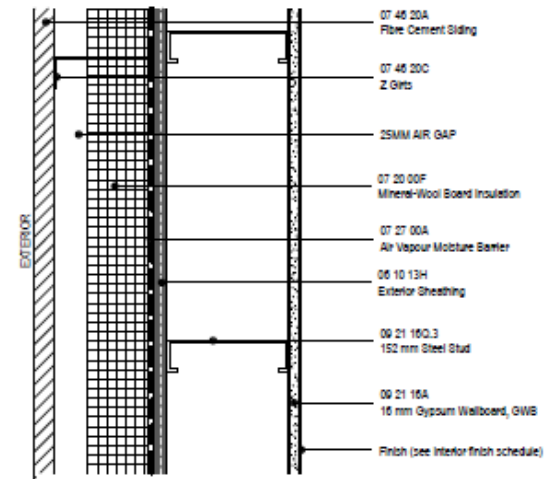
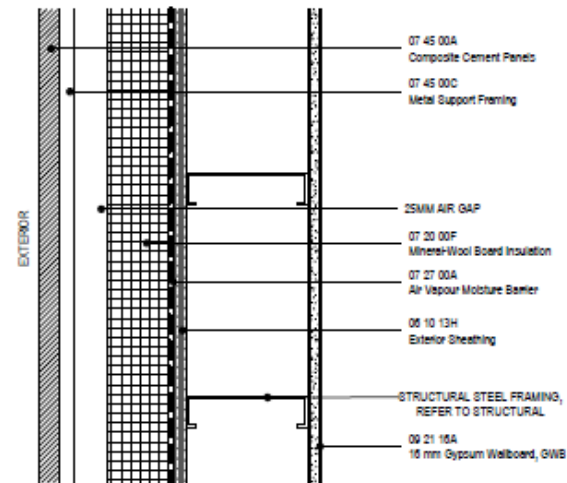
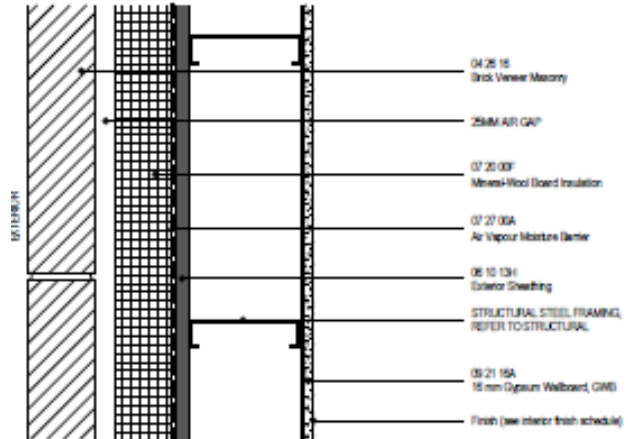
E4 CLADDING of STRUCTURE (CONCRETE OR FRAMED WALL)

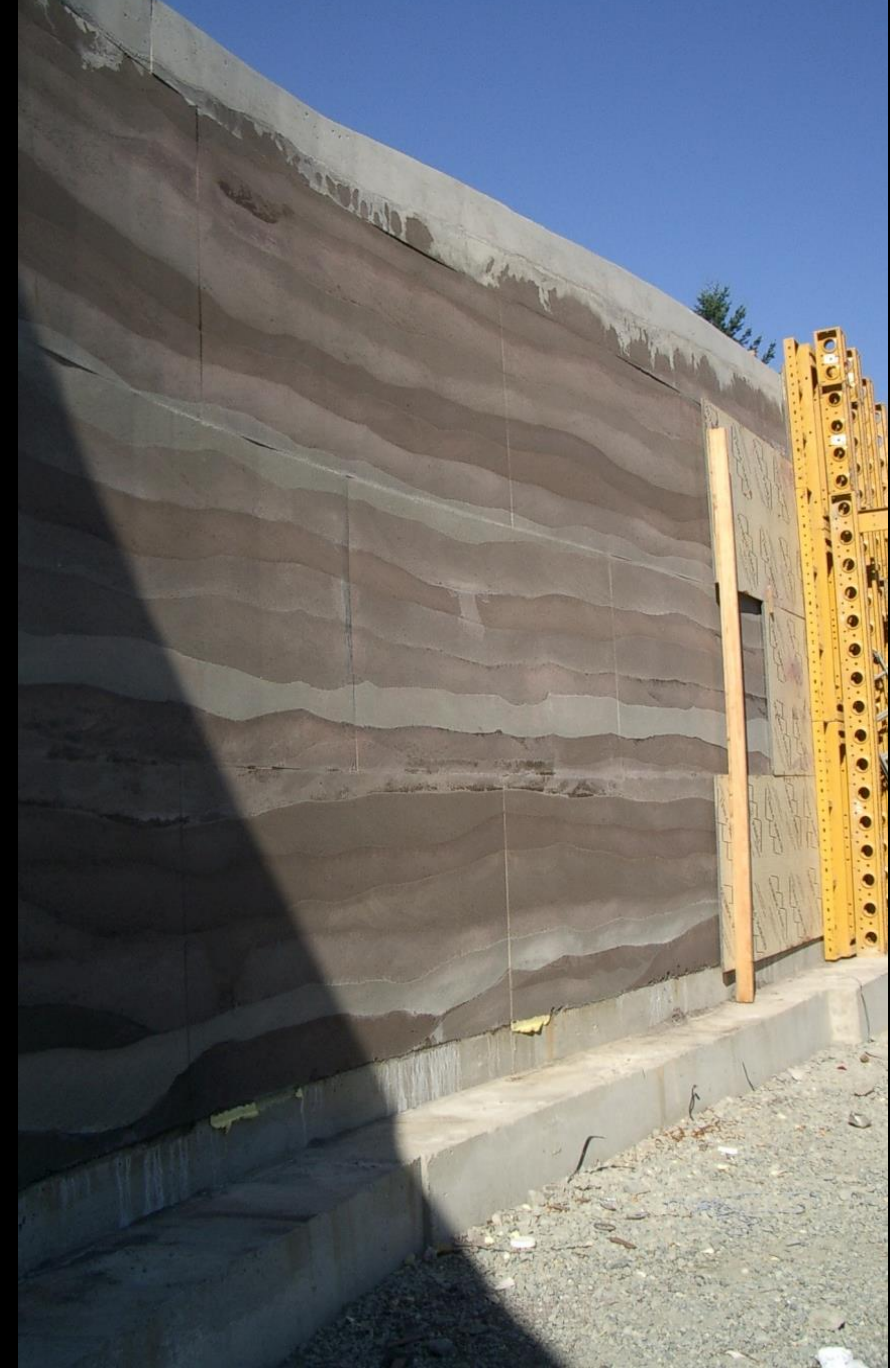
-- -- --

TEST REF. F.R.R. STC

E5 CEMENTITIOUS CLADDING of STRUCTURE (CONCRETE OR FRAMED WALL)

-- -- --





VanDusen Botanical Garden Visitor Centre / Rammed Earth 06 October 2010??



VanDusen Botanical Garden Visitor Centre / Materials

MATERIAL TRACKING

- The challenge is real
- Ingredients lists are not understood and poorly documented by manufactures
- Burden of research on design and construction team
- Holistic approach is key to transform industry

Material	Material Name	Material Description	Material Quantity	Material Unit	Material Location	Material Status	Material Tracking
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LIVING BUILDING CHALLENGE INFORMATION SHEET

Vancouver Board of Parks and Recreation has registered the New Visitor Centre - VanDusen Botanical Garden for Living Building Challenge (LBC). LBC is a rating system that ensures the high 'Yes' to any of the above does your product have more than 10 constituent parts? best level of sustainable construction and design is achieved. The following information is required, pursuant to Ledcor's Schedule F. This information will be included as separate documentation to the LBC application.

<input checked="" type="checkbox"/> PRODUCT INFORMATION	
Material: BUILDING SEALANT	Petro/Manufacturer: POW CORNING
Product Line/Model #: 795 SILICONE BUILDING SEALANT	Address of Vendor/Manufacturer: PO BOX 994 MIDLAND, MICHIGAN 48680
Vendor/Manufacturer Representative: DAVE NOWAK @ CI DISTRIBUTORS	E-mail Address of Vendor/Manufacturer: dnowak@crossroadsci.com

COMPLETE A SEPARATE SHEET FOR EVERY MATERIAL USED ON SITE - Checkmark all related sections

<input checked="" type="checkbox"/> 11 Red List					
Asbestos	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	HCFC's	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Cadmium	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Lead (Added)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Chlorinated Polyethylene and Chlorosulfinated Polyethylene (except HDPE & LDPE)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Mercury	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
CFC's	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Petrochemical Fertilizers/Pesticides	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Chloroprene (Neoprene)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Phthalates	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Formaldehyde (Added)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Polyvinyl Chloride (PVC)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Halogenated Flame Retardants*	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Wood treatment containing Creosote, Arsenic or Pentachlorophenol	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

*Halogenated flame retardants include PBDE TBBPA HBCD Deca-BDE TCPP TECEP, Dechlorane Plus and other retardants with bromine or chlorine

If "Yes" to any of the above, does your product have more than 10 constituent parts? Yes No

If "Yes", attach backup documentation showing the component containing the Red List substance is discrete and contained and is less than 10% of the product by both weight and volume

<input checked="" type="checkbox"/> 13 Responsible Industry					
Does the product contain wood?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Is the wood from a salvaged source?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Was the wood harvested from this site?	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Is the wood FSC certified?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
FSC chain-of-custody certificate number			Attach information source specifying certified wood	<input type="checkbox"/>	

<input checked="" type="checkbox"/> 14 Appropriate Sourcing	
Specification section for this product per the MasterFormat 2004 system	<u>N/A</u>
Does this product meet the specified Appropriate Sourcing Radius criteria?	Yes <input type="checkbox"/> No <input type="checkbox"/>
See Appropriate Sourcing Matrix attached	
Where is the location of final assembly? (City/Province) <u>ELIZABETHTOWN, KY</u>	Distance to Site <u>3,000</u> km
Where is the location of Extraction* (City/Province) <u>N/A</u>	Distance to Manufacturer <u>/</u> km
*Note only certain spec sections need to specify Extraction Location refer to Appropriate Sourcing Matrix	

<input checked="" type="checkbox"/> 15 Conservation & Reuse	
I read & understand Ledcor's CWM Plan.	
Do you recycle your construction waste?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>
Using your own bins? We require ALL tickets / manifests - measured by weight	
Describe how waste is minimized during the product manufacturing process (attach separate sheet if required):	
Describe how waste is minimized during the construction process (attach separate sheet if required):	

Company Name	KEITH PANEL SYSTEMS	Contact Number	(604) 987-4499
Contact Name	REBECCA BARR	Signature	<i>Rebecca Barr</i>
		Date	11/10/10

THE LESSONS

UNDERSTAND RISK

- Red list vs performance
- Local sourcing vs durability
- Early adoption



LBC IS REALLY HARD



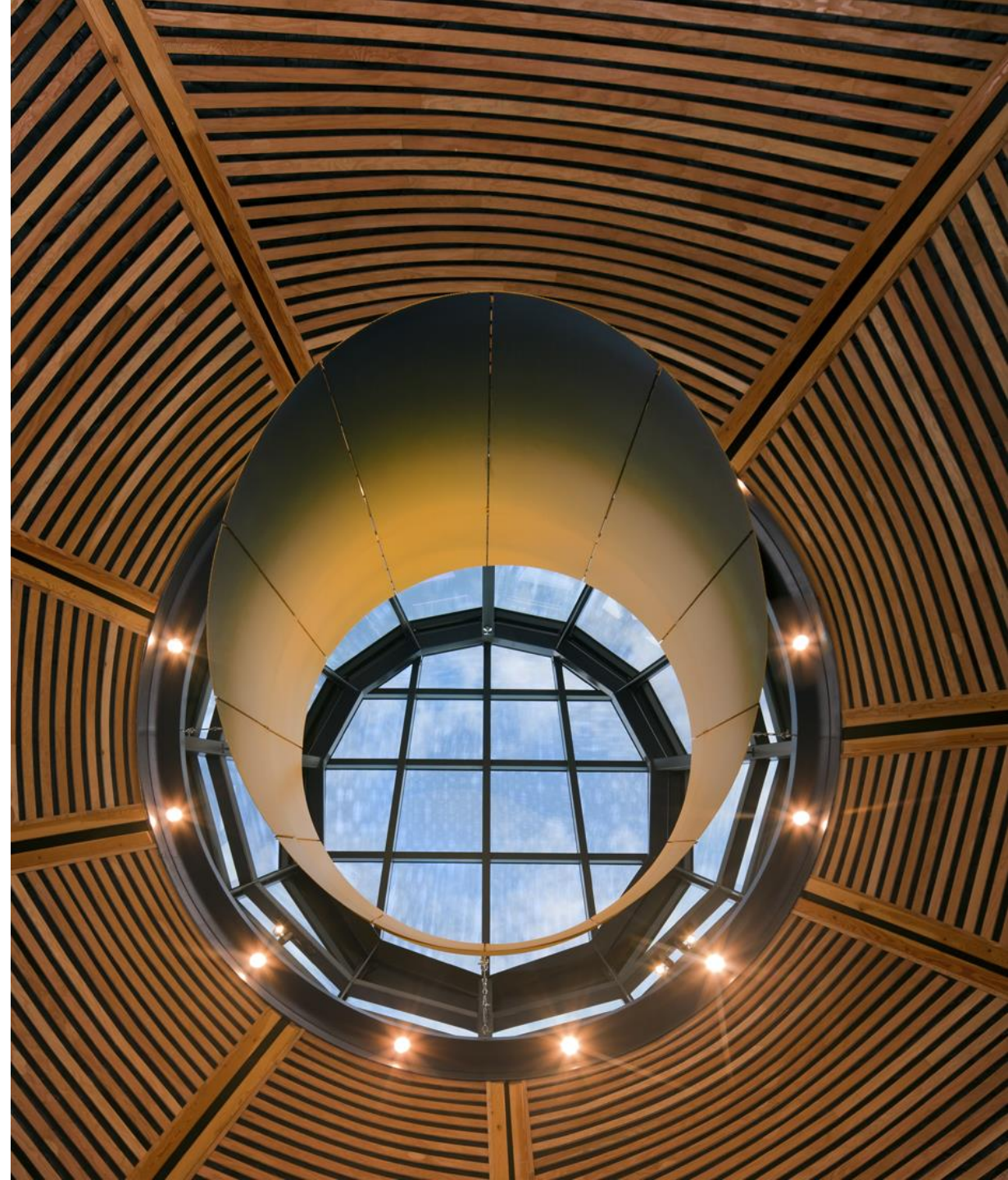
- 2_Beghelli_Fortezza_Exit_Sign
- 3_Beghelli_Ottica_Exit_Sign
- 4_Atkore_International_Electrical_Metallic_Tubing
- 5_Delta_Transformers_Electrical_Transformer
- 6_Eaton_Enclosed_Control_ECX_SVX
- 7_Erico_Low_Carbon_PreGalvanized_Steel
- 8_Fre_Composites_Fiberglass_Conduit
- 9_FSR_Inc_FL600P
- 10_General_Cable_RW90_Building_Wire
- 11_General_Cable_Teck90_Armoured_Cable
- 12_NDS_212BCB_Elec
- 13_Northern_Cables_AC90
- 14_West_Coast_Electric_Steel_Enclosure
- 15_Thomas_Betts_Steel_Fittings
- 16_Thomas_Betts_Steel_Aluminum_Boxes_Covers
- 17_Thomas_Betts_Steel_Boxes_Covers
- 18_The_Watt_Stopper_Dimming_Photosensor
- 19_Pass_Seymour_WP_Cover_CA26GV
- 20_Pass_Seymour_switch_2601W
- 21_Pass_Seymour_StainlessSteel_WallPlates_SS262
- 22_Pass_Seymour_Receptacle_CRB_5262W
- 23_Pass_Seymour_Receptacle_26252W
- 24_Eaton_Uninterruptible_PowerSupply_Powerwar9390
- 25_Eaton_PanelBoards_SwitchBoards
- 26_Eaton_Motor_Control_Centres
- 27_Coleman_Cable_Inc_4c22_Station_Wire
- 28_Belden_Twited_Pairs_UTP_Cable
- 29_Belden_MDVO_Video_F_Module
- 30_Belden_Decora_Straps_A0409653
- 31_Belden_CAT6_MOVO_Jacks_AX101065
- 32_Belden_CAT6_MOVO_Jacks_AX101320

R	D	C	MANUFACTURER INFORMATION				PRODUCT INFORMATION						NOTABLE PRODUCTS				
			NAME	LOCATION	DISTA MILE FROM SITE [mi]	NAME	CONTENT LOCATION	CONTENT DISTANCE FROM PHFP [mi]	RESPONSIBLE INDUSTRY PSC Certified with COC, authorized, granted	EXCEPTION APPLIED?	RED LIST level 1	PSC CERT level 1	Exception reference	HSDS/Spec sheet link	Req version date?		
1																	
2	03/08/00	1	500	2 Endcapgit	Gaithersburg, MD	418	Abrazar end	Prison Group, DC	185	N/A	No	No	Yes	N/A		Yes	Yes
3	03/08/00	1	500	3 Hot/Wet Coalescence	Vancouver, BC	8	Coalescer/separator subassembly	Dallas, DC	18	N/A	No	No	Yes	N/A		Yes	Yes
4	03/08/00	5	5000	4 MIH	Beverly, DC	15	CF 818 Coaxial and Jaxial Form [Pulverized Stone from: Donald Smith]	NA	NA	N/A	No	No	Yes	N/A	166-E4/2083	Yes	Yes
5	03/05/15	5	5100	5 MIH	Milwaukie, OR	3343	MIHRE 588 Epoxy Adhesive	Halifax, NS - Table 4	N/A	N/A	Yes	No	Yes	N/A	166-E4/2083	Yes	Yes
6	03/05/15	5	5100	6 Knaufceil Manufacturing	Dallas, DC	21	3185 Epoxy	Halifax, NS - Table 4	N/A	N/A	Yes	No	Yes	N/A	166-E4/2083	Yes	Yes
7	03/08/00	1	500	7 Krupel	Vancouver, BC	7.5	Internal ammonia separator subassembly	Scranton, PA	151	N/A	No	No	Yes	N/A		Yes	Yes
8	03/08/00	1	500	8 Lushik	Dallas, DC	21	FullLoad Control	Tuill	488	N/A	No	No	Yes	N/A		Yes	Yes
9	03/08/00	1	500	9 Lushik	Vancouver, BC	8.82	Switch End	Scranton	184	N/A	No	No	Yes	N/A		Yes	Yes
10	03/08/00	1	500	10 MainLead Sand and Gravel	Vancouver, BC	8.82	Three road base sand	Abbotsford	82	N/A	No	No	Yes	N/A		Yes	Yes
11	03/05/15	5	5100	11 Silo Coagulation	Vancouver, BC	8.82	Siloxia RE 3 800 w/separator	Lynchburg, NJ	3813	N/A	No	No	Yes	N/A	166-E4/2083	Yes	Yes
12	03/08/00	1	500	12 Xerox	Vancouver, BC	8.82	Concrete waterproofing	Richmond, DC	18	N/A	No	No	Yes	N/A		Yes	Yes
13	03/08/00	1	500	13 LMS Houser	Savoy, DC	22	Concrete waterproofing sheet	Scranton, PA	173	N/A	No	No	Yes	N/A		Yes	Yes
14	03/08/00	1	500	14 Delta Forming	Dallas, DC	21	Sheet Ties	NA	NA	N/A	Yes	No	Yes	N/A	166-E4/2083	Yes	Yes
15	03/08/00	5	5100	15 Vya Dux	Georgetown, WV	1125	GreatWall Gravel/road Base Mat Subsoil	Table 4, Division not tracked	NA	NA	Yes	Yes	Yes	N/A	red list item see subassembly application in the data	Yes	Yes
16	03/08/00	5	5100	16 Vya Dux	Billings, MO	1161	GreatWall DP Gravel/road Base Mat Subsoil	Table 4, Division not tracked	NA	NA	Yes	Yes	Yes	N/A	red list item see subassembly application in the data	Yes	Yes
17	03/08/00	5	5100	17 Vya Dux	Billings, MO	1161	Extra-High Yield Drivall Gravel	Table 4, Division not tracked	NA	NA	Yes	Yes	Yes	N/A	red list item see subassembly application in the data	Yes	Yes
18																	
19	04/08/00	1	500	1. Above Metal Shear Supply	Beverly, DC	15	Modifying Inland Shear	Modifying Inland, DC	317	N/A	No	No	Yes	N/A		Yes	Yes
20	04/08/00	1	500	2. DC Brick Metal Materials	Lynchburg, DC	45	Concrete pavers	Chillicothe, DC	85	N/A	No	No	Yes	N/A		Yes	Yes
21	04/08/00	1	500	3. Northward Concrete Shear Supply	Spartanburg	58	Rebar Shear	Spartanburg	8	N/A	No	No	Yes	N/A		Yes	Yes
22																	
23	05/08/00	1	500	1. Cleverbrook Iron works	Abbotsford, BC	51	Fabricated Steel	Table 4, Division not tracked	N/A	N/A	Yes	No	Yes	N/A	166-E2/2088	Yes	Yes
24	05/08/00	1	500	2. Cleverbrook Iron works	Abbotsford, BC	51	Steel bridge beams	Abbotsford, BC	8	N/A	No	No	Yes	N/A		Yes	Yes
25	05/08/00	2	1000	3 Skowhegan	Calgary, AB	675	Skowhegan Steel Structural Service	Table 4, Division not tracked	N/A	N/A	Yes	No	Yes	N/A	166-E2/2088	Yes	Yes
26	05/08/00	2	1000	4 McQueen Thomas	Vancouver, BC	8.82	Steel Frames	Table 4, Division not tracked	N/A	N/A	Yes	No	Yes	N/A	166-E2/2088	Yes	Yes
27	05/08/00	2	1000	5 Iron Age Manufacturing	Vancouver, BC	25	Castles S85000 Wires	NA	NA	N/A	Yes	No	Yes	N/A	166-E3/2088	Yes	Yes
28	05/08/00	2	1000	6 Iron Age Manufacturing	Vancouver, BC	25	Skowhegan steel absorption well	NA	NA	N/A	Yes	No	Yes	N/A	166-E3/2088	Yes	Yes
29	05/08/00	2	1000	7 Iron Age Manufacturing	Vancouver, BC	25	Skowhegan steel fiber racks	NA	NA	N/A	Yes	No	Yes	N/A	166-E3/2088	Yes	Yes
30	05/08/00	2	1000	8 Iron Age Manufacturing	Vancouver, BC	25	Skowhegan steel ballards	NA	NA	N/A	Yes	No	Yes	N/A	166-E3/2088	Yes	Yes
31	05/08/00	1	500	9 K-V-111 Panel System	North Vancouver, BC	18	Headlock	NA	NA	N/A	Yes	No	Yes	N/A	166-E2/2088	Yes	Yes
32																	
33	06/08/00	2	1000	1 Olympic Panel Products	Skilton, WA	228	Formwork B-Plate-MDO	Skilton, WA	246	SW-COC-883337	No	Yes	Yes	Yes	III-E11/2083	Yes	Yes
34	06/08/00	2	1000	2 Shredco	Prattville, DC	258	Glulams	Coalinga, DC	148	SW-COC-881853	No	No	Yes	Yes	N/A	Yes	Yes
35	06/08/00	2	1000	3 Roanoke Panel Products (supplied by Griff Building Supplies)	Roanoke, OR	778	Roanoke Pigeon	Wood, CA	283	SCS-COC-883388	No	No	Yes	Yes	N/A	Yes	Yes
36	06/08/00	2	1000	5 Roanoke Panel Products (supplied by Griff Building Supplies)	Ellis, DC	518	Lumber	South East, DC	118	CU-COC-815838	No	No	Yes	Yes	N/A	Yes	Yes
37	06/08/00	2	1000	3 Pioneer Valley Building Supplies	Hinton, DC	51	Pigeon			SGSNA-COC-88932	No	Yes	Yes	N/A		Yes	Yes
38	06/08/00	2	1000	6 Kalsbeek's Lumber Co.	Thames, DC	483	Lumber	Nelson, BC	48	SW-COC-884648	No	No	Yes	Yes	N/A	Yes	Yes
39	06/08/00	2	1000	7 Roanoke Panel Products (supplied by Dick's Curtis Lumber)	Roanoke, OR	778	Roanoke Pigeon	Wood, CA	283	BA-COC-884651	No	No	Yes	Yes	N/A	Yes	Yes
40	06/08/00	2	1000	8 Woodland Parcel	Vancouver, BC	4.5	Pigeon			SW-COC-882288	No	Yes	Yes	Yes	166-E11/2083	Yes	Yes
41	06/08/00	2	1000	9 Pacific Woodworking Ltd	Beverly, DC	16	Valuform Room wallwork	Madison, OR	718	SW-COC-883236	No	No	Yes	Yes	N/A	Yes	Yes
42	06/08/00	2	1000	10 Pacific Woodworking Ltd	Beverly, DC	16	Workroom Wallline	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
43	06/08/00	2	1000	11 Pacific Woodworking Ltd	Beverly, DC	16	Great Hall Wallwork	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
44	06/08/00	2	1000	12 Pacific Woodworking Ltd	Beverly, DC	16	Flow Room 182	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
45	06/08/00	2	1000	13 Pacific Woodworking Ltd	Beverly, DC	16	Classroom Hillwork	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
46	06/08/00	2	1000	14 Pacific Woodworking Ltd	Beverly, DC	16	Reform Die	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
47	06/08/00	2	1000	15 Pacific Woodworking Ltd	Beverly, DC	16	Tailor partition	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
48	06/08/00	2	1000	16 Pacific Woodworking Ltd	Beverly, DC	16	Service panels	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
49	06/08/00	2	1000	17 Pacific Woodworking Ltd	Beverly, DC	16	Revised Hillwork	Klamath Falls, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
50	06/08/00	2	1000	18 Pacific Woodworking Ltd	Beverly, DC	16	Litework Hillwork	Madison, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
51	06/08/00	2	1000	19 Pacific Woodworking Ltd	Beverly, DC	16	Great Hall Sliding Door	Maple Ridge, BC	58	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
52	06/08/00	2	1000	20 Pacific Woodworking Ltd	Beverly, DC	16	Reception Desk	Klamath Falls, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
53	06/08/00	2	1000	21 Pacific Woodworking Ltd	Beverly, DC	16	Workroom Counterlegs	Klamath Falls, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes
54	06/08/00	2	1000	22 Pacific Woodworking Ltd	Beverly, DC	16	Cardstock separator	Klamath Falls, OR	718	SW-COC-883238	No	No	Yes	Yes	N/A	Yes	Yes

40 folders, 368 Files = 1, Excel Tracking Document = 274 Materials

YOU CAN'T COLLABORATE ENOUGH

- Living buildings require special relationships
- Trust
- Transparency in workflow
- Avoid compartmentalizing and separating ideas or strategies or disciplines



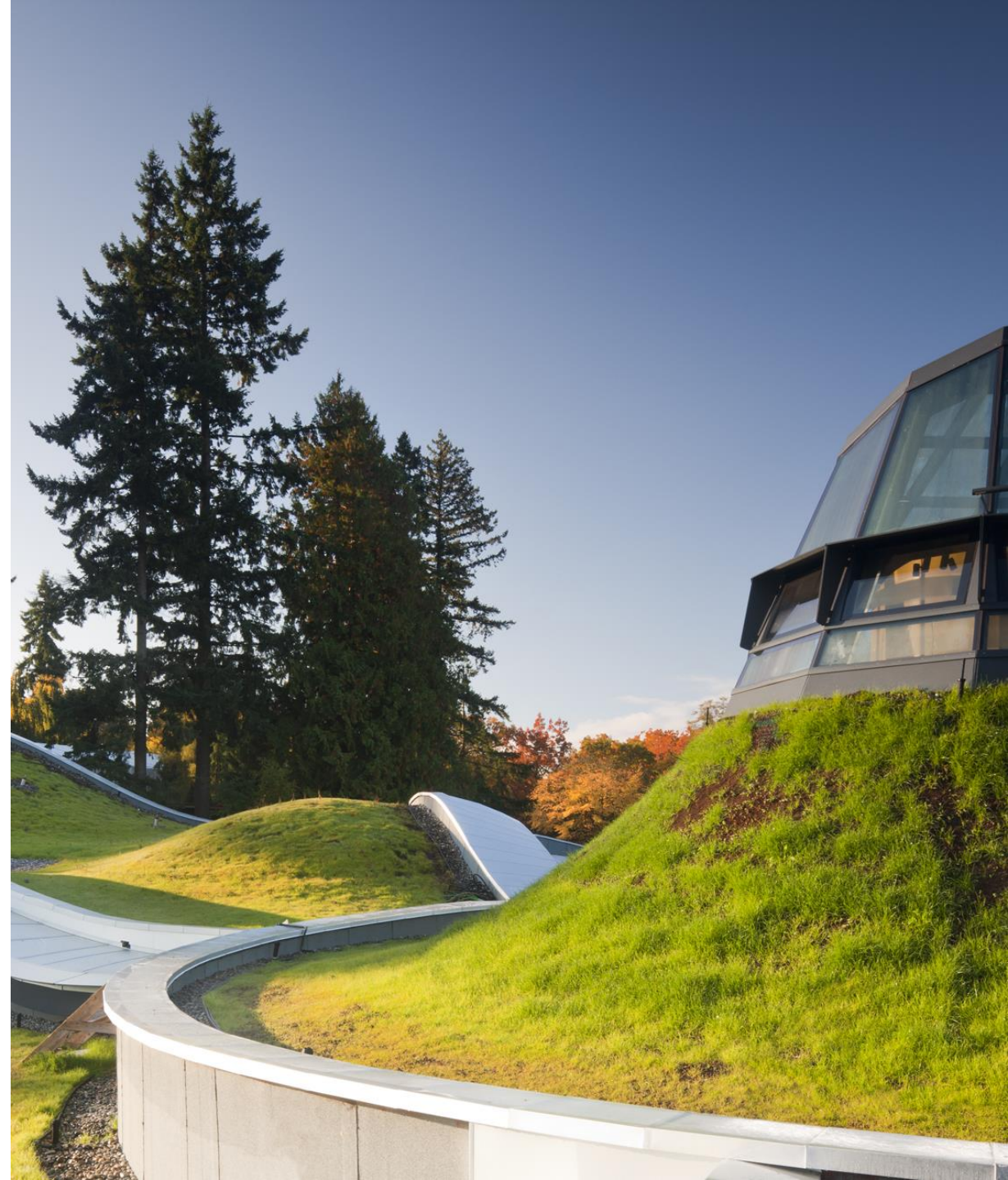
IT'S A FINE BALANCE

- Occupants and operations program are significant
- How do you account for flexibility and change over time?
- In an effort to simplify, did we add complexity?



LIVING BUILDINGS ARE CHANGING THINGS

- Occupant feedback confirms people love their spaces for all the reasons we hoped they would
- Experience is education
- Advocacy works





Elementary School Project

THANK YOU!

Fantastic
come to the visitor
centre and experience
the magic in curves.