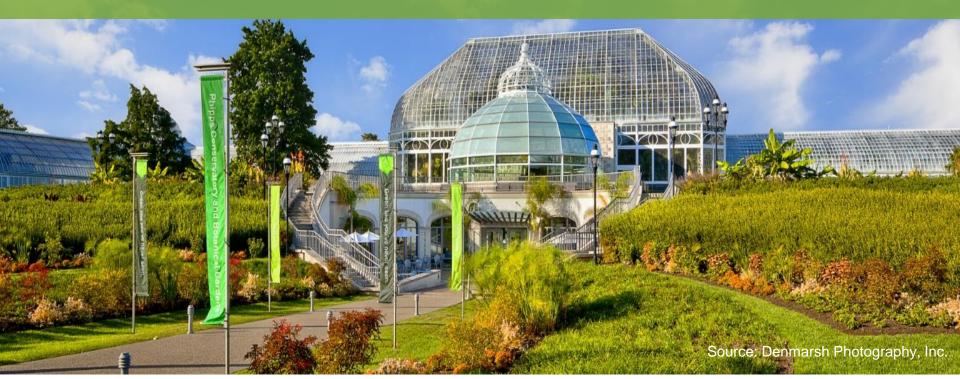


What Does Good Look Like? Getting the Green Building You Want



Richard V. Piacentini Executive Director richard@phipps.conservatory.org Jason Wirick Director of Facilities and Sustainability jwirick@phipps.conservatory.org **Meghan Scanlon**

Wellness and Sustainability Specialist mscanlon@phipps.conservatory.org







Unsustainable Use of Natural Resources and Exponential Population Growth

Climate Change, Habitat Destruction, Loss of Biodiversity

Symptoms Not the Cause

How do we get people to care about the environment?



Traditional Botanical Garden Response



Plant Collection



Ethnobotany



Seed Banks



in situ



ex situ



Educational Programs





Source; Chris Jordan/Flickr

It is a Life Style Issue The Western Way



Equity and Social Justice



Shift Thinking – Outcome to Values



Sources: Annie O'Neill Denmarsh Photography, Inc. Renee Rosensteel

Why Buildings? The Typical Building – Health and Environment are an Afterthought

90%

Many Environmental, Human Health, Social Justice and Equity Issues can be Addressed in the Built Environment



Can the Rating Systems Help?

Turn Values Into Goals

- ✓ Living Building Challenge
- ✓ Certified Net-Zero Energy
- ✓ LEED
- ✓ Sustainable SITES
- ✓ WELL Building

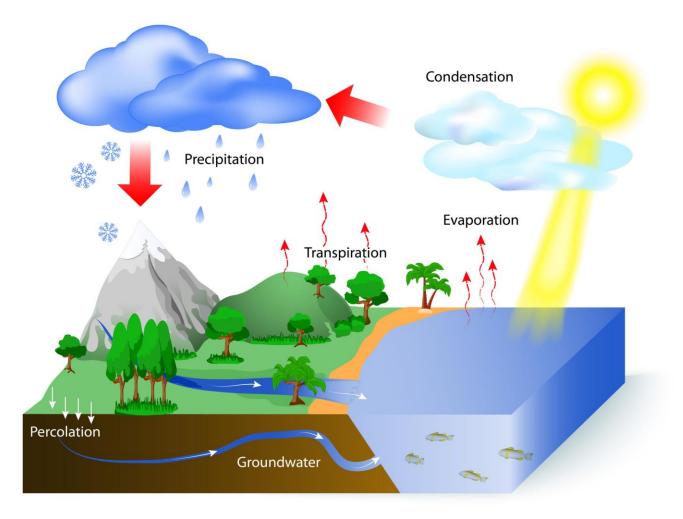


Four Different Paradigms for Interacting with the World

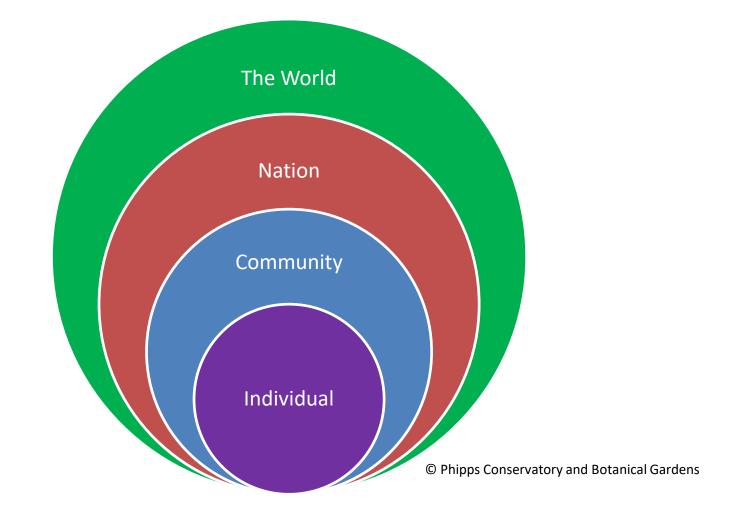
Extractive	Less Bad	Do Good	Regenerative
About Me	About Us Inter-connected	About Us Reciprocity	About Us System
Fragments	Fragments Stabilize them	Fragments Improve them	Whole

Source: Carol Sanford

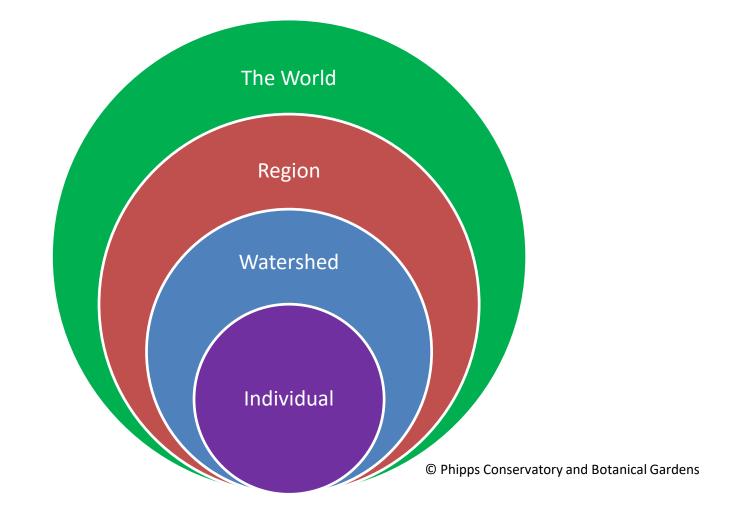
Nature Works in Systems

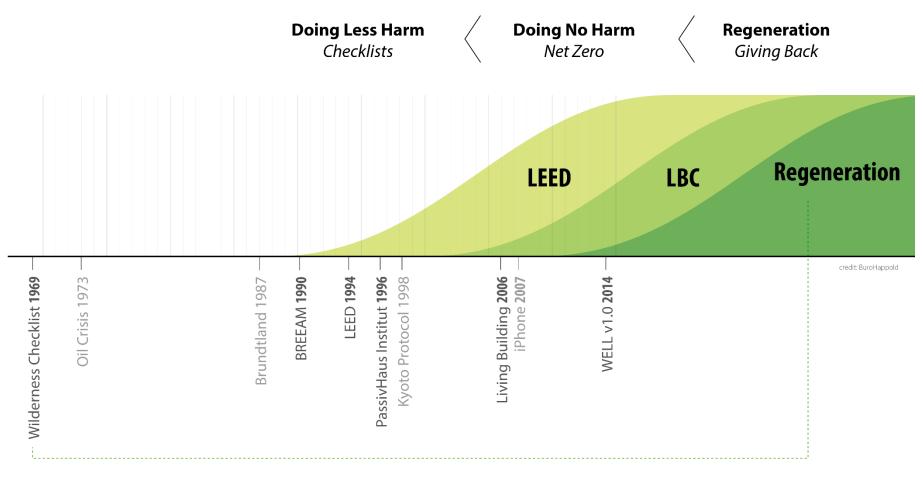


Focus on Human – Nested Systems



Focus on Natural - Nested Systems





Source: BuroHappold

Phipps Conservatory, Schenley Park, Pittsburg, Pa.

1893





First LEED Visitor Center in a Public Garden A Conservatory with no Greenhouse Effect First LEED Greenhouses (Platinum EBOM)

Center for Sustainable Landscapes

Source: Denmarsh Photography, Inc.







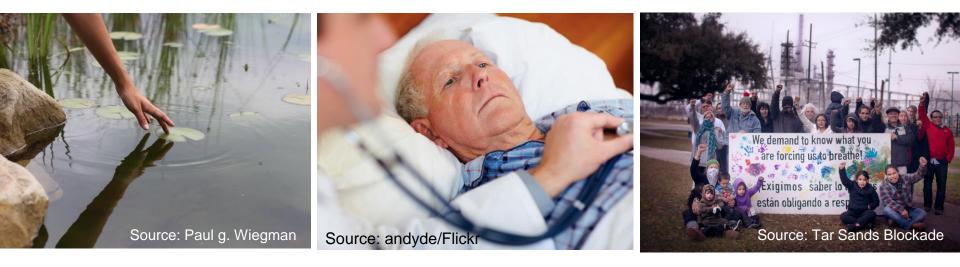








Turn Values Into Goals



Environment

Human Health

Social Justice and Equity

Contract for Success

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Typical Design Process – Designed to Fail

RFP

• Idea usually based on function

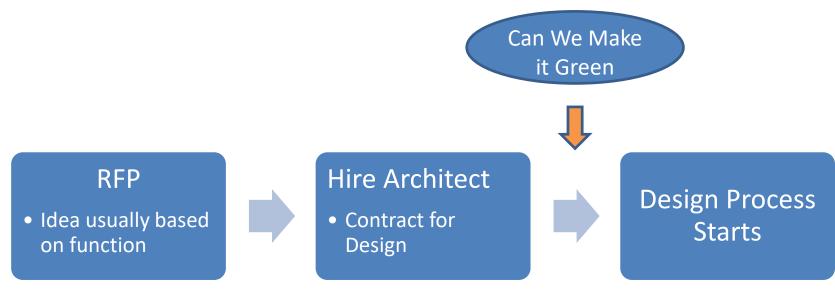
Hire Architect

• Contract for Design to meet function

Design Process Starts

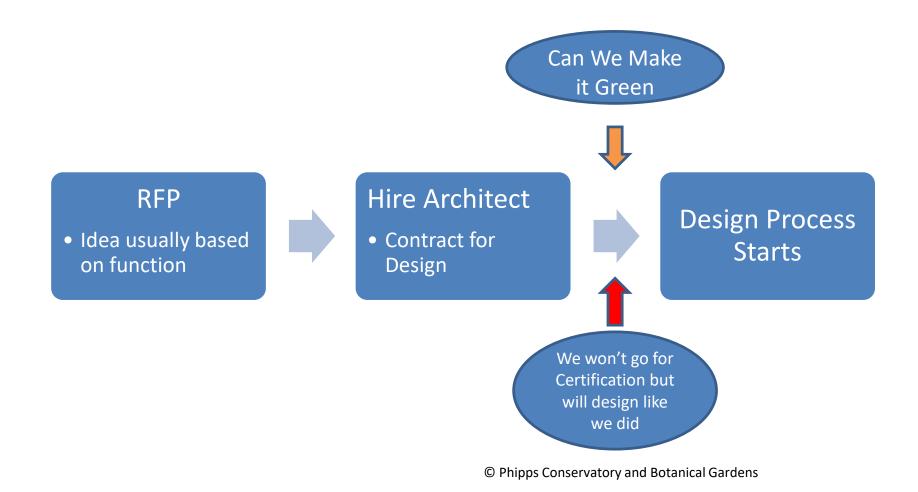
© Phipps Conservatory and Botanical Gardens

Typical Design Process – Designed to Fail



© Phipps Conservatory and Botanical Gardens

Typical Design Process – Designed to Fail



Ideal Design Process – Designed to Succeed

RFP

 Idea based on function, values and goals

Hire Architect

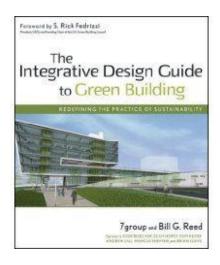
• Contract for Design to meet function, values and goals

Design Process Starts

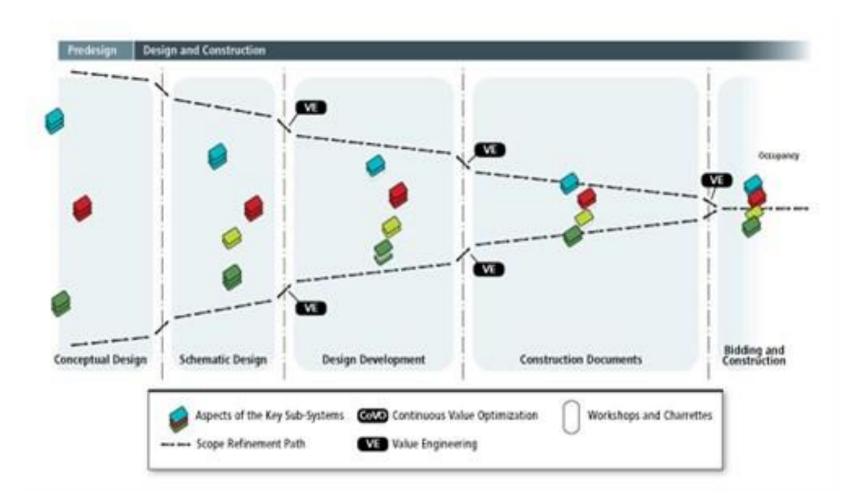
© Phipps Conservatory and Botanical Gardens

An **integrated design process** (IDP) involves a holistic approach to high performance building, design, and construction. It relies upon every member of the project team sharing a vision of sustainability, and working collaboratively to implement sustainability goals.

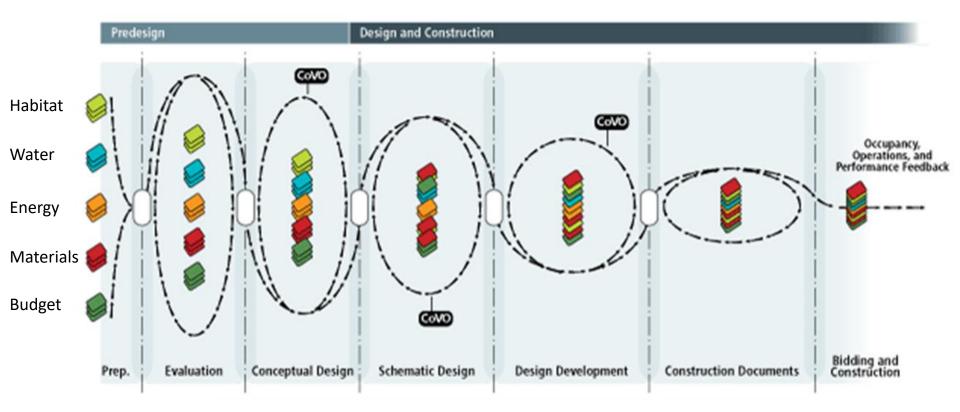




The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability by 7group and Bill Reed



Source: © 2009 7group and Bill Reed







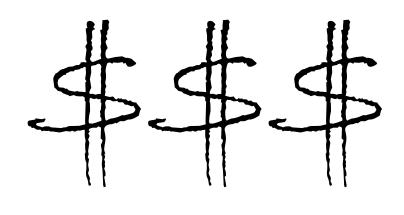


Rating Systems are Worth the Cost



Institutional Thinking Long Term Value vs. Short Term Costs

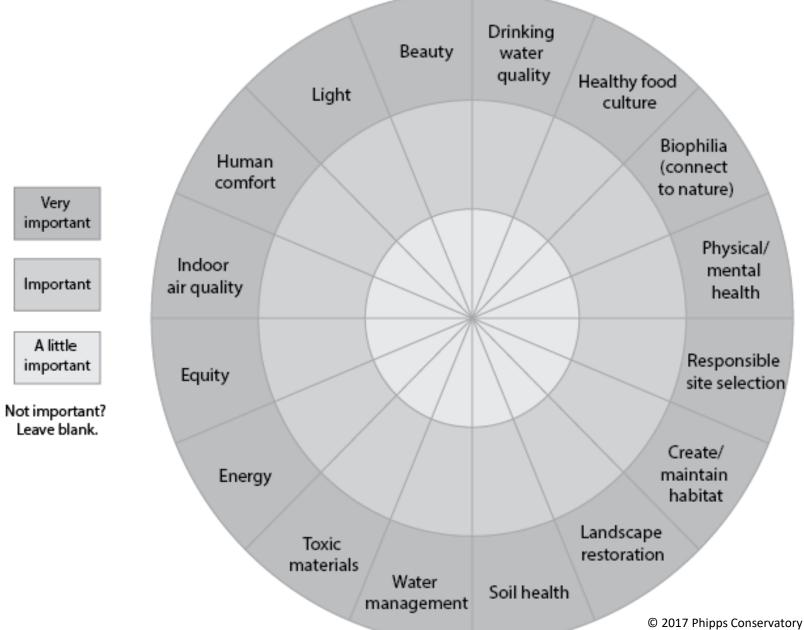
Your Mission Your Aspirations Your Role in the Community Your Role in the World



What is the Long Term Costs of Operating the Building Over the Next 100 Years

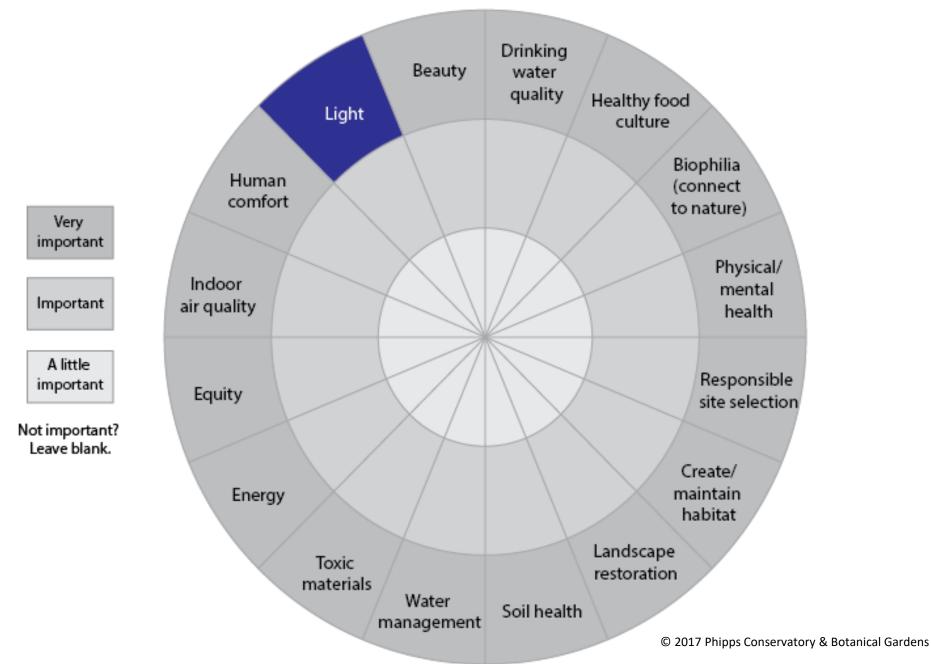


in your project?

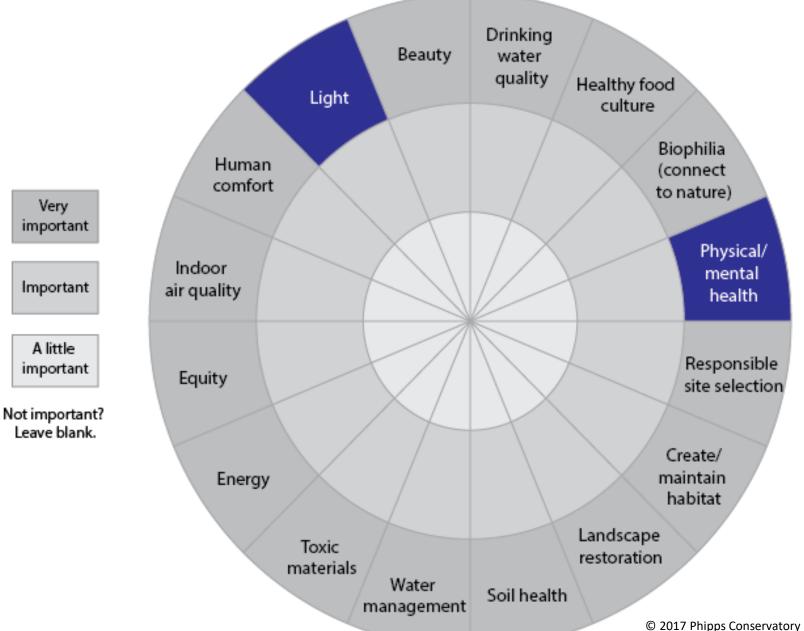


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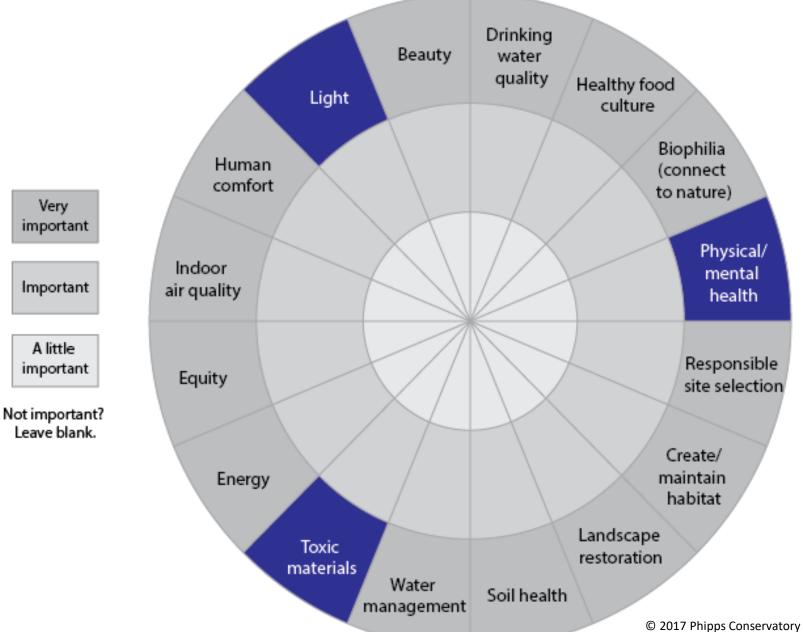
in your project?



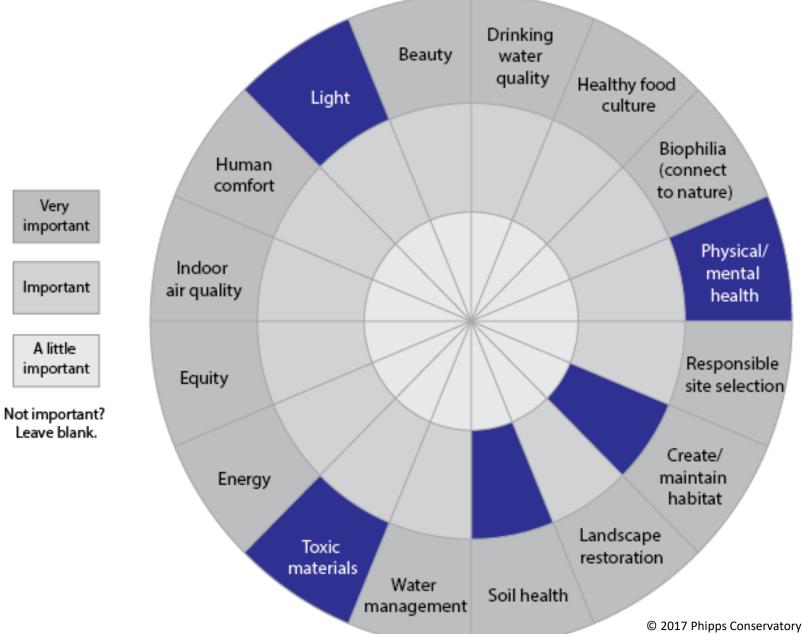
in your project?



in your project?

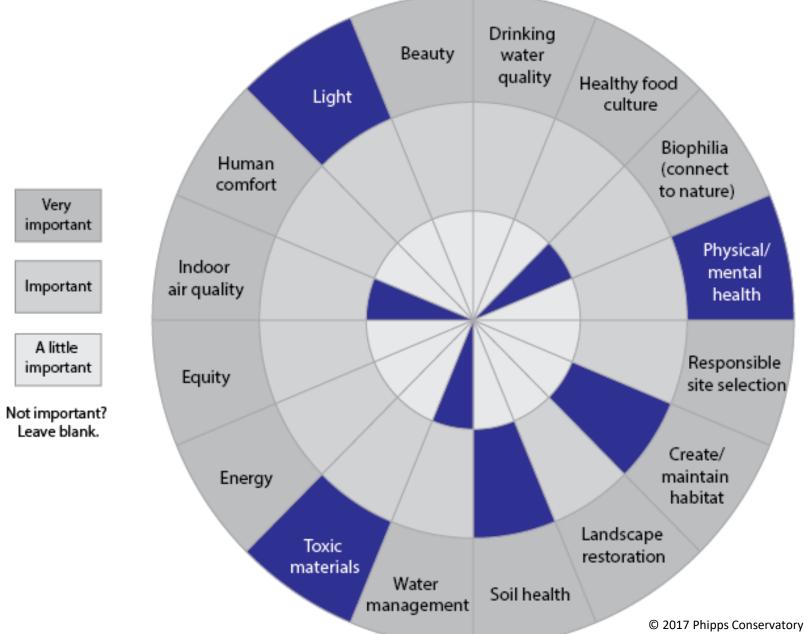


in your project?



© 2017 Phipps Conservatory & Botanical Gardens

in your project?



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LEED Credits

Points Available

- Location and Transportation
- Water Efficiency
- Materials and Resources
- Innovation

- Sustainable Sites
- Energy and Atmosphere
- Indoor Environmental Quality
- Regional Priority

Location and Transportation

Alternative transportation
Site context and density



Energy and Atmosphere Energy efficiency Renewable power Performance verification

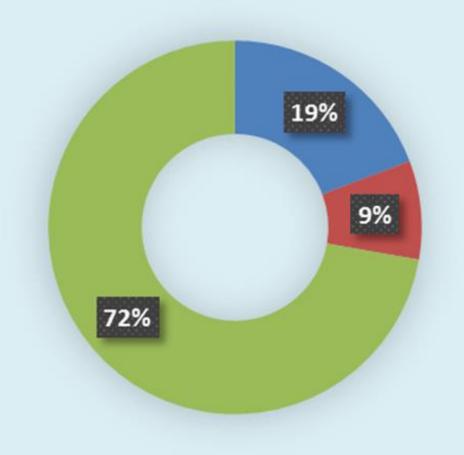
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LEED at the CSL



LEED at the CSL

2015: CSL - Annual Water Usage



 Potable Water Usage (Drinking, Handwashing)

Reuse Water - Irrigation

Reuse Water - Toilet Flushing

LEED at the CSL

Yea	ar 1	Year 2							
Renewables	133,301 kwh	Renewables	133,891 kwh						
Building Usage	129,876 kwh	Building Usage	122,706 kwh						
Net	+3,425 kwh	Net	+11,185 kwh						
EUI	20 kbtu/sf/yr	EUI	19 kbtu/sf/yr						

LEED: Resource

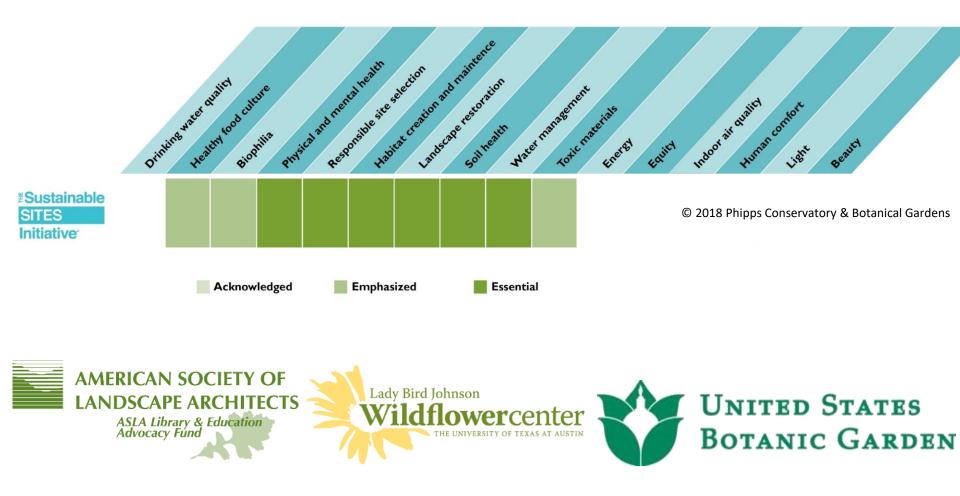
efficiency + high performance

Source: Paul g. Wiegman

www.usgbc.org/leed

	Drinking water	eater food call	ure mis physic	cal and mes	traineaters	election and	and mainteners	stion stion realth	a managery	-materials	81 Equit	a Indos	st air quality	an confort	Beaut	
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Points Available

Site context

SITES

Credits

- Site design water
- Site design materials selection
- Construction
- Education + performance monitoring

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Site design - human health + well-being

Site design - soil + vegetation

Pre-design assessment + planning

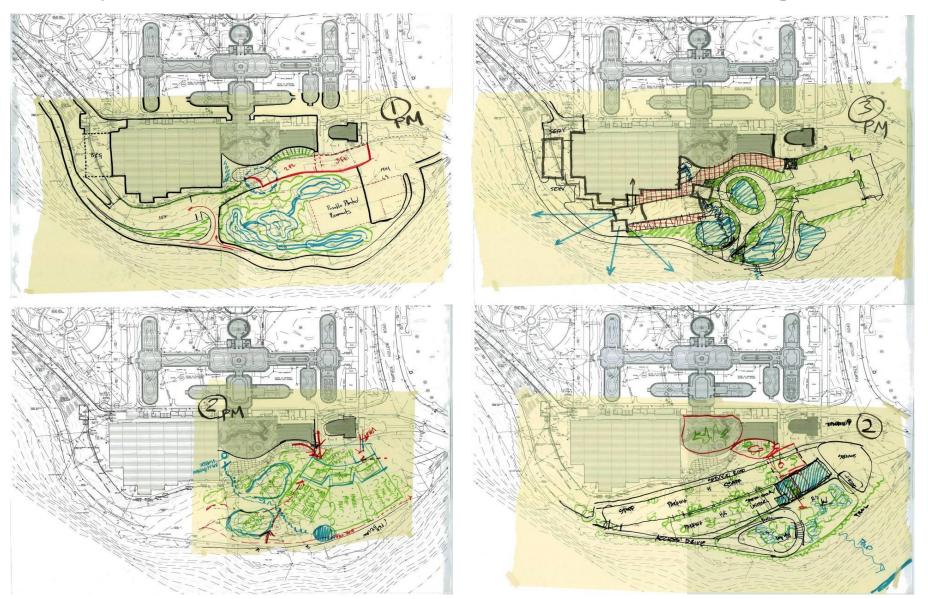
- Operations + maintenance
- Innovation or exemplary performance

Every project holds the potential to conserve, restore and create the benefits provided by healthy ecosystems.

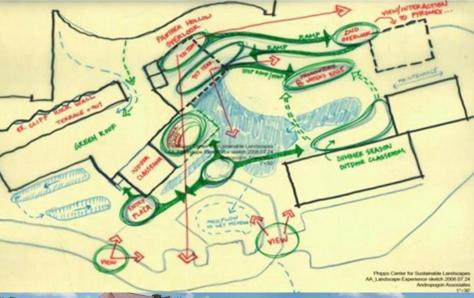


Integrative Design Process

Uses systems oriented approach to problem solving



SITES at the CSL







Source: Paul g. Wiegman

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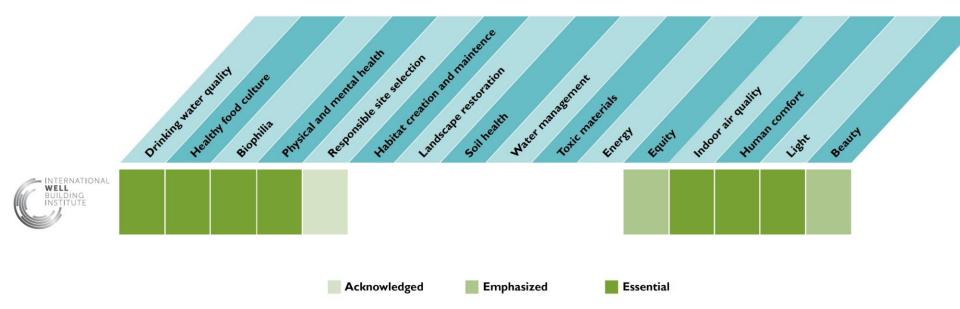
And Miles

SITES: Ecosystem health

http://www.sustainablesites.org/

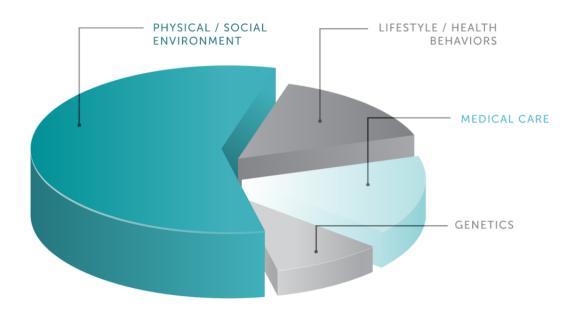
Source: Paul g. Wiegman

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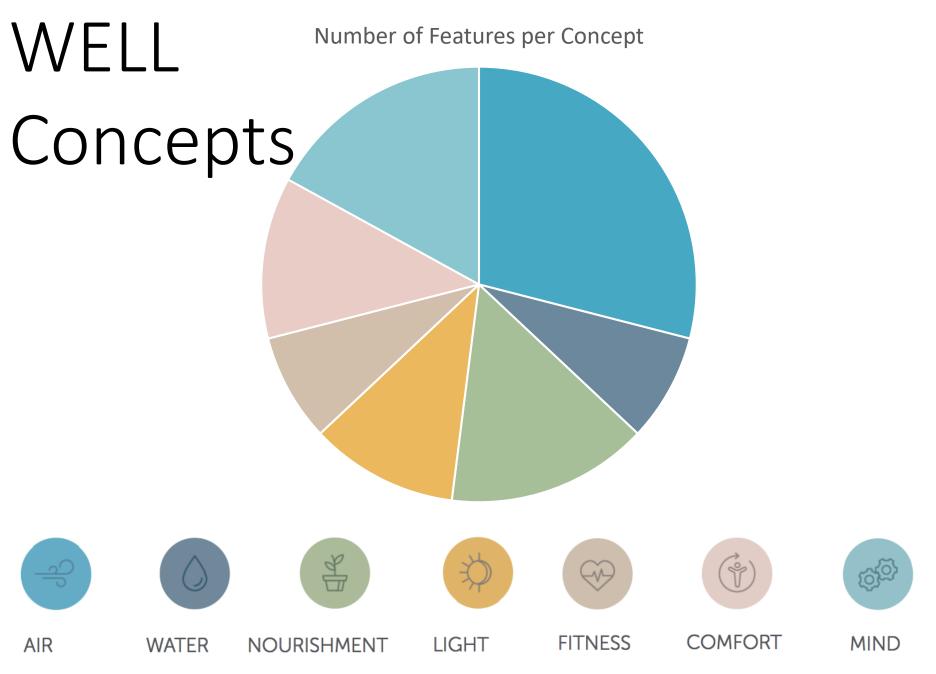


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WHAT DETERMINES THE STATE OF HEALTH?



Source: Centers for Disease Control and Protection. Frequently Asked Questions. 2014. Available online at: http://www.cdc.gov/nchhstp/socialdeterminants/fag.html



Source: International WELL Building Institute

AIR

Breathe easy with optimal indoor air quality

- Material selection
- Ventilation
- Filtration
- Moisture control
- Maintenance and operations
- Source of concern protection
- Construction purposes

NOURISHMENT

Dig in to wholesome foods. WELL Certified[™] buildings limit the presence of unhealthy ingredients and can encourage better eating habits.

- Healthy portions
- Mindful eating

A.

- Food production
- Access to healthy foods

- Food preparation
- Allergies and alternatives
- Transparency
- Environmental Cues and influencers

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MIND

Stay centered: WELL helps support cognitive and emotional health through design, technology and treatment strategies.

- Stakeholder engagement
- Transparency
- Wellness awareness and protocols

- Connection to nature
- Adaptable spaces
- Altruism

WELL at the CSL





Building Costs

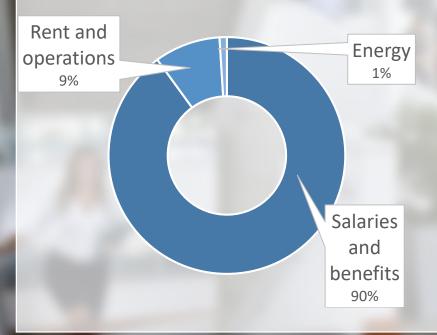
First costs (one time)

Operations Costs (ongoing)

Photo credit: Denmarsh Photography, Inc

WELL is healthy + happy + productive

Operating Expenses



Cost of WELL Certification

\$1-4/sf one time cost

Benefit of WELL Certification

1% reduction in turnover

\$1.50-\$2.50/sf per year

2% reduction in absenteeism

\$1-2/sf per year

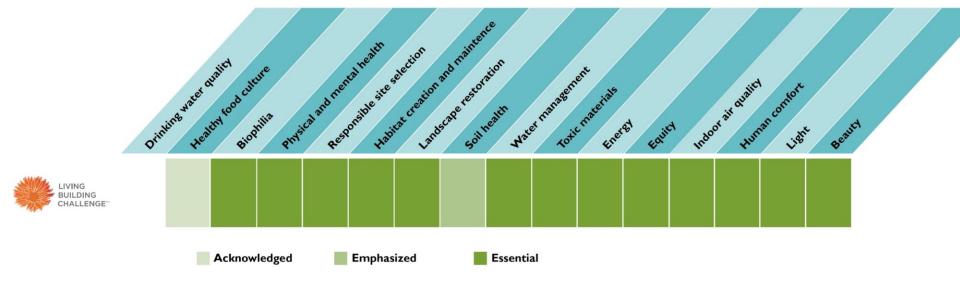
Sources:

Urban Land "Making the Case for Health: Insights from the First WELL Projects" 2017 Knoll Workplace Research "What's Good for People, Moving from Wellness to Well-Being" 2014

WELL: Human health

www.wellcertified.org

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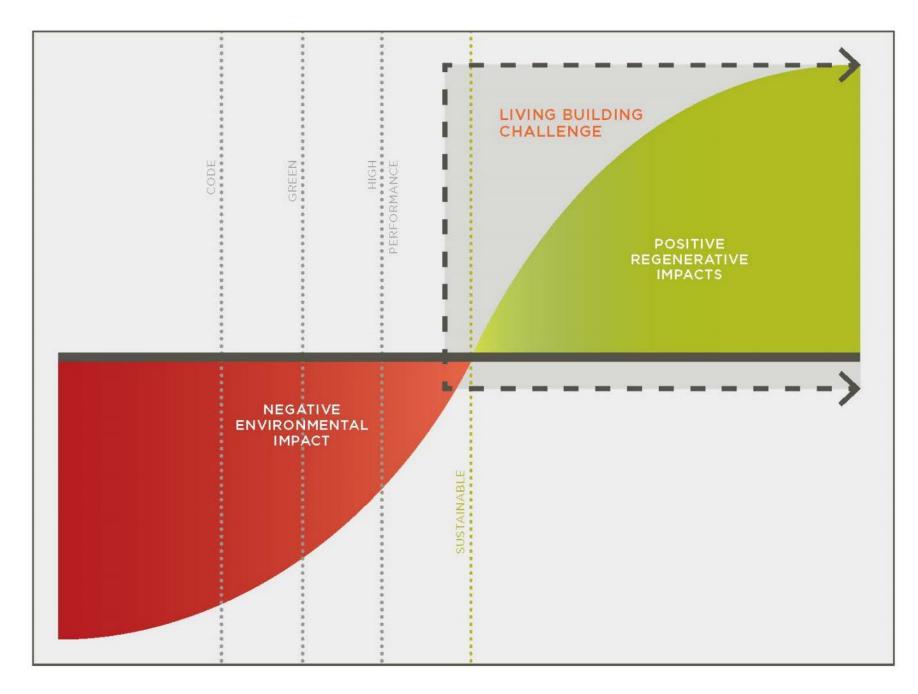


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Instead of a world that is merely a less bad version of the one we currently have, we ask a simple and profound question—

WHAT DOES GOOD LOOK LIKE?

Source: International Living Future Institute



Living Building Challenge



NATE

PLACE

ENERGY

Envisions a Society that is Culturally Rich, Socially Just, and is Ecologically Restorative

IMPERATIVES

LIMITS TO GROWTH URBAN AGRICULTURE HABITAT EXCHANGE HUMAN POWERED LIVING

NET POSITIVE WATER

NET POSITIVE ENERGY

CIVILIZED ENVIRONMENT

HEALTHY INTERIOR ENVIRONMENT

BIOPHILIC ENVIRONMENT EMBODIED CARBON FOOTPRINT

RESPONSIBLE

RED LIST

LIVING ECONOMY SOURCING

NET POSTIVE WASTE

HUMAN SCALE + HUMANE PLACES

UNIVERSAL ACCESS TO NATURE + PLACE EQUITABLE INVESTMENT JUST

ORGANIZAITONS

BEAUTY + SPIRIT INSPIRATION + EDUCATION

Source: International Living Future Institute ENERGY

NET POSITIVE ENERGY





One hundred and five percent of the project's energy needs must be supplied by on-site renewable energy on a net annual basis, without the use of on-site combustion. Projects must provide on-site energy storage for resiliency.

> Solar array at The Hawaii Preparatory Academy Energy Lab, Kamuela, HI Photo: Matthew Millman Photography / Courtesy: Flansburgh Architects

WATER IN HARMONY WITH SITE Natural Water Flows 100% On-Site Water 100% On-Site Treatment

RED LIST





There are temporary exceptions for numerous Red List items due to current limitations in the materials economy. Refer to the v3.1 Materials Petal Handbook for complete and up-to-date listings.

The project cannot contain any of the following Red List materials or chemicals:²³

- Alkylphenols
- Asbestos
- Bisphenol A (BPA)
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorobenzenes
- Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs)
- Chloroprene (Neoprene)
- Chromium VI
- Chlorinated Polyvinyl Chloride (CPVC)
- Formaldehyde (added)
- Halogenated Flame Retardants (HFRs)
- · Lead (added)
- Mercury
- Polychlorinated Biphenyls (PCBs)
- Perfluorinated Compounds (PFCs)
- Phthalates
- Polyvinyl Chloride (PVC)
- Polyvinylidene Chloride (PVDC)
- Short Chain Chlorinated Paraffins
- · Wood treatments containing Creosote, Arsenic or Pentachlorophenol
- Volatile Organic Compounds (VOCs) in wet-applied products ²⁴
- 23 A link to the list of CAS registry numbers that correspond with each Red List item is available in the v3.1 Materials Petal Handbook.
- 24 Wet-applied products (coatings, adhesives, sealants) must not exceed specific VOC levels. Refer to the v3.1 Materials Petal Handbook for details.

Source: International Living Future Institute

Chloroprene (Necorene) Chlorinated Polyethylene (Cpe) Chiorinated Polyethylene (Cpe. Tyrin) Chlorinated Polyvinyl Chloride (Covc) Pentachlorophenol Polyvinyl Chloride (Pvc) Neoprene Mercurous Chloride Magnesium Arsenate Copper Arsenate Potassium Arsenite (Ash3O4 Xk) Cupric Acetoansenite Gallium Arsenide Arsenic Pentoxide Arsenic Disulfide Arsenic Trisulfide Arsenic Trioxide Sortium Arsonate Triethyl Arsenate Ammonium Copper Arsenate Arcanazo III Arsenic V Arsenic III Arsenic (Trivalent) Calcium Arsenite Sodium Arsenate (Ash3Od Xna) Arsenic Acid Calcium Arsenate [2Ash3O4.2Ca] Arsenic Trichloride Potassium Arsenate Sodium Arsenite Imazapyr (Arsenal) Cadmium Acetate, Dihydrate Cadmium Nitrate, 4-Hydrate Cadmium Chloride, Anhydrous Cadmium Sulfate, Anhydrous Cadmium Oxid Cadmium Sulfide Cadmium Hexafluor Cadmium Stearate Cadmium 2-Ethylhexanoate Cadmium Carbonate Cadmium Cvanide Cadmium Acetate Cadmium Cadmium Bromide Cadmium Chloride, 2.5 Hodrate Cadmium Eluorida Cadmium lodide Cadmium Sulfate, Hydrate Lead Arsenite Lead Nitrate Lead lodide Chromium Lead Silicate Lead Silicate Lead Chromate Molybdate Sulfate Red Lead Dioxide Lead Oxide, Red Lead Sulfide Lead Oxide (Litharge) Lead Sub-Carbonate Lead Sub-Acetate Lead Azide Lead Fluoborate Lead-210 Lead, Isotope Of Mass 214 1,3-Benzenediol, 2,4,6-Trinitro-, Lead Salt Lead(II) Methanesulphonate Cyclo-Dic-Ovo(-Phthalato)Trilead Lead Fluorosilicate Lead Acetate Lead Tetraacetate Lead Thiocyanate Lead Carbonate Lead Acetate, Trihydrate (1.2-Benzenedicarboxylato(2-))Dioxotrilead Lead Stearate Lead Lead Sulphate Lead Phosphate Lead Chloride Lead Chromate Lead Fluoride Lead Arsenate Mercuric Nitrate **Dimercury Dichloride** Mercury, Ammoniated Phenyl Mercuric Propionate Mercurous Nitrate Nethyl Mercury Chloride Hydroxymethyl Mercury 2-Methoxyethylmercury Chloride Dimercury Dicyanide Oxide Mercuric Sulfide

Methoxyethylmercuric Acetate Mercurous Oxide Mercuric Acetate Mercuric Oxide Ethylmercuric Phosphate Mathul Morcury (Mehn)

Dimethyl Mercury Phenylmercuric Acetate Ethylmercury Fulminate De Mercure Mercury Mercuric Chloride (Hocl2) Mercuric Iodide, Red Mercurous Nitrate, Monohydrate Mercuric Sulfate Mercuric Bromide Melamine Formaldehyde Urea Formaldehyde Sodium Polynapthalenesulfonate Formaldehyde Cyanohydrin Formaldehyde, Polymer With Phenol, Potassium Salt 4-Toluenesulfonamide Formaldehyde Resorcinol Formaldehyde Toluenesultonamida Formaldabuda Melamine-Urea-Formaldehyde (Muf) P-Tert-Butylphenol Formaldehyde Urea Phenol Formaldehyde Urea Extended Phenol-Melamine Formaldehyde Resin Phenol-Resorcinol-Formaldehyde Resin (Prf) Xylene Formaldehyde Ammonia-Urea-Formaldehyde Phenol. Polymer With Formaldehyde, Glycidyl Ether O-Cresol Formaldehyde Epoxy Paraformaldehyde Formaldehyde, Polymer With 4-(U-Dimethylethyl) Phenol, Methyloxirane And Oxirane (9Ci) Naphthalenesulfonic Acid. Formaldehyde Polymer. Calcium Salt Formaldehyde Butylated Polyoxymethylene Urea Formaldehyde, Melamine Polymer, Methylated Cresol Formaldehyde Rosin, Formaldehyde, Fumaric Acid Polymer Potassium Salt Phenol Formaldehyde Polymer Hexamethylenetetramine Cross-Linked Formaldehyde, Polymers With Isobutylenated Phonol Formaldehyde, Urea Adduct Benzenesulfonic Acid, 4-Hydroxy-, Polymer With Formaldehyde And 4,4"-Sulfonylbis(Phenol), Socium Salt (9Ch) Formaldehyde, Compd With Monosodium Sulfite (20) Phenol Formaldehyde Naphthalenesulfonic Acid, Polymer With Formaldehyde, Potassium Salt Naphthalenesulfonic Acid, Formaldehyde Polymer Ammonium Salt Melamine Formaldehyde Extract Residues (Coal), Creosote Oil Acid Creosote Oil Creosote Oil Creosote Oil, Low-Boiling Distillate Creosote Coal Tar Wood Creosot Creosote Oil, Acenaphthene Fraction Lead Sulfochromate Yellow (C.I. Pigment Yellow 34) Creosote Oil, Acenaphthene Fraction, Acenaphthene Residues (Coal Tar), Creosote Oil Distn. Bromobiohenvi Decabromodiphenyl Ether (Decabde Bde-209) 2.4.6-Tribromophenol Phosphoric Acid Mixed 3-Bromov2 2-Dimethyloropy And 2-Bromoethyl And 2-Chloroethyl Esters Tris (2.3-Dibromopropyl) Phosphate Alpha-Hexabromocyclododecane (&Alpha-Hbcd) Beta-Hexabromocyclododecane (Åžá²-Hbcd) Gamma-Hexabromocyclododecane (Åžá*-Hbcd) Decabromobiphenyl Cyclododecane, 1,2,5,6,9,10- Hexabromo-(IR 2R 5R 65 9R 105)-Dibromostyrene Copolymer (Firemaster Cp44-Hf & Pbs-64Hw) 2.2'.3.4.4'-Pentabromodiphenyl Ether (Bde 85) 2-Ethylhexyl-2.3.4.5-Tetrabromobenzoate (Tbb Or Eh-Tbb) 2.2',4,4',6-Pentabromodiphenyl Ether (Bde-100) 2.2'.3.4'.5.6'-Heptabromodiphenyl Ether (Bde-183) Tris (Tribromoneopentyl) Phosphate 2-Hydroxy-Propyl-2-(2-Hydroxy-Ethoxy)-Ethyl-Tbp 2.2',4,4',5,6'-Hexabromodiphenyl Ether (Bde-154) 2,2',3,4,4',5',6-Heptabromodiphenyl Ether (Octabde Bde-183) Tetrabromobisphenol A Bis(2,3-Dibromopropyl) Ether (Toboa-Dboa) Disodium Tetrabromoohthalate Hexabromocyclodecane (Hbcd) Hexabromocyclododecane (Hbcd, Hbcdd) Bis(2-Ethyl-1-Hexyl)Tetrabromophthalate (Tbph Or Behtbo)

Hexabromocyclododecane (Hbcdd)

Pentabromodiphenyl Ether (Pentabde)

Octabromodiphenyl Ether (Octabde)

tholono Ris/Tatrahe

Dhon

Methylmercuric Dicyanamide

Mercuric Cyanide

Mercury Thiocyanate

Tetrabromoethylcyclohexane [Tbech] 2.3-Dibromopropyl-2.4.6-Tribromophenyl Ether (Dote Or Tho-Dhoe) Hexabromobiphenyl Hexabromodiphenyl Ether (Hexabde) 1,2-Bis(2,4,6-Tribromophenoxy)Ethane (Btbpe)) Tetrakis(2-Chloroethyl)Dichloroisopentyldiphosphate (V6) Tetrabromodiphenyl Ether (Tetrabde Bde-47) 2,4,4'-Tribromodiphenyl Ether (Bde-28) Bis(2-Hydroxyethyl Ether) (Tbbpa)] 2.2' 3.3' 4.5' 6-Heptabromodiphenyl Ether (Bde-175) Tribromodiphenyl Ethe Hexachlorocyclopentadienyl-Dibromocyclooctane (Dibhc-Totd Or Hodibco) Bis(2.3-Dibromopropyl)Phosphate 2.2'.4.4'-Tetrabromodiphenyl Ether (Bde-47) Tribromostyrene Tetradecabromo (P-Diphenoxybenzene) 2.4.5.2" 4" 5"-Havahromohinhanvi Pentabromo-Benzyl-Acrylate, Polymer Tetrabromobiphenyl 2.2' 4.4'.5-Pentabromodiphenvil Ether (Bde-99) Tetrabromophthalic Anhydride Nonabromodiphenyl Ether (Nonabde) Phenol. 2.4.6-Tribromo- Carbonate (2:1) 2.2',4.4',5.5'-Hexabromodiphenyl Ether (Bde-153) 2.2'-{(1-Methylethylidene)Bis{(2.6-Dibromo-4.1-Phenylene) Heptabromodiphenyl Ether (Heptabde) 2.4.6-Tribromophenyl Terminated Carbonate Oligomer 11.3-Trichloro-1.2.2-Trifluoropropane (Hcfc-233Cb) 1,2-Benzenedicarboxylic Acid, 3,4,5,6-Tetrabromo-, Mixed Esters With Diethylene Glycol And Propylene Glycol Tetrabromobisphenol A (Tbbpa) Decabromodiphenylethane (Dbdpe) Pentabromoethylbenzene (Pbeb) Hexabromobenzene (Hbb) Pentabromotoluene (Pbt) Benzene, Ethenyl-, Homopolymer, Brominated Dibromobiphenvl Carbonic Dichlorida Rohmar With 4.4'-/LMathulathu-Idana/Eliz/2.6- Dibromonhanal) And Ehanal Di(2-Ethylhexyl)Phthalate (Dehp) Ditridecyl Phthalate (Dtdp/Ditp)
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 Monochlorador propingia (ser (H1-37))
 23.1 ° Fandhorador (H1-67)
 23.1 a forsechlarador (H1-67)

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 23.2 a forsechlarador (H1-67)
 23.4 a forsechlarador (H1-67)

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 23.2 a forsechlarador (H1-67)
 23.4 a forsechlarador (H1-67)

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 23.5 a forsechlarador (H1-67)
 23.4 a forsechlarador (H1-67)

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 23.6 a forsechlarador (H1-67)

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 23.1 a forsechlarador (H1-67)

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 Dilsodecyl Phthalate (Didp) Disoheptyl Phthalate (Dihp) Diethyl Phthalate (Dep) Disobutyl Phthalate (Dibp) Dibutyl Phthalate (Dbp) Di-N-Hexylphthalate (Dnhp) Butyl Benzyl Phthalate (Bbp) Disoundecyl Phthalate (Diup) Chicagodic Acid Tris/2,Chloroathy() Phosphate (Tran) Dechlorane Plus (Dp) Tris(1-Chloro-2-Propyl)Phosphate (Tcpp, Tmcp) Chlorinated Tris (Tdcpp, Tdcp) Tris(2-Chloropropyl) Phosphate Tris(2.3-Dichloro-I-Propyl)Phosphate Short Chain Chlorinated Paraffins (Scop) - Alkanes. C12-13, Chloro Bis(1-Chloro-2-Propyl) 2-Chloro-1-Propyl Phosphate Bis(2-Chloro-1-Propyl) 1-Chloro-2-Propyl) Tris(2.3-Dichloro-1-Propyl)Phosphate Short Chain Chlorinated Paraffins (Sccp), C10-13 Pentachlorotrifluoropropane (Cfc-213) Pentachiorotrifluoropropane (Cfc-213 Isomer 1.1.3-Trichloro-1.2.2.3.3-Pentafluoropropane (Cfc-215) 1,13.3-Tetrachloro-2,2,3,3-Tetrafluoropropane (Cfc-214Cb) Tetrachiorotetrafluoropropane (Cfc-214) Hexachlorodifluoropropane (Cfc-212) Reprochlorodifluoromethane (Cfc-12B1) Pentachiorofkioroethane (Cfc-III) Trichlorotrifluoroethane (Cfc-II3 Isomer) 1.1.1.2-Tetrafluoro-2.2-Dichloroethane (Cfc-II4A) Heptachlorofluoropropane (Cfc-211) Chloroheptafluoropropane (Cfc-217) Trichloropentafluoropropane (Cfc-215)

Dichlorohexafluoropropane (Cfc-2)6)

Bromotrifluoromethane (Cfc-13B1)

Trichlorofluoromethane (Cfc-II)

Dichlorodifluoromethane (Cfc-12)

Chiorotrifluoromethane (Cfr-13)

1112-Tatrachlor-2.2-Diffu

112.2-Tetr 11.2-Trichlorotrifluoroethane (Cfc-II3) Chloropentafluoroethane (Cfc-115) 2-Chloro-1112.3.3.3-Heptafluoropropane (Cfc-217Ra) 11.3.3-Tetrachloro-2.2-Diffuoropropane (Hcfc-232Ca) 1.1-Dichloro-1,2,3,3,3-Pentafluoropropane (Hcfc-225Eb) Dichlorotrifluoropropane (Hcfc-243) Dichlorotetrafluoropropane (Hcfc-234) Trichlorodifluoropropane (Hcfc-242) 2.2-Dichloro-111.3.3-Pentafluoropropane (Hcfc-225Aa) Aroclor 1254 Tetrachlorofiuoropropane (Hcfc-241) nochiorotetrafluoropropane (Hcfc-244) Trichlorofluoropropane (Hcfc-251) Dichlorodifluoropropane (Hcfc-252) 1.1-Dichloro-1,2.2,3,3-Pentafluoropropane (Hcfc-225Cc) Aroclor 1016 1.3-Dichloro-1.1.2.3.3-Pentafluoropropane (Hcfc-225Ea) Dichlorodifluoroethane (Hcfc-132B) Dichlorofluoroethane (Hcfc-141B) Monochiorotetrafluoroethane (Hcfc+124) Dichlorotrifluoroethane (Hcfc-123) 1.1.1.2-Tetrachioro-2-Fluoroethane (Hcfc-121A) Tetrachioenflumenethane (Hrfc-121) Trichlorodifluoroethane (Hcfc-122) 1.2-Dichloro-112-Triffuoroethane (Hcfc-123A) 1-Chloro-112 2-Tetrafluoroethane (Hcfc-124A) Trichlorofluoroethane (Hcfc-131) 2-Chloro-2-Fluoropropane (Hcfc-2718) Dichlorofluoropropage (Hcfc-261) 1-Chloro-2,2-Difluoropropane (Hcfc-262Ca) Monochlorotetrafluoropropane (Hcfc-251) Pentachlorofluoropropane (Hcfc-231) Hexachlorofluoropropane (Hcfc-221) 1,2-Dichloro-1,1,2,3,3-Pentafluoropropane (Hcfc-225Bb) 2.3-Dichloro-U,1,2,3-Pentafluoropropane (Hcfc-225Ba) Tri-Pcb Pentachlorodifluoropropane (Hcfc-222) Tetrachlorotrifluoropropane (Hcfc-223) Trichlorotetrafluoropropane (Hcfc-224) Chloro-11.2.2.3.3-Hexafluoropropane (Hcfc-226Cb) Dichloropentafluoropropane (Hcfc-225Ca) Dichlorotetrafluoropropane (Hcfc-234) Monochlorofluoropropane (Hcfc-271) 12-Dichloro-L-Ekiomethane (Mcfc-141) **RED LIST TRANSLATED**

Chioroprene (Neoprene)

Ethylfluoride (Hfc-161)

Polyvinylidene Chloride

Methylmercury Acetate

Mercury Naphthenate

Mercury Pentanedione

Mathylmercury Nitrile

Methylmercury Benzoate

Phonylmeecuric Chloride

Phenylmercury Hydroxide

Phenylmercuric Lactate

Phenylmercuriurea

Methylmercury 8-Guinolinolate

Phanylmercuric-2-Ethylhexonate

Hydroxymercuri-O-Nitrophenol

Phanylmercuric Thiocyanate

Phenylmercuric Formamide

Phenylmercuric-8-Quinclinate

Phonylmercuric Salicylate

Phenylmercuric Napthenate

Mercury, (9-Octadecenoato-O)Phenyl-, (2)-

Phenylmercuric Threthanolammonium Lactate

Methylmercury 2.3 Dihydoxybropyl Mercaptide

Tetramethyl Lead

Mercury Dioleate

Mercury Phenate

Tetraethyl Lead

Tetrachloroethylene (Perchloroethylene

13.2.3.3-Pentafluoropropane (Hfc-245Ea)

11133-Pentafluorobutane (Hfc-355Mfc)

1312.3-Pentafluoropropane (Hfc-245Eb)

111.2.3.3-Hexafluoropropane (Hfc-236Ea)

1.11.3.3-Pentafluoropropane (Hfc-245Fa)

13.2.2.3-Pentafluoropropane (Hfc-245Ca)

1113.3.3-Hexafluoropropane (Hfc-236Fa)

111-Trichloroethane (Methyl Chloroform)

Methylene Chloride (Dichloromethane)

1 Chloro-I-Fluoroethane (Hcfc-151A)

Phonylmercuric Ammonium Acetate Phenylmercuric Ammonium Propionate Phenylmercuric Carbonate Phenylmercuric Monoethanol Ammonium Lactate Thimerosal Phonylmercury Nitrate Phenylmercuric Monoethanol Ammonium Acetate Arocler 1260 Aroclor 1268 Arocior 1221 Aroclor 1232 Aroclor 1248 Aroclor (Unspecified) 2.2 Dichlorobiphenyl (Pcb-4) 3.3'.4.4'.5.5'-Hexachlorobiphenyl Arocior 1210 Ameline 1916 2.4.5-Trichlorobiphenyl (Pcb-29) 2.2',6.6'-Tetrachlorobiphem/ (Pcb-54) Arocior 1250 2.3-Dichlorobiphenyl (Pcb-5) 2.4.5-Trichinrobioherwi 2.1.4.5.6-Pert achlorobipherwi (Pcb-116) 3.T-Dichlorobinhanyl (Pcb-II) 4,4'-Dichlorobiphenyl (Pcb-15) 2.2'.3.3'.4.4'.5.5'.6.6'-Decachlorobiphenyl (Pcb-209) 2-Chlorobiphenyl (Pcb-I) 3-Chlorobiphenyl (Pcb-2) 4-Chlorobiphenvil (Pcb-3) 2.2',3,3',5,5',6,6'-Octachlorobiphenyl (Pcb-202) 2.2'.4.4'-Tetrachlorobiphenyl (Pcb-47) Penta-Pcb DI-Peb 2.3°-Dichlorobiphem/ Hexa-Pcb Tetrachiorobia Mono-Pcb Hepte-Pcb

2.4"-Dichlorobiphenyl (Pcb-8)

2.2' 3.3' 4.4' 5-Heptachlorobinhenvi

2.2',5,5'-Tetrachlorobiphenyl (Pcb-52)

2.4.6-Trichlorobiphenyl (Pcb-30)

2.2' 3.3' 5.5' Havachlornhinhand

2.2'3 d.d' S.Havachlorohinhand

2.2' 5-Trichlorobiphern/ (Pcb-18)

3.3',4-Trichlorobiphenyl (Pcb-35)

2.2'.3.3'.4.6'-Hexachlorobiphenyl

2733456-Hentachlorobinbeny

2.3.3'-Trichlorobiphenvi (Pcb-20)

2.3' 5-Trichlorobipherryl (Pcb-26)

2'3.4-Trichlorobiphenvi (Pcb-33)

2.3'.3.3'-Tetrachlorobiphenyl (Pcb-40)

2.2.6-Trichlorobiphenyl

2.3'.6-TrictNorobiphwny

2.3'.5-Trichlorobiphem/

3.3.5-Trichlorobiohenvi

3.4',5-Trichlorobiphenyl

3.4.4'-Trichlorobiphenyl

2.2',4,5,5'-Pentachiorobiphenyl (Pcb-101)

2.3'3.5.6-Pentachloroblphenyl (Pcb-95)

2.2'4.4'.6-Pentachlorobiphenyl (Pcb-99)

2.2'3.4.5'-Pentachiorobiphenyl (Pcb-87)

2,3,3',4',6-Pentachlorobiphenyl (Pcb-II0)

2.2'.3,4',5',6-Hexachlorobiphenyl (Pcb-149)

2.2".3.3".4.4"-Hexachlorobiphenyl (Pcb-128)

2.3.3'.4.4'.5-Hexachlorobiphenyl (Pcb-156)

2.2',4-Trichlorobiphenyl

2.3',5'-Trichlorobiphenyl

2.2'.3.4'-Tetrachlorobiphenyl

Aroclor 1231

Aroctor 1262

Dihydrogen [Orthoborato(3-)-Ol@henylmercurate(2-) 2.2'.3.3'.6.6'-Hexachlorobiphenyl (Pcb-136)

2.2',4,4',5,5'-Hexachtorobiphenyl (Pcb-153)

2,2',3,4,4',4',5-Hexachlorobiphenyl (Pcb-138)

2.2.3,4,4',5,5'-Heptachlorobiphenyl (Pcb-180)

2.2'3.3'.4.4'.5.5'-Octachlorobiphenyl (Pcb-194)

3.3'.4.5.5'-Pentachlorobipheny 2.1.3'.4'.5.5'-Hexachlorobiphenyl 22'13'45'6-Heptachlorobinhenvi 2,2'.3,3'.4.5'.6.6'-Octachlorobiphenyl 2.2',3.3',4.4',5.5',6-Nonachlorobiphenyl (Pcb-206) 2.2',3.4,5,6-Hexachlorobiphenyl 2.3.3'.4.5.6-Hexachlorobiphenyl 2.3,4,4',5,6-Hexachtorobiphenyl 2.3.3'.4.4'.5.6-Heptachlorobipheny 2.2'.3.5'-Tetrachlorobiphenyl (Pcb-44) 2.2".4.5"-Tetrachlorobipherwl (Pcb-49) 2.2',5.6'-Tetrachlorobiphenyl (Pcb-53) 2.3.5.5 Tetrachlorobiphenyl 2,3,3',4'-Tetrachlorobiphenyl 2.3.4'.6-Tetrachiorobiphenyl 2.2'.3.6'-Tetrachiorobiphenyl 3 E 4 5'-Tetrachiorobiohend 2.3.3',5'-Tetrachiorobiphenyl 2.2' 1.4' 5'-Pentachiorohinhered 22'34'55'-Hexachlorobiphenvi 2.3.4'.6-Tetrachicrobinherwi 2.2" 3.4-Tetrachlorobiphem/ 22.33.6-Pentachlorobipheny 2.2°3.5.5'-Pentechlorobinhenvi 2.2'.3.3'.4-Pentachlorobiphenyl 2.2'.3.5.5'.6-Hexachlorobiphenyl 2.2'3.3'.5.6.6'-Heptachlorobiphenvi 2.2'.3.3'.4.6.6'-Heptachlorobiphenw 2.2'3.3'.4.5'-Hexachlorobiphern/ 2.2'.3.3'.5.5'.6-Heptachlorobiphenvil 2.2'.3.4'.5.5'.6-Heptachlorobiphenyl (Pcb-187) 2.2' 3.4.4' 5' 6-Heptachlorobipherwi 2.2',3.3',4, 5',6'-Heptachlorobiphenyl 2,2',3,3',4,4',6-Heptachiorobiphenyl (Pcb-17) 2,4,5,3',4',5'-Hexachlorobiphenvi 22'33'45.6.6-Octachlorobipheny 2.2'3.3'4.5.5'-Heptachlorobiphem/ 2.2'.3.3'.4.5.5'.6'-Octachlorobipheny 2.2'.3.4.4'.5.5'.6-Octachlorobiphenvl 22'33'455'66'-Nenachlombishand (Beb. 500

2.3.3'.5.5'-Pentachlorobiphenyl

2,2',4,6,6'-Pentachlorobiphenyl (Pcb-104) 2.3",4,4",6-Pentachiorobiphenyl 2.3.4.5.6-Pentachlorobipherwi 3.3'.4.4'.5-Pentachlorobiphenyl (Pcb-126) 22'344'6'-Hexachiombioherwi 2.1 4.4 5'6-Hexachlorobiphanyl 2,2'3,3',5-Pentachlorobiphenyl (Pcb-83) 2.2" 4.5" 6-Dentachicrohinhered 2.2' 4 4' 5.6' Herachinenbinhanul 2.3", 4.6-Tetrachlorobiphenyl 2.2'.3.4'.6-Pentachiorobiphenvi 2.2'.3.3'.4.6-Hexachiorobiphenvi 2.2".4.6-Tetrachiorobiphenvil (Pcb-50) 2'3.4.4'.5-Pentachlorobipherwl (Pcb-123) 2.2",3.4.5-Pentachlorobiphenyl (Pcb-86) 2.2',4.5-Tetrachlorobiphenyl (Pcb-51) 2,2',3,4',6-Pentachiorobiphenyl 2.2',4.5.6'-Pentachiorobipheny 2.2'.3.4'.5-Pentachiorobiphenyl 2.2',3.4',6.6'-Hexachlorobiphenyl 22'3.5.6.6'-Hexachlorobipheny 2.3.3'.5' 6-Pentachlorobipheny 2.3.4',5.6-Pentachlorobiphenyl 2.3",4,5,5"-Pentachiorobipheny 2.2'.3.4'.5.6-Hexachlorobipheny 2.2'.3.4.5'.5-Hexachlorobiphenyl 2.2"3.4 5.6"-Hexachiorobioherwi 2.2" 3.3" 4.5.6-Hantachiombiohenvil 22'33'455'5-Octachlorobiphenyt 23.3 4.4 5 Hexachiorobiphenvil 2.1.2" 4" 5.5" E. Hontarbloenbinhanu 2.4.4" Trichlorobiohered (Bch. 28) 2.3.3',4.5'-Pentachlorobipherv/ 2.2 3.6-Tetrachiorobiohenvi 2.2' 3.5-Tetrachiorobipherwi 2.2'.4.5-Tetrachlorobiphenvi 2.3'.4'.5'-Tetrachlorobipheny 3.3',4,5-Tetrachlorobiphenyl

2.3.3' 4.5-Pentachlorobiphenyl 2'3.4.5.5'-Pentachlorobiphenvi (Pcb-124) Aroclor 1240 2.T.4.5-Tetrachlorobiohenvt 2,3,4,5-Tetrachlorobiphenyl 2.2'3'.6.6'-Pentachlorobiphenyl 2,2'3',5,6'-Pentachiorobiphenyl 2.2',3',5.6-Pentachlorobiphenyl 2.2',3.4.6'-Pentachlorobiphenyl 2.3.5.6-Tetrachilorobiphenyl 2.3.3' 4-Tetrachlorobipheny 2.3.3' 6-Tetrachlorobipheny 2.3.4',5-Tetrachlorobipheny 2.3.3'.4.6-Pentachlorobipheny 2,3,3',5,6-Pentachilorobipheny 2.3.4.4 5-Pentachlorobipheny 2.3.4.4'.6-Pentachlorobiphenyl 2.3',4',5',6-Pentachiorobiphenyl 2.2',3.4.6.6'-Hexachlorobiohand 2.2'.3.4'.5.6'-Hexachlorobiphenyl 2.3.3'.4.4'.6-Hexachlorobiphenyl 2.1.3' 4.5' 6-Hexachlorobiohenvi 2.3.3' 4'.5.6-Hexachlorobioherwi 2.3.3' 4' 5' 6-Hexachlorobiphenvi 2.3.3.5.5%-Hexachlorobiphenyl 2 2' 3 4 4' 5 6-Heptachlorobinhem/ 2.2', 3.4.4', 5.6'-Heptschlorobiphenyl 2.2',3.4.5.6.6'-Heptschlorobiphenyl 2.3.3'.4.4'.5'.6-Heptachlorobipherwi 2.3.3'.4.5.5'.6-Heptachlorobipherul 2.2'.3.4.4'.5.6.6'-Octachlorobipherwi 2.3.3' 4.4'.5.5'.6-Octachlorobiphenvi 2.2'.3.4'.5.6.6'-Heptachlorobipherwi 2.3.3' 4.5-Pentachlorobinhervi Aroclor 1252 Ammonium Copper Arsenate - See 16102-92-4 Arsonic Arsenous Acid Rocarsone 10.10'-Bis(Phenoxyarsinyl) Oxide Triphonylarsing Arsonobatsina Dichlorophenylarsin Sodium Chromate Strontium Chromate Ammonium Dichromate Barium Chromate Chromium (Vi) Oxide Basic Lead Chromate Barlum Dichromate Zinc Chromate Calcium Chromate Lithium Dichromate (VD Lithium Chromate Chromium Oxychioride Lead Chromate Oxide Zinc Chromate With Zinc Hydroxide And Chromium Potassium Dichromate Ammonium Chromate Potassium Chromate Sodium Dichromate Lead Oxide Sulfate (Pb2O(So4)) Lead Titanium Oxida (Phbio3) Lead Oxide Sulfate (Pb5O4(Sod)) Lead Oxide Photphonate (Pb3O2(Hpo3)) Lead Oxida Sulfata (Ph4O3(So40) Dioxobis(Stearato)Trilead Lead Cyanamidate Acetic Acid, Lead Salt, Basic Sulfurous Acid. Lead Salt. Dibasic Silicic Acid (H2S(2O5), Barium Salt (11), Lead-Doped Fatty Acids, C16-18, Lead Salts Perfluorooctanesulfonic Acid (Pfos, C-8) Perfluoroundecanoic Acid (Pfuna, C-II) Perfluorooctane (C-8) Perfluorododecanoic Acid (Pfdoa, Pfdoda, C-12) Perfluoropctanoic Acid (Pfoa, C-8) Perfluorodecanoic Acid (Pfda, C-10) Perfluorohexanesulfonic Acid (Pfhxs, C-6) Perfluoroheptanoic Acid (Pfhpa C-7) Perfluorononanoic Acid (Pfna, C-9) Perfluorotetradecanoic Acid (C-14) Perfluorohexanesulfonyl Fluoride Perfluorotridecanoic Acid (C-13) Perfluoro Compounds, CS-18 Tetrabromobiliphenol & Dialbil Ether (Tobpa-Daa) 2.4.6-Tribromophenyl Allyl Ether (Tbp-Ae Or Att) 2.2',4.5.5'-Pentabromobiphenvl Nonviphenol Phosphite (3:1)

Dichloropentafluoropropana Monochlorodifluoropropane (Hcfc-262) Dichlorodifluoroethane Trichlorofluoroethane Dichlorotrifluoroethane Chlorotetrafluoroethane 13-Dichlaro-1.2.2-Triffuoroethane Dichloro-11.2-Triflucroethane Perfluoropentanoic Acid (Pfpea, C-5) Perfluorohexanoic Acid (Pfhua, C-6) Perfluorobutanoic Acid (Pfba, C-4) Perfluorobutane Sulfonate (Pfbs C-43 Trilead Diarsonate Asbestos(F) Crocidolite Asbestos, Chrysotile Asbestos, Amosite Asbestos Asbestos, Chrysotile Asbestos, Crocidolite Actinolite Tramolita Ashertos Asbestos, Anthophylite Anthophylite, Non-Aabestiform Ashestos, Actinolite Asbestos, Anthophylite Ashestos, Tremolite Ashestos Ethanol. 2-(2-(4-(1),3,3-Tetramethylbutyl)Phenoxy) Ethoxy)-Octokynol-1 Triton(R) X-405 4-Octylphenol Polyethoxylate Octoxynol-9 4-Nonylphenol (Linear) 4-(1-Ethyl-1,4-Dimethylpentyl)Phenol P-(1-Methyloctyl)Phenol 4-(1-Ethyl-1,3-Dimethylpentyl)Pheno P-Isonorytphenol P-(11-Dimethylheptyl)Pheno 4-(1-Ethyl-1-Methylhexyl)Phenol 4-Nonylphenol (Branched) Perfluorooctanesulfonyl Fluoride (Pfost, C-8) Tetrachiorobenzene 12.3.4-Tetrachlorobenzene 1235-Tetrachiorobenzene 12.4.5-Tetrachlorobenzene Ammonium Perfluorooctanoate (C-8) 2-Nonviotenol 3-Nonylphenol Norylphenol (Mixed Isomers) Polyethylene Gycol Mono(Branched P-Nonylphenyl) Ether 4-T-Nonviphenol Disthoxylate Polyoxyethylene Nonylphergi Ether Nonyiphenol Polyethylene Glycol Ether Isononylphenol Ethosylate Polyoxyethylene Branched C9 Alkylphenol Ether Polyethylene Glycol Nonylphenyl Ether Isooctylphenol 4-Tert-Octylphenol 4-N-Octylphenol Tert-Octylpheno 2-Tert-Octylphenol 2-N-Octylphenol Rosin, Polymer With Formaldehyde, 4-Octylpheno And Pentaerythritol Rosin, Polymer With Formaldehyde, Glycarol, Octylphenol And Polymd. Rosin Dimathylassineus Acid Monomethylarsonic Acid Trimethylarsine Monomethylarsane Dimethylamane Arsine Oxide, Hydroxydimethyl-, Sodium Salt, Trihydrate Dimethylarsinic Acid Methylarsonous Acid Trimethylarsine Oxide 1.4-Dichlorobenzene Dichlorobenzene (Mixed Isomers) 1.3-Dichlorobenzene 1.2-Dichlorobenzene 1.3.5-Trichlorobenzene Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,3-Trichlorobenzene Chlorobenzene Hexachiombenzete Pantachiorobetizane Hexamethyldisiloxane (L2) Octamethyltrislioxane (L3) Decemethyltetrasloxane (L4) Dodecamethylpentasiloxane (L5) Dodecamethylcyclohexasiloxane (D6) Decemethylcyclopentasiloxane (D5)

Tributyitin Phthalate Source: International Living Future Institute 3.4.4",5-Tetrachiorobiphenyl (Pcb-061)

Hexamethylcyclotrialloxane (D3)

Octamethylcyclotetrasiloxane (D4)

2-Propenoic Acid, Polymer With Formaldehyde,2,5-

Furancione, Methyloxizane, 4-Nonviphenol And

Dimethosyethyl Phthalate (Demp)

Texapol Serval Phthalate

Oxirane (9Ci)



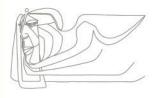
HEALTH & HAPPINESS



- 07: CIVILIZED ENVIRONMENT
- 08: HEALTHY INTERIOR ENVIRONMENT
- **09:** BIOPHILIC ENVIRONMENT



BEAUTY



19: BEAUTY & SPIRIT20: INSPIRATION & EDUCATION

Washroom Volunteer Lounge

VanDusen Botanical Garden Visitor Center, Vancouver, BC Photo: Nic Lehoux / Courtesy: Perkins+Will Living Building Challenge: Regenerative

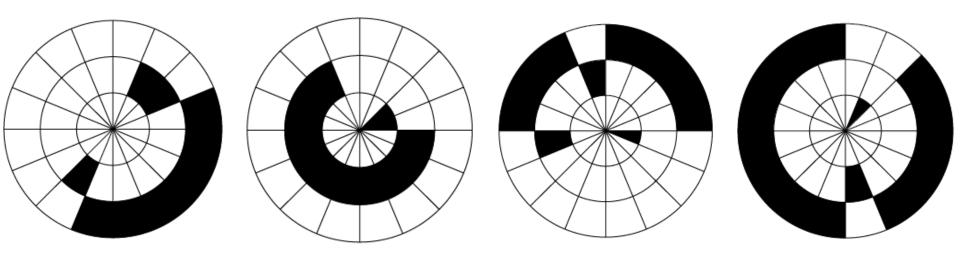
https://living-future.org/lbc/

Source: Paul g. Wiegman



Image by Freepik

Where are your values focused?



SITES: bottom right quadrant

LEED: bottom left quadrant or all over (focused in middle rings)

WELL: top half LBC: all over (focused in outer rings)

PHIPPS LIVING BUILDING PROJECT EDUCATION/RESEARCH/ADMINISTRATIVE BUILDING REQUEST FOR PROPOSAL FOR DESIGN SERVICES

REQUEST

We are pleased to offer you the opportunity to submit a proposal for design services for the Phipps Living Building Project. The goal for this ambitious project is a building that not only fits in complete harmony with its site, but functions well and is aesthetically pleasing.

DESIGN SCOPE

The design team, consisting of architect, MEP engineer and other relevant consultants, is to ultimately provide complete construction documents in Spring 2008 for a nine month design schedule. These documents will specify all systems and will be suitable for contractor bidding in the implementation of the Education/Research/Administration Building. These drawings will ultimately be bid upon by qualified construction entities.

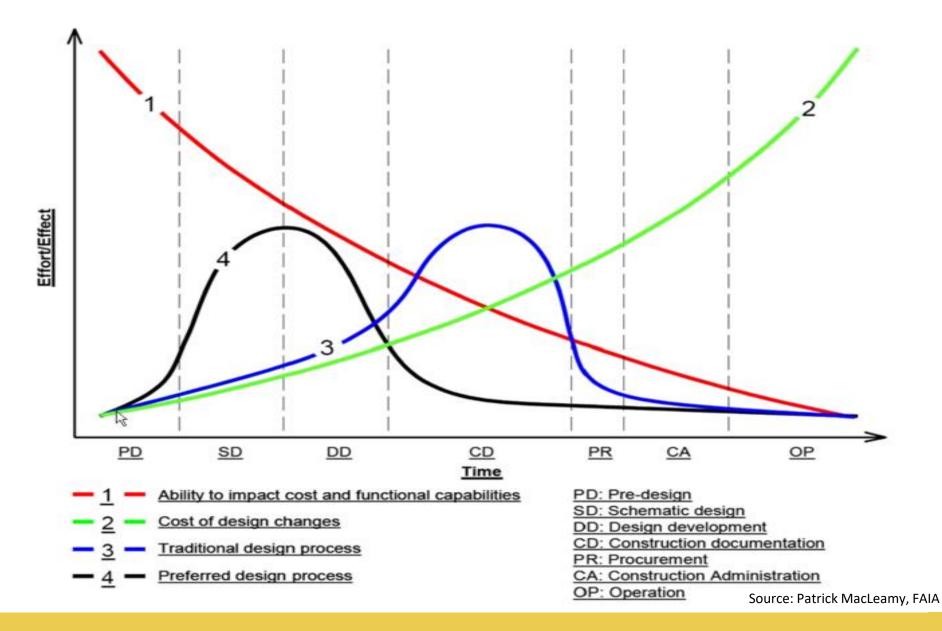
The start of project design will feature an integrated design process, with graphic and verbal real-time input from all relevant team members, including architect, primary and secondary consultants and the owner's team. We would like to see this tool used actively. From our experience, this approach in setting the tone for the project will yield the richest results, with the owner taking an active part in the process. Further, given the very ambitious project goals, we see the integrated design process as the only means of success by design. Once the Predesign activities are complete, the architect, in consultation with his team of sub-consultants, may produce initial graphic suggestions for the project or portions of it. Such suggestions are meant to stimulate thought and discussion, not necessarily to describe the final outcome.

The integrated design process will include at least one **charrette** in the schematic design phase, which the design team may or may not lead, but will certainly play a large part. There will be **five peer reviews** during the design phase, to occur at 50% and 95% of the schematic design phase, at the end of design development, at 60% of the construction document phase, and at the end of the construction document phase. These peer reviews will allow for cross checking and appropriate input for the purposes of systems modeling, commissioning, energy modeling and other opportunities.

Clear Requirements Stated in Contracts

- AIA Forms for Sustainable Projects Stating Clear Project Team Expectations and Responsibilities
- Adjust Retainage Terms to Coincide with Issuance of Certification Documentation and Process Timetable
- Legal Precedent to Not Just Add Specification Section for Rating System Requirements In Project Manual
- Owner Project Requirements
- Integrated Design Process

Changes and Cost Over Project Timeline



Setting Yourself Up for Success

Certifications Establish Clear Goals From the Beginning

Project Team Accountable for Green Goals on Project

Require and Use an Integrated Design Process

Protect Your Organizations – Clear Requirements in AIA Form Contracts

Challenge Short Term Financial Paradigms – Re-Frame Value

Source: Paul g. Wiegman

Join Us!

Sustainability Training Workshop October 9 & 10, Pittsburgh, PA http://phipps.conservatory.org/workshop Benefits for You:

- Go beyond the classroom and see the rating systems in action with an immersive exploration of one of the greenest buildings in the world
- Gain firsthand knowledge from the only team to achieve Living Building Challenge, LEED, WELL and Sustainable SITES certifications in one project
- Discover the nature-inspired systems thinking and facilitated integrative design processes which drive sustainable innovation

"Be the change you wish to see in the world."

-Mahatma Gandhi



What Does Good Look Like? Getting the Green Building You Want

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Building For Sustainability: Sustainability Matrix



Width of Bar =

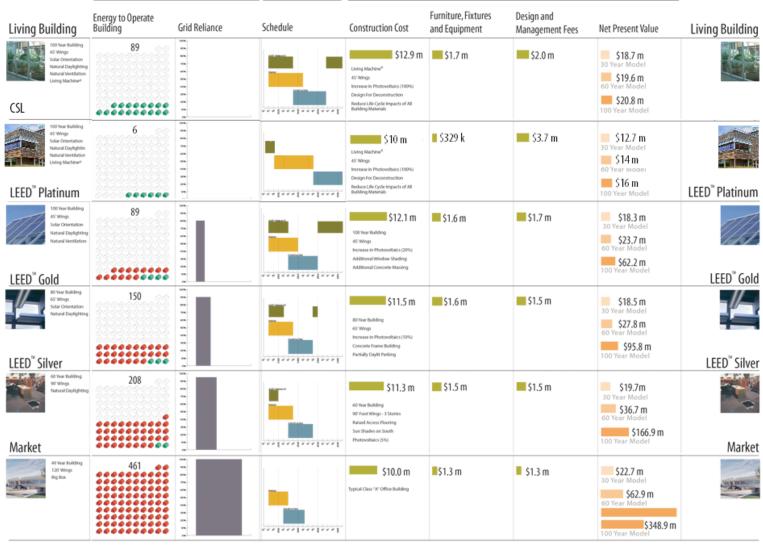
 Energy Consumed by the Building Required
 Energy Generated by

the Building Height of Bar = % of Energy Obtained from the Grid Schedules = Additional Research = Design

= Construction

Short and Long Term Costs

All of these figures are based on cost estimates created for each conceptual building model. All costs shown have been adjusted from actual cost estimates to reflect a \$10 million Market Building as a baseline. The Net Present Values indicated represent 30-, 60- and-100 year cost models that are based on 5% cost of capital, 1-1/2% inflation rate and 5% annual increase in energy costs.



The David and Lucile Packard Foundation Los Altos Project Modified by Phipps Conservatory and Botanical Gardens