

# Material Assessment Protocols

A “how-to” on the  
application of  
green criteria in  
the material  
selection process

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# agenda

1. know available resources
2. identify criteria and priorities
3. review 2 case studies



# resources

**manufacturer's reps:**

know which questions to ask

**web:**

pharos

greenspec / ebn

ED+C magazine / site

certification sites

(SCS, Greenguard, etc.)



# criteria and priorities

when there's no such thing as  
apples to apples



# criteria and priorities

## **conventional criteria:**

product performance

code compliance

## **conventional priorities:**

cost

aesthetics

# case studies

**Palomar Pomerado Health: user-based goals**

**UCSF Mission Bay: eco effective**



PALOMAR  
POMERADO  
HEALTH

**UCSF Medical Center**  
at Mission Bay

# PPH case study

- (1) 350,000sf hospital in a garden: 5-story hospital tower addition + emergency and surgery expansion and
- (1) 750,000 sf garden hospital: replacement facility with 11-story bed tower and 2-story Diagnostic and Treatment area



# PPH case study

- (1) 350,000sf hospital in a garden: 5-story hospital tower addition + emergency and surgery expansion and
- (1) 750,000 sf garden hospital: replacement facility with 11-story bed tower and 2-story Diagnostic and Treatment area



**criteria: user-based goals**

**champion teams**

**Green Guide for Health Care**

**LEED for New Construction**

# material selection criteria

<b>Process</b>	<b>Content</b>	<b>Performance</b>	<b>Safety</b>	<b>End of Life</b>
location of plant	PBTs	maintenance	low VOC	recyclable
ISO 14001	heavy metals	low toxicity	antimicrobial	reclamation-program
other program	rapidly renewable	replacement ease	fire retardants	
	recycled content	duration of use (years)	meets code	

Materials	Mfg	Product example	Source	Content				Flam	Maintenance	Product Safety	Durability	End of Service	Certification					
				regional materials	FSC	heavy metal free	heavy metals							recycled content	SGH400	low energy	form test	Interior Air Quality
Plastic laminate	Formica	Plastic laminate	Ohio	no	yes	no	no	no	yes	class 1	no VOC	10 year warranty	no	no	GREEN GUARD			
	as designed	Plastic laminate	Italy	low	yes	no	no	no	no	class 1	no VOC	10 year warranty	yes	increase for energy	none			
	inherent	Plastic laminate	Texas	low	yes	no	no	no	yes	ES series class 1	GREENGUARD	10-20 years	no	environmentally friendly packaging and products	GREEN GUARD			
Wood Veneer Laminates	None	Composite wood panel	China	low	yes	yes	no	no	no	class A	Open program in place	industry standard for plastic laminate	no	no	no			
	Tree Frog	Laminated Wood Veneer	Italy	low	yes	no	no	no	yes	unconfirmed	Open program in place	industry standard for top laminate	no	no	SCS partition given paper			
	as designed	Oberflex	France	low	yes	no	no	no	yes	low retardant grade	unknown	industry standard for plastic laminate	no	no	PEFC (leaf indicators)			
Laminated glass	Asahi	recycled collection	Beijing, NH	unconfirmed	yes	no	no	40%	no	yes	class 1	no VOC	10 year warranty	no	no	SCS		
	as designed	Clear	New York	low	yes	no	no	no	yes	yes	class 1	no VOC	10 year installed warranty	no	no	SCS		
	Alaris	recycled composite laminate	Washington	unconfirmed	unconfirmed	no	no	aluminum, polyester resin, plastic	no	no	class 1 or 2	no VOC	industry standard	no	no	SCS		
Ceramic tile	Kip Tech	platinum certified	Washington	low	unconfirmed	no	no	100%	no	yes	class A	no VOC	5-year warranty	no	no	FSC		
	Daltile	Pennsylvania	TX, TN, AL, NY	solvent free	no lead or mercury	yes	no	clay & salt	40% min	no	yes	non-harmful	no VOC	long	Owner's care	no	no	none
Glass	Health Ceramics	tile	San Jose, CA	unconfirmed	unconfirmed	no	no	low-fragile low-fragile	no	no	yes	non-harmful	no VOC	lifetime of life	no	no	none	
	Pulp Studio	Denver	Colorado	unconfirmed	unconfirmed	no	no	no	no	no	yes	non-harmful	no VOC	lifetime of life	no	no	none	
Glass tile	Creswell	Recycled glass tile	Tennessee	none	yes	no	no	no	no	yes	non-harmful	no VOC	long	Owner's care	no	no	none	
	Sanatit	recycled glass tile	Ohio	unconfirmed	unconfirmed	no	no	recycled glass	100%	no	yes	non-harmful	no VOC	long	Owner's care	yes	no	none
Floor	3 form	Euroform	Utah	solvent & PVC free	yes	no	no	recycled	40%	no	yes	class B	low VOC	long	yes	no	Green Guard	
	Lumbar	Lumbar R4	Barber, VA	none	yes	no	no	plastic based PETG, recycled glass	40%	unconfirmed	yes	class A	low VOC	long	no	100%	SCS	
	Light Blocks	LightCast	Madison, WI	none	yes	varies	varies	polyester or acrylic	varies	unconfirmed	yes	class A	low VOC	long	varies	depends on resin	none	
Quartz	Varis	Resin-Art panel	Ohio	unconfirmed	unconfirmed	unconfirmed	no	unconfirmed	no	yes	class B	low VOC	long	yes	no	none		
	as designed	Quartz surface	Canada	low	yes	no	no	90% quartz, 7% pigments and polymer resin	no	yes	yes	class 1	no VOC	10 year warranty	no	no	Green Guard	
Wall covering	Campig	Kunst	Belgium	none	yes	no	no	poly-ethylene	no	yes	yes	class A (pending)	California 01300 passed	7 year warranty	yes if no backing	incineration for energy	CCC Silver, SCS Indoor Air Advantage, CHPS	
	Maharsat	Reduced environmental impact	varies	low	low	varies	varies	varies	varies	yes	class A	no VOC	industry standard	installer or Owner's care	no	no	ES facility	
	Innovations	Eco-Archery	New York	none	yes	varies	varies	cellulose, polyester, nylon	no	yes	yes	class A	unconfirmed	industry standard	yes	50% spun nylon polyester	none	
Wall panels	Wolf Gordon	Earthable collection	Holland	none	none	30%	no	polyester 70% wood wool	no	unconfirmed	yes	class A	low VOC	5 year warranty	no	no	none	
	as designed	CGI (Globe)	PA	PVC free	yes	no	no	none	no	yes	class 1	California 01300 passed	40 years (5-year warranty)	Owner's care	yes	no	CCC	
Plastic Panels	Kaindl	Kaindl ETC	PA	solvent free	yes	no	no	recycled aluminum and other	40% min	no	yes	class B	Class VA	industry standard	Owner's care	yes	Kaindlgreen take-back program	none
	as designed	Triacel	Michigan	low	yes	yes - 70%	no	Kraft paper Phenolic Resin, Poly carbonates Resin	10%	yes	yes	class A	GREENGUARD	40-50 years	Owner's care	yes	no	GREEN GUARD
Ceiling materials	Armstrong	Optima open plan	Oregon	none	yes	no	no	bio based fibers	Reynolds 70-75%	no	yes	class A	California 01300 passed	30 year warranty	yes	non-recycling program	none	
	Armstrong	Clear room mgls	Oregon	none	yes	no	no	mineral fiber MCF and	30-70%	no	yes	class A	no	30 year warranty	no	no	none	
	Armstrong	WoodGrain (Bamboo)	Oregon	none	yes	bamboo	no	bamboo veneer	90%	no	yes	class A	no	1 year warranty	yes	no	none	
	Armstrong	aluminum grid	Las Vegas, NV	none	yes	no	no	aluminum	50%	no	yes	class A	no VOC	30 year warranty	yes	no	none	
	8 wood	bamboo wood tile	Oregon	none	yes	yes	bamboo	30% min with 10% MCF	no	yes	class 1	California 01300 passed	one year warranty	yes	no	SCS, EPF, GreenGuard, CHPS		

Materials	Mfg	Product example	Source	Content					Plant	Maintenance	Product Safety		Durability	End of Service		Certification	
				regional materials	PBT	heavy metal free	use of rapidly renewable	raw materials			recycled content	ISO14001		low energy	low toxicity per MSDS		IAQ
Plastic laminate	Formica	Plastic laminate	Ohio	low	yes	no	no top coat	no	20% & up	no	yes	class 1 on CGP	GREENGUARD	10-20 years	no	no	GREEN GUARD
		as designed	Italy	low	yes	no	no top coat	no	40% confirmed	no	yes	class 1	no VOC	industry standard (100 yrs)	yes	increase for energy	none
		as designed	Texas	low	yes	no	no top coat	no	no	no	yes	60 series class 1	GREENGUARD	10-20 years	no	environmentally friendly packaging	GREEN GUARD

Materials	Mfg	Product example	Source	Content					Plant	Maintenance	Product Safety		Durability	End of Service		Certification				
				regional materials	PBT	heavy metal free	use of rapidly renewable	raw materials			recycled content	ISO14001		comments	low energy		low toxicity per MSDS	IAQ	anti-microbial	life-expectancy
Rubber																				
sheet	as designed	NORA	Ecoplan	Germany	PBT free	yes	yes	12-15% virgin rubber content	up to 30%	yes	-	yes	yes	GREEN GUARD	inherent	minimum 12 years / industry typical	Difficult (downtime-2 days minimum) / Installer required	no	none	GREEN GUARD
	Flexco	Retro	Alabama	solvent & PVC free	yes	yes	-	90%	yes	-	yes	un-confirmed	GREEN GUARD	yes, non toxic	downcycle			none	GREEN GUARD	
	Johnsonite	Triumph	Ohio	solvent & PVC free	yes	no	-	50%	no	-	yes	yes	un-confirmed	inherent	yes - if installed without adhesives			RESTART	Floor Score	
wall base	as designed	Johnsonite	Tightlock	Ohio	solvent & PVC free	un-confirmed	no	-	0%	unconfirmed	-	yes	yes	Meets CHPS 01350	inherent		no	-	N/A	
Linoleum																				
	FORBO	Marmoleum	Netherland	solvent & PVC free	yes	yes	linseed oil, wood, cork, resin, limestone, jute	50%	yes	-	yes (with TopShield)	yes	Own program in place	inherent	25 years / 5 year warranty		bio-degradable	none	none	

	as designed	Dubay	Quartz surface	Canada	low	yes	no	90% quartz, 1% pigments and polymer resin	no	yes	yes	class 1	no VOC	10 year warranty	no	-	none	
Wall coverings																		
	Campco	Kural	Belgium	none	yes	no	epoxy-aliphatic	no	yes	yes	class A (inherent)	California 01350 passed	7 year warranty	yes if no backing	incineration for energy	CCIC Silver, SCS Indoor Air Advantage, CHPS		
	Maharati	Reduced environmental impact	varies	low	varies	varies	varies	varies	varies	yes	class A	no VOC	industry standard	installer or Owner's choice	no	-	UL facility	
	Innovations	Eco-Archery	New York	none	yes	varies	cellulose, polyester, nylon	no	yes	yes	class A	un-confirmed	industry standard	yes	50% spun waste polyester	none		
	Wolf-Garten	Earthable collection	Holland	none	none	30%	polyester, 50% wood chips	no	un-confirmed	yes	class A	low VOC	5 year warranty	no	-	none		
Wall panels																		
	as designed	CG Group	Azulyn 3000 series	PA	PVC free	yes	no	-	none	no	yes	class 1	California 01350 passed	Owner's choice	yes	-	CCIC	
	Kaindl	Kaindl ETC	PA	solvent free	yes	no	recycled aluminum and other	40% min	no	yes	class B	Class VA	industry standard	Owner's choice	yes	Kaindlgreen take-back program	none	
Plastic Panels																		
	as designed	Formica	Milori	Germany	low	yes	yes -10%	Kraft paper Phenolic Resin, Poly carbonates Resin	10%	yes	yes	class A	GREENGUARD	40-60 years	Owner's choice	yes	-	GREEN GUARD
Ceiling																		
	Armastrong	Optima open plan	Oregon	none	yes	no	bio based finishes	Reynolds	70-75%	no	yes	class A	California 01350 passed	30 year warranty	yes	own recycling program	none	
	Armastrong	Clear room mgls	Oregon	none	yes	no	mineral fiber	30-70%	no	yes	class A	-	30 year warranty	no	-	none		
	Armastrong	WoodGrain (Bamboo)	Oregon	none	yes	yes	bamboo	MCF and 90%	no	yes	class A	-	7 year warranty	yes	-	none		
	Armastrong	aluminum grid	Las Vegas, NV	none	yes	no	aluminum	50%	no	yes	class A	no VOC	30 year warranty	yes	-	none		
	8 wood	bamboo wood tile	Oregon	none	yes	yes	bamboo	30% min (with MCF)	no	yes	Class 1	California 01350 passed	one year warranty	yes	-	SCS SFP, GreenStar, CHPS		

Materials	Mfg	Product example	Source	Content					Plant	Maintenance	Product Safety		Durability		End of Service		Certification
				regional materials	PBT	heavy metal free	use of rapidly renewable	raw materials			recycled content	low energy	form test	Interior Air Quality	life expectancy	ease of replacement and repair	
Plastic laminate	Formica	Plastic laminate	Ohio	low	yes	no (not forest certified)	no	20% & up	no	yes	class 1 per USEPA	GREENGUARD	10-20 years	no	no	GREEN GUARD	
			Italy	low	yes	no (not forest certified)	no	no	no	yes	class 1	no VOC	quality standard (ISO 9001)	yes	increase for energy	none	
			Texas	low	yes	no (not forest certified)	no	no	no	yes	ISO series class 1	GREENGUARD	10-20 years	no	enhancements fully comply with GREENGUARD	GREEN GUARD	

Materials	Mfg	Product example	Source	Content					Plant	Maintenance	Product Safety		Durability		End of Service		Certification											
				regional materials	PBT	heavy metal free	use of rapidly renewable	raw materials			recycled content	ISO14001	comments	low energy	low toxicity per MSDS	IAQ		anti-microbial	life-expectancy	ease of replacement and repair	recyclable	reclamation program						
Flooring Materials	as designed: NORA	Ecoplan	Germany	PBT free	yes	yes	12-15% virgin rubber contact	up to 30%	yes	-	yes	yes	GREEN GUARD	inherent			no	none	GREEN GUARD									
																				Rubber	FORBO	Marmoleum	Netherland	solvent & PVC free	yes	yes	linseed oil, wood, cork, resin, limestone, jute	50%
Armstrong	Marmorette	Germany	PVC free	yes	yes	linseed oil, flax seed oil, wood flour, limestone, cork, jute, natural resins	up to 35%																					

Materials	Mfg	Product example	Source	Content					Plant	Maintenance	Product Safety		Durability		End of Service		Certification																																																
				regional materials	PBT	heavy metal free	use of rapidly renewable	raw materials			recycled content	low energy	form test	Interior Air Quality	life expectancy	ease of replacement and repair		recyclable	comments																																														
Ceramic tile	Kraft	Ceramic tile	Germany	low	yes	yes (70%)	Kraft paper, Phenolic Resin, Poly carbonate, Resin	10%	yes	yes	class A	GREENGUARD	40-50 years	Owner's care	yes	-	GREEN GUARD																																																
																		Armstrong	Optima open plan	Oregon	none	yes	100% bamboo	Bamboo	70-75%	no	yes	class A	California 01390 passed	30 year warranty	yes	no recycling program	none																																
																																		Armstrong	Clear vision maple	Oregon	none	yes	no	mineral fiber	30-70%	no	yes	class A	-	30 year warranty	no	-	none																
																																																		Armstrong	Woodbridge (Bamboo)	Oregon	none	yes	bamboo	MDF and bamboo	80%	no	yes	class A	-	1 year warranty	yes	-	none
Kraft	Ceramic tile	Oregon	none	yes	yes	bamboo	30% min (with 100% MDF)	no	yes	class 1	California 01390 passed	one year warranty	yes	-	SCS SIF GreenStar DPM																																																		

# general vs LEED vs GGHC

<b>general criteria</b>	<b>LEED v2.2 NC</b>	<b>GGHC</b>
location of plant	material resource	yes
PBTs	-	yes
maintenance	-	yes
low VOC	indoor air quality	yes
recyclable	material resource	yes
ISO 14001	-	-
heavy metals	-	yes
low toxicity	-	yes
antimicrobial	-	-
reclamation program	-	-
rapidly renewable	material resource	yes
ease of replacement / flexible	-	yes
fire retardants	-	-
recycled content	material resource	yes
duration of use (years)	-	yes

# criteria

location of plant  
PBTs  
maintenance  
low-VOC  
recyclable  
ISO 14001  
heavy metals  
low toxicity  
antimicrobial  
reclamation program  
rapidly renewable  
ease of replacement  
fire retardants  
recycled content  
term of use (years)  
code compliance

# priorities

human health  
LEED  
ecological health  
GGHC  
ease of replacement  
maintainability  
performance  
comfort  
cost  
aesthetics

# UCSF case study

350,000sf urban campus  
children's, cancer & women's hospitals,  
outpatient services



Anshen+Allen | William McDonough + Partners

# UCSF case study

350,000sf urban campus  
children's, cancer & women's hospitals,  
outpatient services



**criteria: eco-effective**

“100% good” or “waste = food”  
maximize ecological, economical,  
and social values through design

# material selection criteria

1. Functional
2. Code compliance
3. Performance - durability
4. Aesthetics
5. Comfort
6. Maintainability
7. Ease of replacement

# material selection criteria

1. Functional
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6. Maintainability
7. Ease of replacement
8. Human health
9. Ecological health

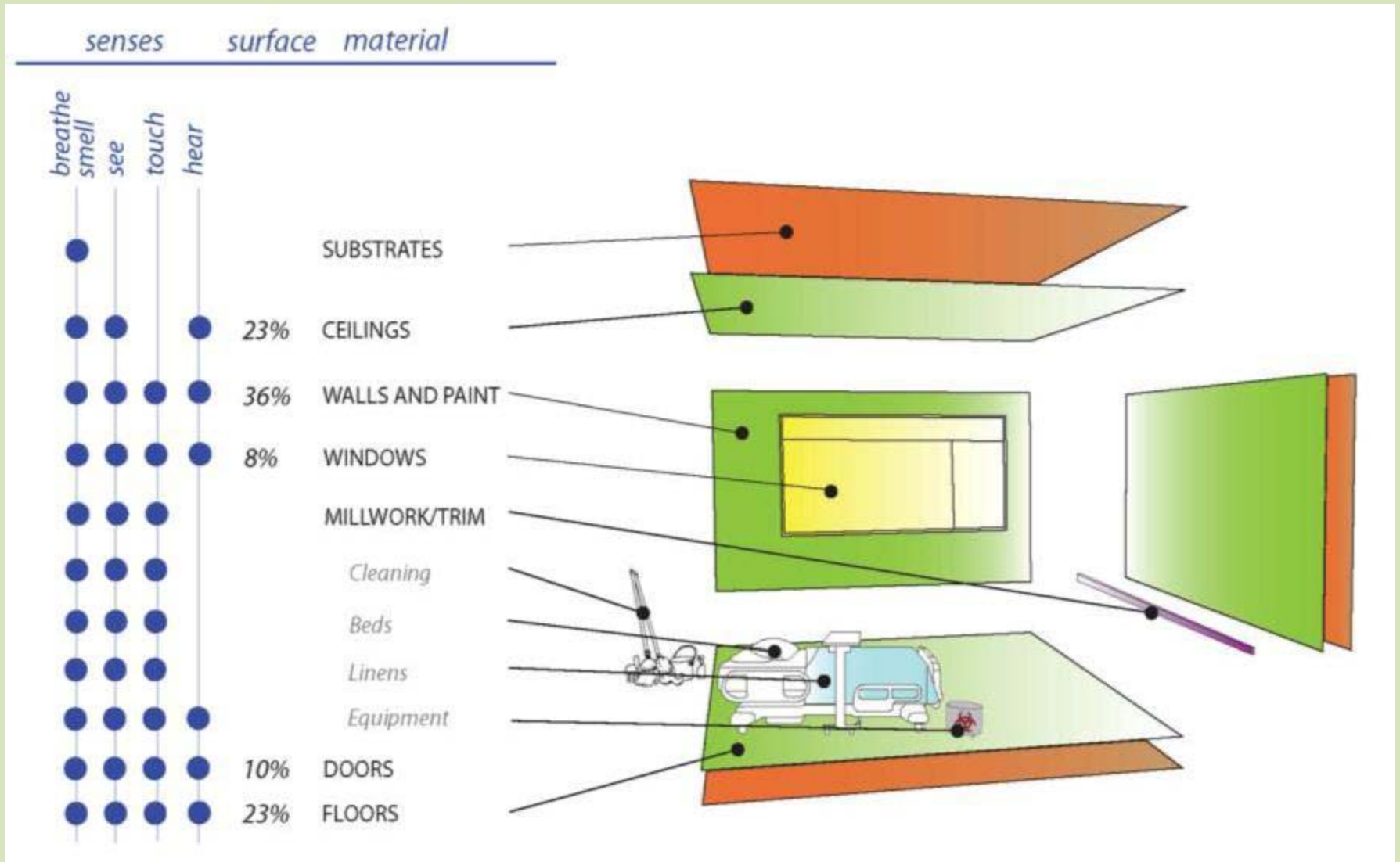
**role of MBDC:**  
evaluated chemical ingredients for  
human health  
and  
ecological health  
based on publicly available information



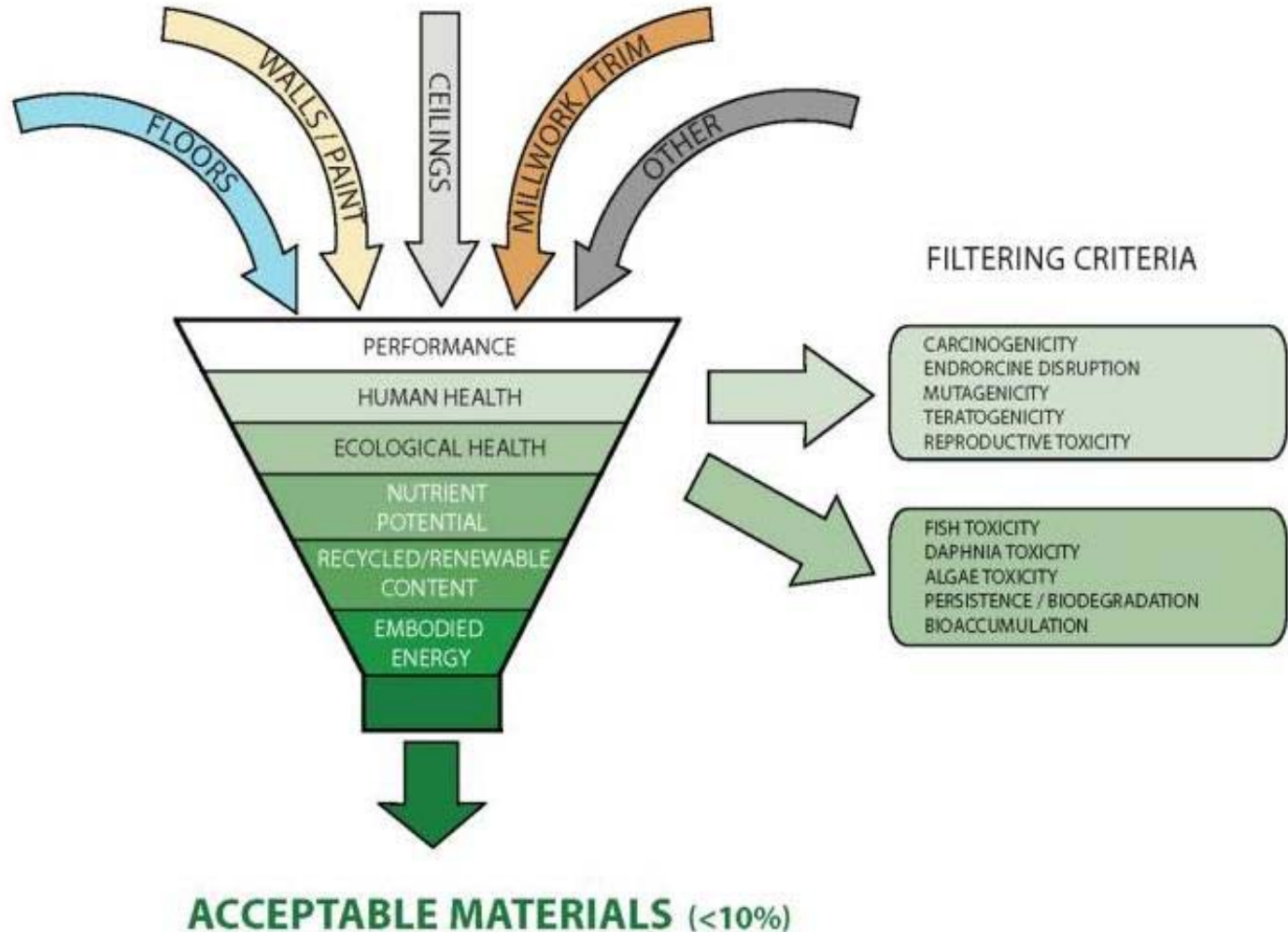
# Patient and Exam rooms



# Impact of Materials composition of a room



# evaluating products



# Human Health Criteria

## Priority Criteria

- Carcinogenicity
- Disruption of Endocrine System
- Mutagenicity
- Reproductive Toxicity
- Teratogenicity

## Additional Criteria

- Acute Toxicity
- Chronic Toxicity
- Irritation of Skin/Mucous Membranes
- Sensitization
- Other (e.g., skin penetration potential; flammability)

# Environmental Health Criteria

- Bioaccumulation
- Climatic Relevance/Ozone Depletion Potential
- Content of Halogenated Organic Compounds
- Persistence/Biodegradation
- Toxic Heavy Metal Content
- Aquatic toxicity
  - Fish toxicity
  - Daphnia toxicity
  - Algae toxicity
- Other (e.g., Water Danger Score; Toxicity to Soil Organisms)





# 1. Organohalogens

- Polyvinyl chloride (PVC), carries health concerns associated with emissions from manufacturing and end-of-life disposal
- Pigments and Dyes
- Brominated Flame Retardants (BFR)
- Dioxins – chlorinated organics
- Teflon (PFTE)
- Antimicrobials – Triclosan
- PCBs - Polychlorinated biphenyl ethers
- Perflouorooctane sulfonate (PFOS) – Stain resistance



**Study finds flame-retardant chemical in U.S. breast milk**

Katrina Friedman feeds her daughter, Ruby Alcorn, in their San Francisco home. Friedman's milk has high levels of chemicals. Chronicle photo by Lea Suzuki



Chronicle / Lea Suzuki

San Francisco Chronicle 9/23/2003

## 2. VOCs

- Vapors emitted from organic substances. VOCs are found in everything from paints and coatings to underarm deodorant and cleaning fluids. Many organic solvents and their vapors are toxic
- Many VOCs react with light and other chemicals to form smog. Some VOCs react with upper atmosphere ozone and destroy it

# 3. Formaldehyde

- Reclassified in 2004 from “probable human carcinogen” to “known human carcinogen”



## 4. Heavy Metals

- Mercury, plutonium, and lead accumulate in the body and can cause central nervous system or vital organ damage. Long term exposure causes physical, muscular, and neurological degeneration.
- Found in catalysts, pigments, and flame retardants

# Evaluating Products

## specification review

### Walls Summary

Score	Areas of High Concern (X)	Material	Product
21*	None	Wallcovering	Innovation Woven Wood
21	None	Tile	Coverings Etc, Inc. Bio-Glass™
17	None	Paint	ICI/Dulux Life Master Eggshell
17	None	Paint	Pittsburgh Pure Performance Eggshell
17	None	Paint	Sherwin Williams Harmony Eggshell
16	None	Tile	Daltile Modern Dimensions
15	None	Wall Panel Systems	ASI Ecotextures®
15	None	Wall Panel Systems	Interlam SierraPine® Medite® FR MDF
15	None	Tile	Roca Coral
14	None	Tile	USCT Color Collection
14	Recycled Content, Embodied Energy	Accoustical Wallcoverings	Carnegie Xorel® Fabrics
13	None	Paint	Benjamin Moore Eco Spec Eggshell
13	None	Tile	Roca Sandstone Collection
11	None	Tile	Porcelanosa Woodtec
11	Recycled Content	Tile	Casa Dolce Casa Contemporanea
11	Nutrient Potential	Tile	Daltile Maracas
11	Nutrient Potential	Accoustical Wallcovering	Knoll Hard Rock
10*	Recycled Content, Embodied Energy	Wallcovering	Innovations Eco-Alchemy
9	Recycled Content	Performance Paint	Böllen International Crafton
9	Recycled Content	Performance Paint	Zolatone Polomyx® All-acrylic
6	Human Health, Ecological health	Epoxy Grout	Mapei Kerapoxy
6	Nutrient Potential, Recycled Content, Embodied Energy	Wall Panel Systems	Marlite FRP
4	Human Health, Recycled Content, Embodied Energy	Epoxy Grout	Custom Building Products 100% Solids
3	Human Health, Environmental	Wallcovering	DesignTex Arboreus

### Millwork Summary

Score	Areas of High Concern (X)	Material	Product
21*	None	Ecoresin™ panels	3form Varia™ Panels
21*	None	Recycled HDPE resin panels	3form 100 Percent™ Panels
19	None	Composite Wood Panels	Kirel® Bamboo with NAUF binder
19	None	Composite Wood Panels	Kirel® Board
19	None	Composite Wood Panels	PlybooPure™ Bamboo Plywood Flat Grain
17*	Recycled Content, Embodied Energy	Polyester Resin panels	KnollTextiles Imago™ (Lintel, Reverie, Zen)
17	Recycled Content	Etched Glass	Skyline Design Suzanne Tick Glass™ Collection
17	Recycled Content, Embodied Energy	Dichroic Glass	World Glass™ Dichro Art™ Rain – DA 533
18*	Embodied Energy	Solid Surfacing	Corian® Terra®
15*	None	Acrylic Resin panels	LightBlocks LightCast
15*	None	Acrylic Resin panels	LightBlocks LightCast
15	None	Recycled Aluminum and Acrylic Resin panels	Alkemi
15	None	Polyester resin	Avonite Surfaces Studio Collection™
15	None	Composite Panel	Panelite™ Cast Polymer Series
13*	None	Quartz surfacing	Dupont™ Zodiac® Terra
13	None	Wood Veneer	Earth Source
13	None	Wood Veneer	Exotic Hardwoods+Veneers
13	None	Composite Wood Panels	Plyboo® Bamboo Paneling Tambour
12	Recycled Content, Embodied Energy	Solid Surfacing	Wilsonart® Gibraltar®
11	None	Quartz surfacing	Caesarstone®
11	Recycled Content	Etched Colored Glass	Skyline Design Etched Glass (colored) using eco-etch™
11	None	Decorative Metal	Stoller Metals
10	Embodied Energy	Decorative Metal	Formica® DecoMetal® solid metals and solid metal strips
10	Recycled Content, Embodied Energy	Acrylic Resin Tiles	Sensibile Scintilla Tiles

# **GREAT NEWS!**

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**This Area Contains  
Only Products  
The State of California  
Considers to Be  
Extremely Beneficial  
to Your Health**

**California Health and Safety**

ANSHEN + ALLEN