



Toxics Use Reduction Institute

# Health and Environmental Hazards of Building Materials

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# Building Materials Learning Objectives

## ***Understand:***

- Toxics Use Reduction concept
- Life cycle of building materials
- Health and environmental hazards of building materials
- Resources for identifying and assessing alternatives

# Toxics Use Reduction

If you don't use toxic substances to begin with, there is no need to manage their impact on health and the environment

- Inherently safer throughout life cycle
- Save \$\$
- Protects human health
- Protects the environment

# Massachusetts Toxics Use Reduction Act

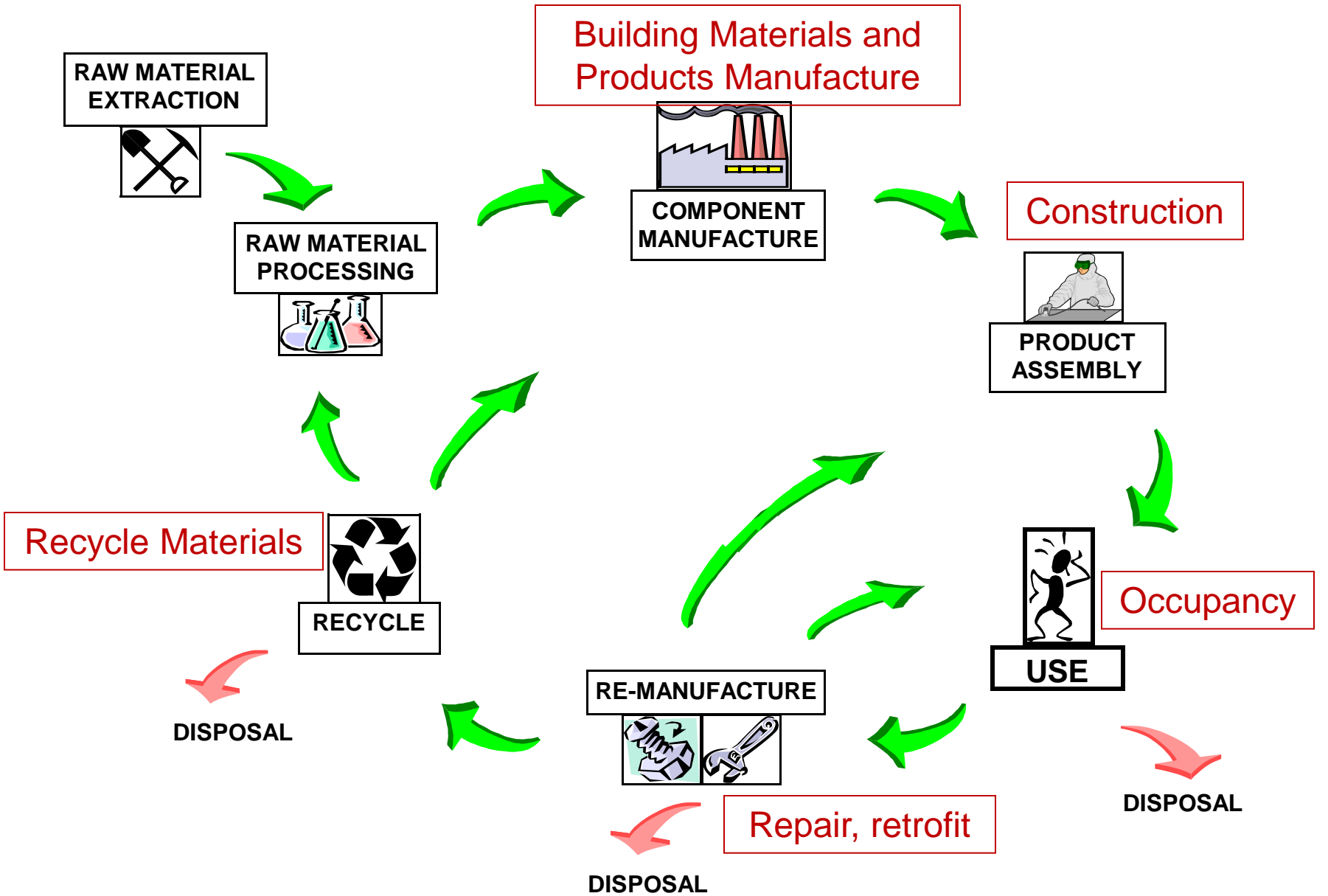
**Massachusetts  
Toxics Use Reduction**



- Works with businesses and communities to reduce their use of toxic substances
- Right to Know Reporting, Facility Planning, and Assistance

# Why do we care about toxics in building materials?

- How “Green” are Green Buildings?
- What are builders and architects typically concerned about?
  - Indoor air quality (IAQ)
  - Construction worker health and safety
  - ??





# Wire and Cable Materials

## Life Cycle



Bingham Canyon Copper mine, Utah



AGC chloralkali plant

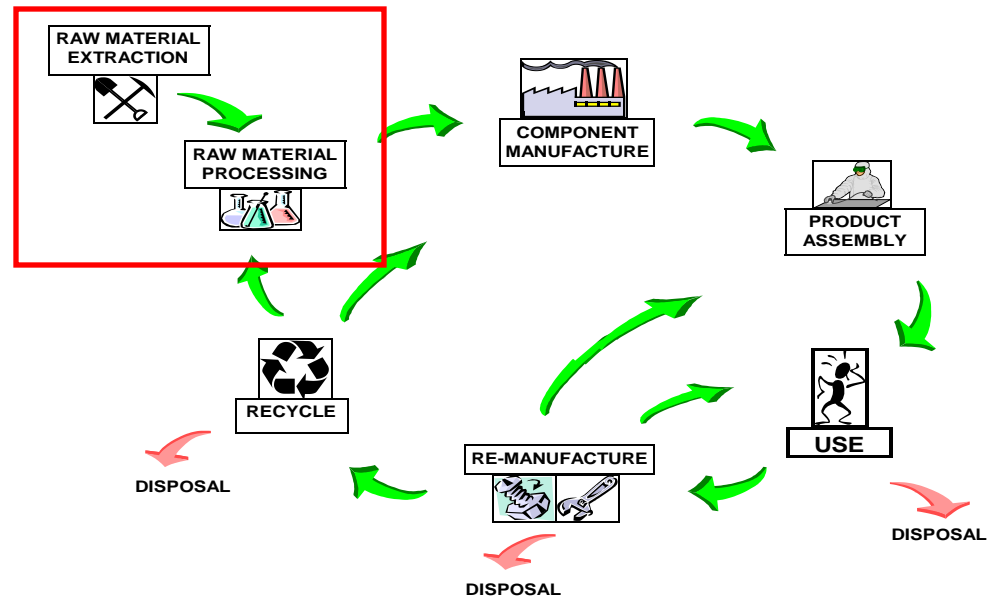


Ethylene + chlorine = ethylene dichloride

- vinyl chloride monomer > PVC
- PVC + Metal stabilizers + plasticizers + flame retardants + colorants



Shell Refinery, Deer Park, TX  
Photo: Dave Einsel/Getty Images



Albemarle, Bayport, TX

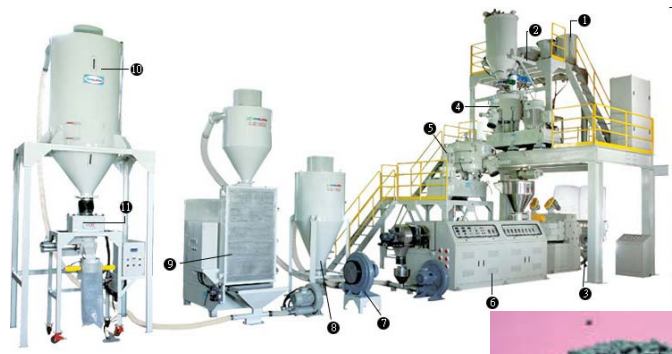
# Wire and Cable Materials

## Life Cycle

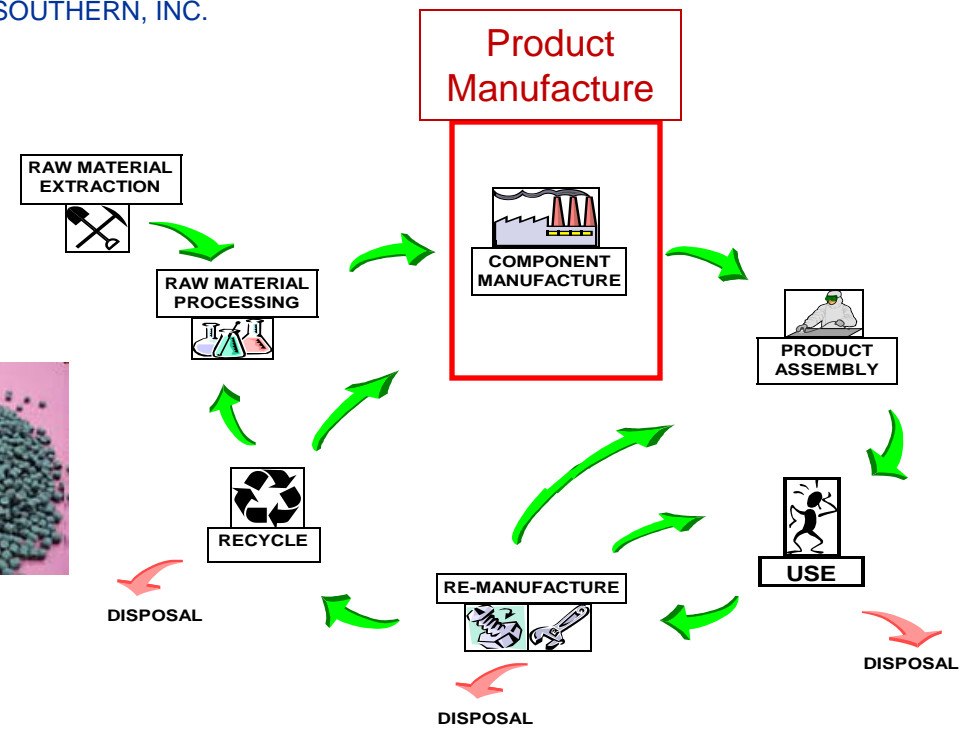


CZ-φ70 × 25D  
 电线电缆挤出机  
 CZ-φ70 × 25D Power Cable  
 Extruding Machine

Wire Extrusion Equipment,  
 courtesy of PANTECH SOUTHERN, INC.



PVC compounding system

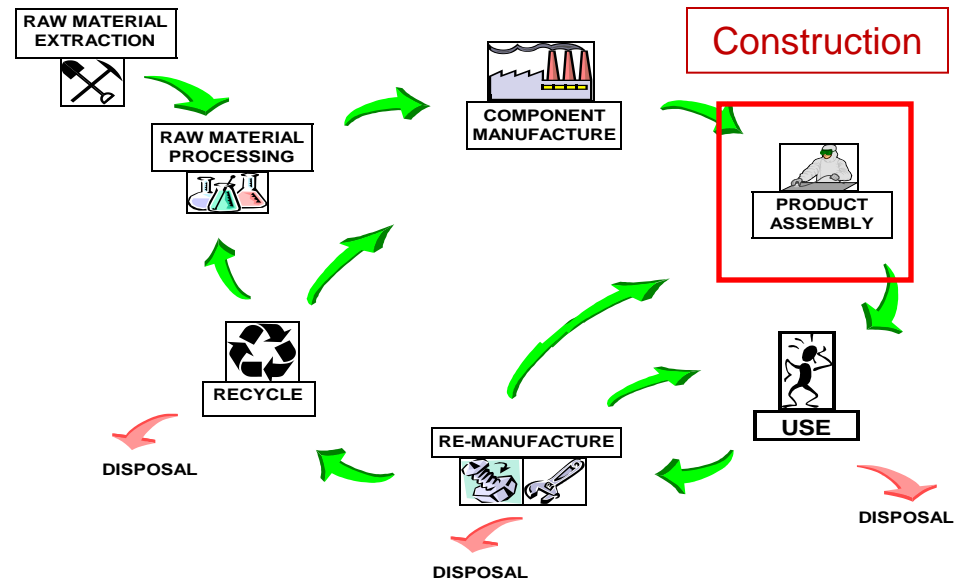
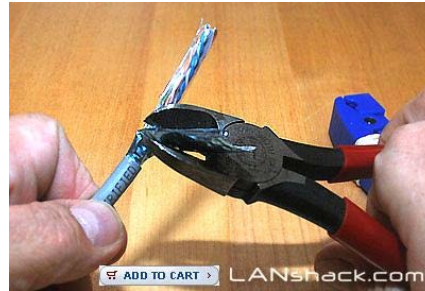


# Wire and Cable Materials

## Life Cycle



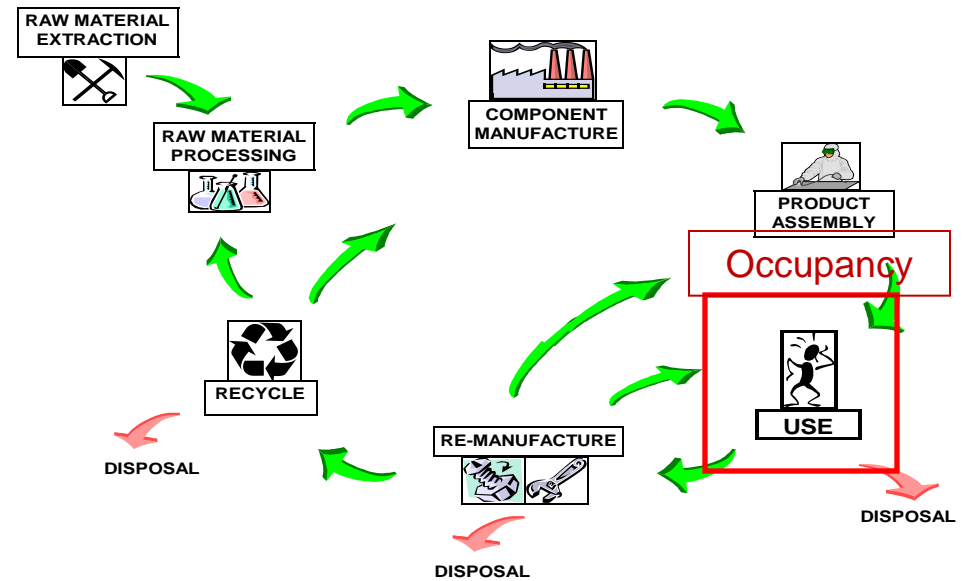
Stripping insulation from wire



# Wire and Cable Materials Life Cycle



Lead dust in ceiling space



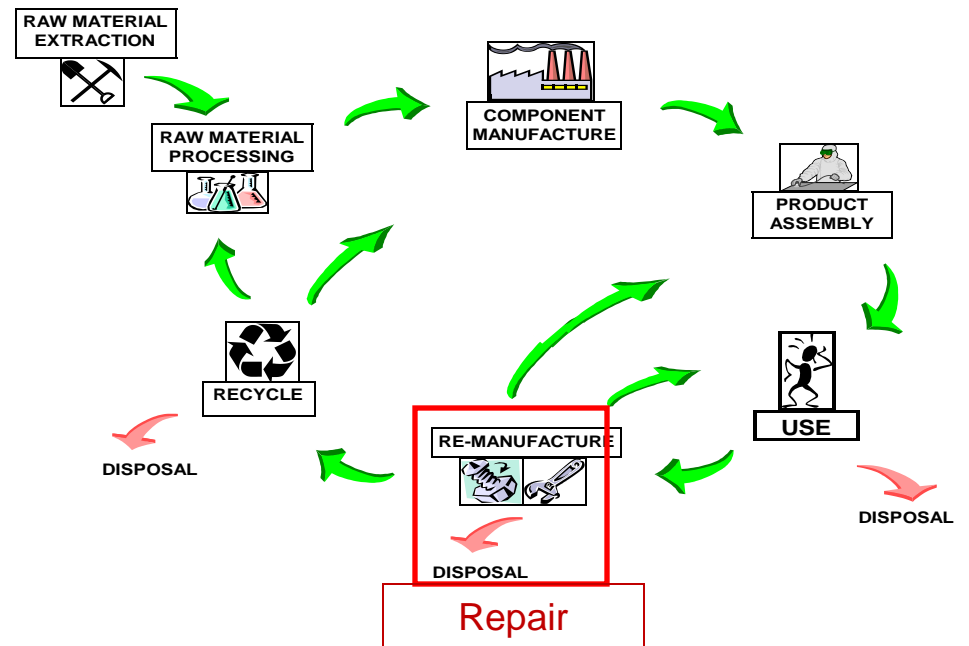


# Wire and Cable Materials

## Life Cycle



Removing abandoned wire and cable





# Where are toxic chemicals used in building materials?

- Remember to consider entire Life Cycle
  - raw materials, finished goods, recycling, EOL disposal
- Sustainable, responsible sourcing



Mike Donenfeld/Shutterstock; Zed Nelson/Panos Pictures

# Where are toxic chemicals used in building materials?

- Finishes
- Insulation
- Structure/Building Materials
- Utilities

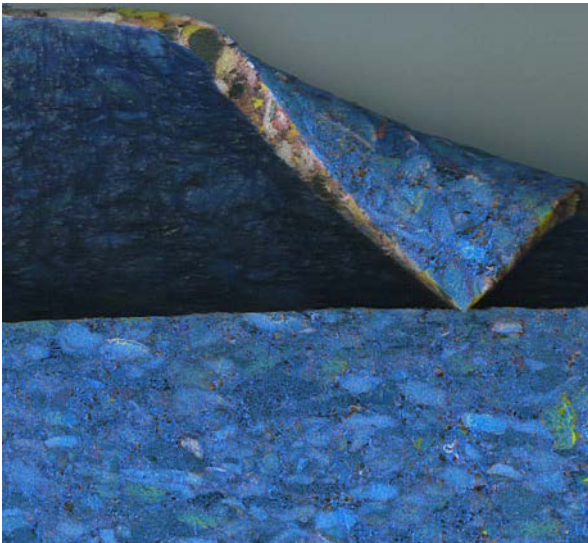


- Flooring
    - Vinyl (sheet and tile) – PVC + additives + coatings
      - PVC additives:
        - stabilizers (lead, calcium zinc, magnesium zinc, etc.)
        - Plasticizers ( phthalates)
        - Flame retardants (brominated organics, antimony)
        - Colorants (organic or metal pigments)
    - Rubber
    - Engineered wood – resin + additives, adhesives
-

- Paints, coatings
    - solvents, VOC's, biocides, colorants, resins
  - Carpeting and fabrics
    - VOC's, anti-stain treatments, carpet cushion
  - Wallcovering
    - PVC + additives + coating
  - Cove base, blinds
    - PVC + additives
  - Cushions, foams
    - Flame retardants
-

# Where are toxic chemicals used in building materials?

- Recycled materials  
...where did the material come from?



- Fiberglass bat
  - Glass fibers and formaldehyde-based binder
- Polyurethane and polyisocyanurate foams
  - Isocyanates
- Expanded polystyrene foam
  - Styrene monomer
- Recycled Paper/fiber
  - Flame retardants

# Structure, Building Materials

- Engineered Wood products
  - Resins (formaldehyde), adhesives, biocides
- Concrete
  - Hexavalent chromium, fly ash (lead, mercury)
- Vinyl siding, windows
- Gypsum wallboard
  - Sulfur contaminants in Chinese wallboard
- Roofing
  - Asphalt, EPDM/rubber, PVC
- Waterproofing, adhesives (epoxies, asphalt)

- Wire and cable
  - PVC, fluoropolymers, additives
- Renewable Energy: Storage batteries
  - Lead-acid
  - Nickel-Cadmium
- Wind Turbines
  - Blade materials
    - Fiberglass composite/laminates, polyester, epoxy or styrene-based resins, solvents
    - Wood, carbon, glass fibers in epoxy matrix

- Photovoltaics
    - Multijunction PV: gallium indium phosphide (GaInP), gallium arsenide (GaAs), and germanium (Ge)
    - Gallium arsenide (GaAs)
    - Crystalline silicon (mfr uses strong acids (HF), toxic gases)
    - Amorphous silicon (toxic, pyrophoric gases)
    - Cadmium telluride thin film (CdTe)
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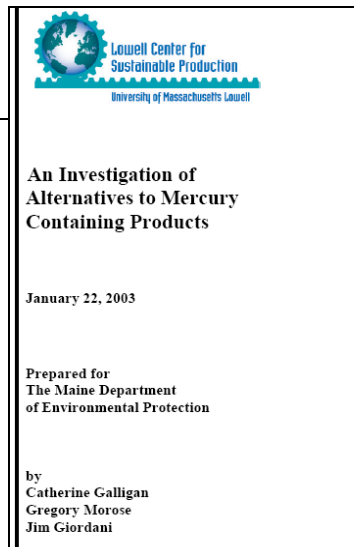
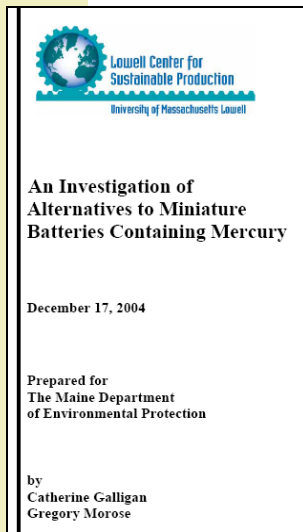
# Mercury

- Mercury
  - Thermostats, switches, batteries, fluorescent lamps, relays

## Interstate Mercury Education & Reduction Clearinghouse (IMERC) Mercury-Added Products Database

### Product List

appliances | automobiles | button cell batteries | chemical compounds | computers | dental amalgam | electronics-miscellaneous | film | heating/cooling equipment | industrial machinery | lamps | LCDs/monitors/projectors | measuring devices | miscellaneous | office equipment | pumps | recreational vehicles | relays | sensors | switches | thermometers | thermostats | toys | transducer | valves |





- Healthy Building Network

- [www.healthybuilding.net](http://www.healthybuilding.net)

- Pharos – database of information on health and environmental impact of materials and products

- <http://www.pharosproject.net/>



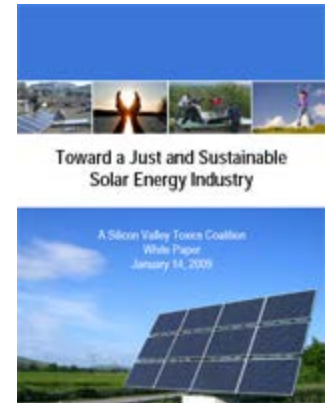
- Building Green network

- [www.buildinggreen.com](http://www.buildinggreen.com)

- Great source of current information

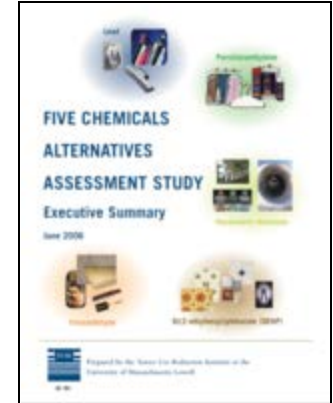


- Silicon Valley Toxics Coalition
  - Toward a Just and Sustainable Solar Energy Industry
    - [www.svtc.org](http://www.svtc.org)
- Health Care without Harm
  - [www.noharm.org](http://www.noharm.org)
- Center for Maximum Potential Building Systems
  - [www.cmpbs.org](http://www.cmpbs.org)



# Resources - TURI

- 5 chemicals alternatives assessment study
  - Wire and cable, wood building panels, resilient flooring
- Environmental, Health and Safety Issues in the Coated Wire and Cable Industry
- Chemical fact sheets and hazard information
- Cleaning laboratory



# Questions??

- Contact Info:

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