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Cal Recycle
Recycled Tire Applications in Construction and Landscaping

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CalRecycle Purpose

Working to protect public health and the environment by effectively and efficiently managing California’s waste disposal and recycling efforts.

Divisions:
- Administration, Finance & Information Technology Services
  - Materials Management and Local Assistance
    - Recycling
  - Waste Permitting, Compliance and Mitigation
How Much is ~40 Million Passenger Waste Tires?

40 Million Tires = 5,681 Miles

Distance from San Francisco to New York City........ AND BACK!
Waste Tires

2 Major Threats: Pests and Fire

Negative Impacts

- Hazardous
  - Potential for fire and toxic chemicals from smoke

- Public Health
  - Tires are a breeding ground for mosquitoes

- Environmental
  - Air, water and land pollution with potential public health effects

- Aesthetic
  - Ugly piles of tires stockpiled on a parcel of land
Health & Safety Research

- 2003 Building Materials Emissions Study (BMES)
- 2011 Tire-Derived Rubber Flooring Chemical Emissions Indoor Reference Exposure Limits (IREL) Study

More research findings are posted at:
www.calrecycle.ca.gov/greenbuilding/Materials/Research/TireStudy.htm
Tire-Derived Product Business Assistance

Health and Environmental Impacts of Tire-Derived Products

The following links provide access to recent articles, research, studies, and fact sheets that specifically examine the potential health and environmental risks associated with various tire-derived product types. These references are also included in the literature review mentioned directly below.

Tire-Derived Product Performance Literature Review (MS Excel, 97 KB)—Results of an extensive literature review undertaken by R.W. Beck in 2008 to identify publications relevant to tire-derived product performance and research addressing health and environmental concerns, and life cycle costs for marketing purposes. The spreadsheet indicates the name of identified articles, source/author, applicable product types, and where the article can be found online, if available.

Artificial Turf | Crumb Rubber | Pour-In-Place Products | Rubber Mulch | Tire-Derived Aggregate

Artificial Turf

- OEHHA Artificial Turf Study—The Office of Environmental Health Hazards Assessment (OEHHA) has been contracted to study the health effects of the new generation of artificial turf playing fields.
- Synthetic Turf Council Position Paper Regarding Health and Environmental Impacts (Adobe PDF, 29 KB)
- New York State Department of Health Fact Sheet on Crumb Rubber Used as Infill Material in Athletic Fields in Synthetic Turf Fields (August 2009)
- Connecticut Department of Public Health Fact Sheet on Artificial Turf Fields (October 2007) (Adobe PDF, 63 KB)
- New York City Department of Health and Mental Hygiene Questions and Answers Regarding Artificial Turf
- An Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb Rubber Infilled Synthetic Turf Fields (May 2008) (Adobe PDF, 966 KB)
- Air Quality Survey of Synthetic Turf Fields Containing Crumb Rubber Infill (March 2009) (Adobe PDF, 670 KB)
- A Review of the Potential Health and Safety Risks from Synthetic Turf Fields Containing Crumb Rubber Infill (May 2008) (Prepared for New York City Department of Health and Mental Hygiene by TRC) (Adobe PDF, 958 KB)
- San Francisco Recreation and Park Department Synthetic Playfields Task Force Findings and Department Recommendations (August 2008)
HAZARDS IDENTIFICATION

Primary Route(s) of Exposure: Inhalation, skin contact, eye contact, ingestion.

Effects of Overexposure

Inhalation: Irritation of respiratory tract. Prolonged inhalation may lead to mucus membrane irritation, dizziness and/or light headedness, headache, nausea, coughing, central nervous system depression.

Skin Contact: Irritation of skin

Eye Contact: Irritation of eyes. Prolonged or repeated can cause conjunctivitis, tearing of eyes, and redness of eyes.

Ingestion: May cause fatigue, drowsiness, dizziness and/or light headedness. Medical conditions aggravated by exposure: eye, skin, respiratory disorders.

FIRST-AID MEASURES

Inhalation: Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty. Remove to fresh air if inhalation causes eye watering, headaches, dizziness, or other discomfort.

Skin Contact: Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral oil on to skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. If irritation occurs, consult a physician.

Eye Contact: Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion: Do not give liquid if unconscious or drowsy. Give no more than 2 glasses of water. Obtain medical attention.

ACCIDENTAL RELEASE MEASURES

Steps to be taken in case material is released or spilled: Comply with all applicable health and environmental regulations. Ventilate area. Clean up with towels, broom, or other absorbers. Large spills – use a respirator if not in a ventilated area. Shut-off leak. Surround and contain spill. Pump to storage or salvage vessel. Use absorbent to pick up excess residue. Keep salvage material and rinse water out of sewers and water courses. Small spills – use absorbent to pick up residue and dispose of properly. Clean up with soap and water.

HANDLING AND STORAGE:

Handling and Storage: Keep out of surface waters, sewers, and waterways entering or leading to surface waters. Keep containers tightly sealed when not in use. Store in temperatures between 40°F - 100°F. DO NOT FREEZE.

TOXICOLOGICAL INFORMATION:

Routes of Entry: Irritation caused through all routes of Entry. Hazard through repeated or prolonged inhalation and ingestion.

Toxicity to Animals: Not established.

Ecotoxicity: This product has not been tested to determine environmental effects.

CARCINOGENIC EFFECTS: None of the ingredients in this product are listed with OSHA, IARC, or NTP as carcinogenic.

DISPOSAL CONSIDERATIONS

Waste disposal: Dispose in accordance with all applicable regulations. Avoid discharge to natural waters. Under EPA-RCRA [40 CFR 261]. This material is not a hazardous waste.

REGULATORY INFORMATION:

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA Inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

TOXIC SUBSTANCES CONTROL ACT: This product is in compliance with the U.S. Toxic Substances Control Act (TSCA) inventory requirements.

FOR EMERGENCY CALL: 1-800-424-9300 (CHEMTREC)

IIIMIS (U.S.A.):

Health Hazard: 1
Fire Hazard: 0
Reactivity Hazard: 0
Personal Protection: B

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, expressed or implied, with respect to such information, as we assume no liability resulting from its misuse. Users should take their own investigations to determine the suitability of the information for their own particular purposes. In no event shall reRubber LLC be liable for any claims, losses, or damages, however arising, even if reRubber LLC has been advised of the possibility of such damages.
Market Incentive Funds

Tire-Derived Product Grant Program

- Eligible: Public schools, CA cities, counties and state agencies
- Reimbursement Grant
- Max $150K/applicant, based on $5 for passenger tire equivalent diverted

Noel Davis, Grant Manager  (916) 341-6341
Noel.Davis@calrecycle.ca.gov
Market Incentive Funds (cont.)

Active Transportation Program (ATP)
- $367 million in Funding

Teresa McWilliam  (916) 653-0328 teresa.mcwilliam@dot.ca.gov
Ted Davini  (916) 653-4335 ted.davini@dot.ca.gov

Safe Routes to School

Kevin Atkinson  (916) 653-6920 kevin.atkinson@dot.ca.gov

Environmental Enhancement and Mitigation (EEM) Program
- $7 Million

Brenda Herron  (916) 653-8740 brenda.herron@dot.ca.gov
  eemcoordinator@resources.ca.gov
High Performance Incentive (HPI) Grant

- $100 Million in Funding
- School-related projects for energy efficiency and sustainable building

**Tim Hegedus, Project Manager**  (916) 375-4672  timothy.hegedus@dgs.ca.gov
**Janna Shaffer, Supervisor**  (916) 376-1822  janna.shaffer@dgs.ca.gov

California Clean Energy Jobs Act (Prop 39)

- $550 Million in Funding
- School-related projects for energy efficiency and sustainable building

**Contact**  (855) 380-8722  Prop39@energy.ca.gov
Tire Derived Product Categories

- Accessibility Ramps, Paths & Sidewalks
- Animal Care Products
- Synthetic Turf
- Flooring & Mats
- Sports Surfacing
- Landscaping & Rubber Mulch
- Outdoor Surfacing, Pavers & Tiles
- Playground Surfacing
- Traffic Related Products
Locations of Installed Tire-Derived Products
City of Los Angeles

Locations statewide are listed at: http://goo.gl/maps/VoPu
TDPs Contribute to LEED Credits & CalGreen Standards

**LEED v4 Credits**
- Rainwater management
- Heat island effect
- Outdoor water use
- Building life-cycle impact
- Green purchasing
- Local sourcing of raw materials
- Low-emitting materials
- Acoustical performance
- Exterior noise control
- Design innovation

**CalGreen Standards**
- Regional materials
- Recycled content
- Enhanced durability and reduced maintenance
- Weather resistance and moisture management
- Heat island effect
  - Cool roof
  - Hardscape alternatives
- Potable water reduction
Sealants and Membranes

CSI Divisions

- 07 00 00: Thermal & Moisture Protection
- 09 00 00: Finishes
- 13 00 00: Special Construction
Anaheim Hilton Hotel

Options for leaking roof:

- $1,000,000 to replace roof
- $450,000 to repair roof
- Best option: $150,000 to reseal roof

Benefits:

- California tires diverted from landfills: 2,000
- Energy savings
- Reduction of carbon emissions
- Mitigation of the heat island effect where dark, non-reflective hardscapes and buildings absorb heat.
Completing rubberized primer application.

Application of top-coat

Finishing application of White top-coat
Roofing Membranes
Chrisman Pumping Plant

- California tires diverted from landfills: 157 tires
- The 300 mils thickness ensures the roofing can handle foot traffic
- The roof was then coated with a cool roof rated coating to meet Title 24 and reduce energy consumption

Benefits:
- Contains ~8% recycled rubber which contributes to the system’s waterproof qualities
- Durable waterproof layer is flexible and can withstand hot temperatures
- Heat welding creates strong bonds with adjacent pieces
Roofing Underlayment
Roofing Shingles
Moisture Barriers
Flooring & Mats

Product benefits may include:

- Durability & wear-ability
- Low installation & maintenance costs
- Reduced injuries & enhanced comfort
- Non-skid surface & slip resistance in both wet / dry conditions
- Reduced fatigue & improved productivity

Potential LEED® v4 Credits:

Building Life-Cycle Impact Reduction
Building Product Disclosure and Optimization
  – Environmental Product Declaration
Building Product Disclosure and Optimization
  – Sourcing of Raw Materials
Acoustic Performance
Case Study: Flooring Underlayment

Concerto Lofts, Los Angeles, CA
Solair Condos, Los Angeles, CA

Benefits:

- California tires diverted from landfills: 55,000
- Reduces the noise from foot traffic, televisions and stereos
- Superior impact sound isolation required for multi-family, condominium and commercial installations
- Resilience of tire rubber maintains its form over time
- Durable compared to other underlayment materials
Multipurpose
Outdoor Surfacing, Pavers & Tiles

Product benefits may include:

- Durable and resilient to various climates and exposure to elements
- Resistant to fading and cracking
- Low installation and maintenance costs
- Reduced injuries and enhanced comfort
- Non-skid surface & slip resistance in both wet/dry conditions
- Permeable surface, depending on product

Potential LEED® v4 Credits:

- Rainwater Management
- Heat Island Reduction
- Building Product Disclosure and Optimization
  – Environmental Product Declaration
  – Sourcing of Raw Materials
Case Study: Outdoor Pavers

Contra Costa County Fairgrounds, Antioch, CA

Benefits:

- California Tires diverted from landfills: **6,469 tires**
- Shock-absorbing
- Anti-skid surface
- Water Permeable
- Durable in hot and cold climates
- Reduced tripping hazard compared to concrete pad
Accessibility Ramps, Paths & Sidewalks

Product benefits may include:
- Enhanced durability & resilience
- Easy maintenance & installation
- Enhanced safety & reduced liability
- Enhanced comfort
- Absorbs and retains less heat than concrete
- Reduced storm water run-off depending on product permeability

Potential LEED® v4 Credits:
- Rainwater Management
- Heat Island Reduction
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
- Building Product Disclosure and Optimization
  - Sourcing of Raw Materials
Accessibility Ramps, Paths & Sidewalks

CSI Divisions

- 32 00 00: Exterior Improvements
- 32 12 00: Flexible Paving
- 32 16 10: Sidewalks

Vancouver 2010 Winter Olympics
Used rubber tiles from recycled tires instead of asphalt
Set & Lock Flexible Sidewalk Modules
Detectable Warning Mat Molded Rubber
Examples of the Color Black Used on a Sidewalk Retrofit

Plastic concerns
Safer Sidewalks for City Blocks
100% Recycled Rubber for Pigmented Pervious Pavement for Walkways
Pour in Place & Tree Wells
Monrovia High School
Case Study: Accessibility Ramps

Liberty Station, San Diego, CA

- Made from **100% California recycled tires**
- California tires diverted from landfills: **3,200 tires**

Benefits:

- Compliance with federal ADA access laws codified in local building requirements
- These recycled rubber tire ramps have no load-weight limitations
- Unlike other construction materials such as aluminum, wood and plastic
- Installation of recycled tire rubber accessibility ramps do not require jack-hammering or sawing
Flooring & Accessibility Mats
Solid Surfaces, Pavers, Bound Mulch & Tiles

CSI Divisions

- 32 00 00: Exterior Improvements
- 32 18 00: Athletic & Recreation Surfaces
Multipurpose Pavements and Tracks
Elementary School in Petaluma, CA

Playground – 15,000 California tires diverted from landfills
Running track – 7,627 tires diverted
LAUSD projects with Playground Tiles

- Central Region Elementary #18
- South Region Elementary #6
- Kaiser Watts Learning Center
- South Region High School #15
- South Region Span K-8 #1
Case Study: Playground Tiles
Glen Paul School, Eureka, CA

BEFORE
- Woodchips float on puddles
- Mushrooms grow

AFTER
- Improved safety
- Increased access for students with disabilities

California tires diverted from landfills: **14,825 tires**

“The tiles have made a big difference. Kids bounce off them when they fall and are surprised that they don’t get hurt.” - Tess Ives, Principal
Pour-in-Place

Potential LEED® v4 Credits:
- Rainwater Management
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
- Building Product Disclosure and Optimization
  - Sourcing of Raw Materials
1) Concrete Edge

2) Poured-In-Place Shredded SBR Cushion Layer (Depth Varies Depending Upon Fall Height of Equipment)

3) Poured-In-Place Wear Course, .5" Min. Thk. (2% Max Slope)

4) Optional Wheel Chair Stop

5) Sand/Wood Fiber

6) 18" Minimum Turndown Recommended (Turndown at 45° Angle)

7) 4" Min. Sub-Base (Concrete, Asphalt, or 95% Compacted Aggregate Installed in 2-2" Lifts), Slope 2% Max.

(NO SCALE)

DATE: 02/17/10
Case Study: Parks

Livermore Area Recreation and Park District

- California tires diverted from landfills: **3,281 tires**

Benefits:

- Requires less maintenance
- Less frequent replenishment vs. sand and wood
- Meets ASTM F1292 and ASTM F1951 standards
Case Study: Playground Mulch

Snowden Elementary & Hester Elementary School

- California tires diverted from landfills: **29,986 tires**

**Benefits:**

- Safer surface cushions child’s fall
- Eliminates splinters
- Fade reducing colorant coating
- Long lasting and durable
- Tires diverted from the landfill
- Meets ASTM F1292 and ASTM F1951 standards
Case Study: Landscaping Bark

Redding Recycling and Transfer Station

- California tires diverted from landfills: 6,183 tires

Savings

- Reduced labor, maintenance and replacement of wood chips every few years
- The bark controls weed growth, reduces dust, provides excellent drainage and is long lasting

Benefits:

- Durable
- Aesthetically pleasing
- Diverts tires from landfills
Case Study: Rubber Mulch

Santa Clara County Sheriff’s Office, Training Academy
- Prevents weeds
- Reduced mulch erosion
- Discourages animals

“We are located right against the foothills near a county park, and the landscape generates weeds very quickly. This mulch prevents weeds from growing and provides cushioning for falls.” - Deputy Sheriff Devin Fontana
Landscape Edgings

- Colors available:

Potential LEED® v4 Credits:

- Rainwater Management
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
  - Sourcing of Raw Materials
Synthetic Turf

Product benefits may include:

- Durability in all climates
- Easy installation
- Low maintenance
- Reduced injuries & enhanced comfort: Cool Plus Fiber technology
- Reduced water usage

Potential LEED® v4 Credits:

- SRI Value-33
- Rainwater Management
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
  - Sourcing of Raw Materials
Low Maintenance
Humboldt State University

- California tires diverted from landfills: **30,000 tires**

**Savings:**
- Water bill
- Soil amendments
- Fertilizers
- Lawn mower fuel
- Maintenance labor

**Benefits:**
- Extended field use to year round activity.
- Reduces the university’s need to rent space off-site to accommodate group activities that require field time.
- ASTM F1292 and ASTM F1951 Certified
Sports Surfacing

Product benefits may include:

- Durable & resilient surface
- Easy maintenance & installation
- Slip resistant & traction in both wet / dry conditions
- Enhanced cushioning & comfort walking / running
- Enhanced safety and reduced injuries from falls
- Enhanced performance as shock absorption reduces stress on joints, muscles, legs & back

Potential LEED ® v4 Credits:

- Rainwater Management
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
- Building Product Disclosure and Optimization
  - Sourcing of Raw Materials
- Low Emitting Materials

CalRecycle
Traffic Related Products

Product benefits may include:

- Durable & resilient to various climates and exposure to elements
- Low installation & maintenance
- Weighs less than many non-recycled product substitutes
- Reduced cost
- Variety of product options

Potential LEED ® v4 Credits:

Building Product Disclosure and Optimization
- Environmental Product Declaration
- Sourcing of Raw Materials
Case Study: Tire Stops

Dow Chemical
- Installed 400 three ft. tire stops in their parking lot
- California tires diverted from landfills: 800 tires

Benefits
- Lasts longer compared to conventional concrete
- Maintenance free
- Easy to install
- Lightweight
- Reduced risk of damage to vehicles
Traffic Products

Throughout California

• 1 – 3 tires used in sign base
• Provides stability for a variety of portable signs
• Maybe used in pedestrian zones near K-12 schools, in parking garages and at public events

Benefits:

• Heavy weight of the recycled tire rubber provides stability
• Rubber bases are reboundable or detach upon impact
• Divert scrap tires from the landfill
Other Products

Product benefits may include:

- Durable & resilient in all climates
- Low maintenance & easy installation
- Enhanced comfort & safety
- Reduced noise levels from sound absorption
- Absorbs & retains less heat than traditional counterparts
- Enhanced permeability reduces storm water run-off

Potential LEED® v4 Credits:

- Rainwater Management
- Building Product Disclosure and Optimization
  - Environmental Product Declaration
  - Sourcing of Raw Materials
- Enhanced Acoustical Performance
  - Exterior Noise Control
- Innovation in Design
Case Study: Erosion Control Blocks

CalExpo

- California tires diverted from landfills: 7000 tires
- In 2008 CalExpo installed a quarter mile long retaining wall made from dense recycled rubber blocks and rebar

Benefits:

- Durable to outside elements
- Consistent size – each block replaces two typical gravel bags
- Sturdy recycled rubber blocks effectively provide erosion control effectively control Stormwater

Savings:

- Less cost for materials and permitting fees.
Stall & Flooring Mats

CSI Divisions

- 01 00 00: General Requirements
- 01 50 00: Temporary Facilities and Controls
- 09 00 00: Finishes
- 09 65 00: Resilient Flooring
Case Study: Recycled Rubber Tiles

- Designed to be long lasting.
- Easy to install with no tools required.
- Provides great footing for horses while allowing drainage.
- Lightweight, unlike conventional rubber mats.
- Easy to clean and maintain.
Rubber Rolls

Product benefits may include:

- Environmental
- Economic
- Health & Community

Potential LEED® v4 Credits:
Building Product Disclosure and Optimization
  - Environmental Product Declaration
Building Product Disclosure and Optimization
  - Sourcing of Raw Materials
Rubberized Pavement

Product benefits may include:

- Durable & long lasting
- Resistant to cracking
- Cost-efficient installation
- Low maintenance costs
- Enhanced traction & visibility in wet weather, leading to fewer accidents
- Enhanced comfort due to noise reduction

RAC Contact: Nate Gauff  916-341-6686

Potential LEED® NC v3 Credits:
- Stormwater Design (SS Credits 6.1 & 6.2)
- Heat Island Effect (SS Credits 7.1 & 7.2)
- Recycled Content (MR Credit 4)
- Regional Materials (MR Credit 5)
- Innovation in Design (ID Credit 1)

Funding Assistance auto-notices:
www.calrecycle.ca.gov/Listservs/Subscrib e.aspx?ListID=91
Grants hotline: 916/341-5062
Tire-Derived Aggregate

Funding Assistance: www.calrecycle.ca.gov/Listservs/Subscribe.aspx?ListID=120

Permeable Backfill in LFG Collection & Leachate Recirculation Trenches

Roadway Base

CalRecycle expert/engineer: Stacey Patenaude 916/341-6418
LEED Credits for Access Ramps, Paths & Sidewalks

Name Some Potential LEED v4 Credits:

- Rainwater Management
- Heat Island Reduction
- Outdoor Water Use Reduction
- Building Life-Cycle Impact Reduction
- Building Product Disclosure and Optimization
- Acoustical Performance
- Innovation
Discussion/Questions

TDPs Catalog on-line at:
www.calrecycle.ca.gov/tires/Products/Catalog
Contains product specification sheets, etc.

Vendor List:
www.calrecycle.ca.gov/Tires/Products/Vendors.pdf

We hope this presentation has been informative.
Let us know how we might improve.