RESPONSIBLE PURCHASING **GUIDE**

light-duty tires & wheel weights

RPN
Responsible Purchasing Network
Center for a New American Dream

About the Guide

The Responsible Purchasing Guide for Light-duty Tires and Wheel Weights is published by the Responsible Purchasing Network in print, as a PDF file, and on the web. Print and PDF copies are available to the public for purchase. The online edition includes additional resources available to members of the Responsible Purchasing Network, including: searchable product listings, multiple policy and specification samples, comparisons of standards, and related documents. Visit www.ResponsiblePurchasing.org to purchase a copy or to access the members-only web-based edition of the Guide.

About the Responsible Purchasing Network

The Responsible Purchasing Network (RPN) was founded in 2005 as the first national network of procurement-related professionals dedicated to socially and environmentally responsible purchasing.

RPN is a program of the Center for a New American Dream (www.newdream.org) and guided by a volunteer Steering Committee of leading procurement stakeholders from government, industry, educational institutions, standards setting organizations, and non-profit advocacy organizations.

Acknowledgements

The Responsible Purchasing Network (RPN) would like to thank the following people for assisting with the development of this Guide. Their expertise helped to ensure quality and accuracy, though RPN alone accepts responsibility for any errors or omissions. Affiliations listed below were current when input was provided to RPN and are listed for identification purposes only and do not imply organizational endorsement of this Guide.

Lead Author: Matt Kittell Editor: Chris O'Brien

Advisors and Reviewers: Gene Bishop, State of Maine Department of Transportation; Harvey Brodsky, Tire Retread Information Bureau; Chris Calwell, Ecos Consulting; Ken Davies, City of San Jose Environmental Services Department; Jeff Gearhart, Ecology Center; Jason Mathers, Environmental Defense; Gene Peterson, Consumer Reports; Rick Sikes, City of Santa Monica; Luke Tonnachel, Natural Resources Defense Council; Bob Toppen, King County, Washington

Table of Contents

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Overview

The Responsible Purchasing Guide for Light-Duty Tires and Wheel Weights provides detailed information on purchasing, use, and disposal of tires and wheel weights with emphasis on low rolling resistance (LRR) tires, retread tires, and lead-free wheel weights. This Guide can be used to develop a responsible tire policy; to gain an understanding of the LRR, retread, and lead-free wheel weight marketplace; to understand the leading standards and test procedures for tires; and to develop bid and contract specifications.

The following sections are included in this Guide:

Social and Environmental Issues
Social and environmental issues arise during the production, use, and disposal of tires and wheel weights. Turning the wheels consumes between 10 and 20 percent of the energy created in a vehicle engine, one-third of which is lost due to rolling resistance. The manufacture of a new light-duty tire requires 7 to 8 gallons of oil. In 2003, 230 million waste tires in the United States were absorbed into the scrap tire market and another 60 million tires were disposed of in landfills and other locations. Every light-duty vehicle in the U.S. has an average of 4.5 ounces of lead clipped onto tires for wheel balancing. Around 2,000 tons of lead wheel weights falls onto U.S. roadways every year as wheel weights fall from vehicle tires.

Best Practices
Responsible tire and wheel weight management can be achieved through best practices that include forming a team, compiling and tracking data, setting goals and passing a policy, and improving practices. Best practices address the procurement, use, and disposal of tires and wheel weights and are the foundation of a responsible tire program. These best practices can be integrated into broader green fleet programs, thereby achieving efficiencies and maximizing effectiveness.

Cost, Quality and Supply
LRR and retread tires as well as lead-free wheel weights are cost effective, perform as well as conventional products, and are available across the country. LRR tires come standard on most new vehicles but require extra effort to obtain in the replacement tire market. Although LRR tires may cost $5 to $12 more per set of four at the point of purchase than low-end conventional tires of similar size, they can save up to $36 per year in fuel costs. The purchase price of retread tires is equivalent to low cost conventional tires. Studies show that both LRR and retread tires perform as well as conventional tires. Forty-seven states currently have vendors that sell retread tires for light-duty trucks, and vendors in nine states sell retreads for cars. Lead-free wheel weights are just as effective as lead wheel weights. Several companies in the United States produce lead-free wheel weights, largely due to demand from leading institutional buyers like King County, WA and the State of Maine.

Policies
The Policies section of this Guide contains over twenty sample policies from leading institutions. A responsible tire procurement policy establishes official targets and responsibilities for tire and wheel weight procurement, use, and disposal. The policy can establish a training program for purchasers, maintenance staff, and drivers to help them understand the importance of the goals and practices included in the policy. The policy should include a system for tracking and reporting on progress toward the stated goals. A responsible tire procurement policy can be a

stand-alone policy or can be integrated into an organization's broader green fleet policy. See Addendum I for a full model policy.

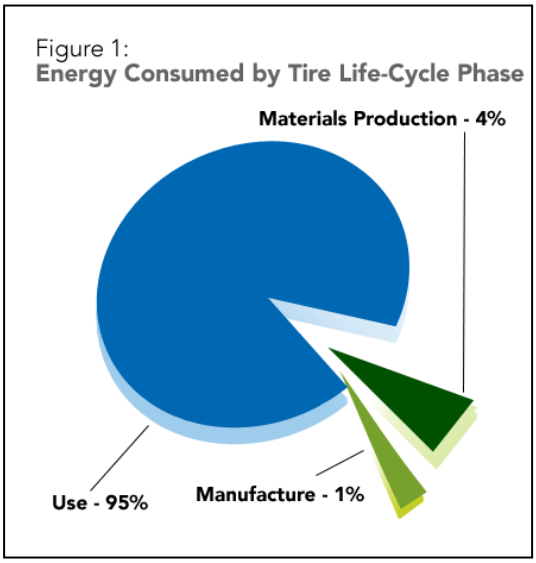
Specifications
The Specifications section of this Guide contains more than a dozen bid and contract documents for LRR and retread tires and lead-free wheel weights. These specifications may require that bidders identify the rolling resistance coefficient (RRC) of their tires and identify an RRC threshold for qualified tires. Specs for retread tires may require bidders to have a quality control program, to be members of reputable tire industry trade groups, and to conform to federal standards and specifications. Wheel weight specs may request information on lead-free alternatives. Specs for tires and wheel weights may also include language requiring bidders to collect and properly recycle or dispose of products at the end of their useful life. See Addendum II for model specifications for LRR tires, retread tires, and lead-free wheel weights.

Standards
The National Highway Traffic Safety Administration sets safety and performance standards for tires including LRR and retread tires. There is no official standard or certification for demarcating LRR tires although the Society of Automotive Engineers has two widely accepted procedures for measuring tire rolling resistance. The International Standards Organization (ISO) also has a tire rolling resistance testing procedure. Federal Standard 117 addresses performance, labeling, and certification of retreaded tires for passenger vehicles. Green Seal Standard GC-10 for fleet vehicle maintenance requires retread tires and proper tire disposal.

Social and Environmental Issues

Below we discuss the social and environmental impacts of tires and wheel weights that occur during production, use, and disposal phases.

This discussion focuses on the production of rubber and tires, but does not directly address the production impacts of additional components that are added to tires, such as: fabric made of steel, nylon, rayon, aramid, polyester, and other corded material; reinforcing chemicals such as carbon black and silica; anti-degradants; adhesion promoters; curatives; and processing aids (Goodyear, undated). For a detailed analysis of tire components and manufacturing, see EPA 2005 under Related Documents at the end of this section.



Energy

Four percent of the energy consumed during a tire's lifecycle is used during the raw material production process (see Figure 1) (CEC, 2003). Rubber can be made from natural or synthetic materials. Energy is required for fertilizers, processing, and transport of natural rubber. Rubber trees absorb carbon dioxide during growth and fix carbon in their fibers. This gives natural rubbers an initial advantage over synthetic rubbers from a greenhouse gas perspective. However, natural rubber consumes more energy than synthetic rubber during other stages of production (UNCTAD, 1997).

One percent of a tire's lifecycle energy is used in the tire manufacturing process (CEC, 2003). In total, 7 to 8 gallons of oil are required to manufacture a new light-duty tire whereas manufacturing a retread tire only requires 2 to 3 gallons (see Figure 2) (ITRA, 2001).

More importantly, ninety-five percent of a tire's energy consumption occurs during use (CEC, 2003). Between 10 and 20 percent of the energy created in a vehicle engine is used to turn the wheels and one-third of this energy is lost due to rolling resistance (NAS, 2006). Rolling resistance is a function of tire inflation and design, vehicle load and speed, and road surface. Improved tire design and proper inflation reduces rolling resistance and leads to direct improvements in fuel economy (see the Best Practices section of this Guide).

Hazardous Substances

Workers in tire manufacturing facilities are exposed to hazardous materials such as ground-level ozone and carbon black used during the rubber vulcanization and metal bonding processes (UNCTAD, 1997).

Hazardous substances are released in gaseous and solid form when waste tires are burned in uncontrolled settings and release smoke that causes short and long term health effects in

exposed individuals (EPA, 1997). In addition, the high heat of these fires can melt metals contained in the tires and cause them to leach into the surrounding soil and groundwater.

Around 4.5 ounces of lead are clipped onto the tires of a typical car for wheel balancing (EPA, undated(b)). Lead is a highly toxic substance that can cause brain and kidney damage when ingested (EPA, undated(c)). In 2003, an estimated 65,000 tons of lead were used as wheel weights in the United States (USGS, 2006). Nearly 2,000 tons of lead is dropped onto U.S. roadways every year as weights fall from vehicle tires, mostly in urban environments due to poor road conditions and less fluid driving styles (e.g., potholes, more turns, more stops and starts). Once fallen, lead weights are exposed to air, water, and vehicle and foot traffic and degrade into fine particulates posing risks to exposed individuals (Ecology Center, undated(a)).

Air Quality

Workers in rubber plants are exposed to a variety of emissions from chemicals used in the production process. Process emissions include volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), and are most problematic with large scale facilities (EPA, 2005). Many natural rubber drying facilities use wood as fuel, which can create hazardous air conditions for workers and surrounding communities (Tekasakul, 2006).

Additional air quality problems surface at the point of tire manufacturing. Solvents and cements release VOCs and HAPs, primarily during the operations that cement the various tire components together. Many tire manufacturers are working to eliminate solvents and cements from manufacturing processes and are switching to silicon, water-based, and organic materials (EPA, 2005).

If tires are recycled into retreads or other products, air quality will be impacted based on the type and amount of energy used in the process.

If tires are burned in combustion turbines like those used for fossil-fuel power plants, air quality impacts are similar to those for fossil fuels, with the exception of zinc emissions, which are higher for tires.

If tires are burned in an uncontrolled setting, significant volumes of air pollutants are emitted directly into the surrounding air, including particulates, carbon monoxide, nitrogen oxides, volatile organic compounds, aromatic hydrocarbons, dioxins, furans, hydrogen chloride, benzene, arsenic, and cadmium. Laboratory tests conducted by the Environmental Protection Agency found that emissions from open tire fires are 16 times more dangerous to human health than smoke from residential wood combustion and 13,000 times more dangerous than emissions from efficient coal power plants with smokestack filtration equipment (EPA, 1997).

Water

Water is required for primary processing of natural rubber and can pollute water supplies around processing facilities (UNCTAD, 1997). Water is used for dilution of rubber latex, washing and transporting slabs of rubber, and washing factory equipment and workspace (Tekasakul, 2006). This water can become acidic from materials used in processing and contains a range of other pollutants that disrupt drinking water and aquatic ecosystems. Zinc is one of the most significant pollutants resulting from rubber processing and is released largely due to improper housekeeping in processing facilities (EPA, 2005).

Lead wheel weights that fall from vehicles can be washed by rainwater into local watersheds. A study by the U.S. Geological Survey in California's Santa Ana watershed found that lead levels

were higher in streams near urban areas than they were in rural areas, due to human impacts such as lead wheel weights (CEH, 2007). Another study by the Wisconsin Department of Natural Resources found that 70 percent of runoff from commercial areas had lead levels high enough to kill aquatic life, and blamed vehicle wheel weights as the primary source (Ecology Center, undated(a)).

End-of-Life Management
In 2003, approximately 290 million waste tires were generated in the U.S. with over 230 million of these tires absorbed into the scrap tire market and the remaining 60 million tires disposed of in landfills and other locations (EPA, undated(a)). The scrap market tires were used as follows:

- 45 percent used as fuel
- 20 percent recycled or used in civil engineering projects
- 8 percent converted into ground rubber and recycled into consumer products
- 7 percent converted into retread tires
- 20 percent used in rubber-modified asphalt, exported, recycled into cut/stamped/punched products, or used for agricultural or miscellaneous uses

A survey in 2005 found that roughly half of fleet managers in the U.S. dispose of their lead wheel weights by sending them directly to smelters or other recyclers. Most large commercial tire producers and vendors have policies to recycle lead wheel weights on returned tires, though the actual percentage of lead recycled is unknown. At least 4,000 tons worth of disposed lead wheel weights are unaccounted for each year in the United States (USGS, 2006).

Social Responsibility
When buying replacement tires, purchase tires that perform safely for the desired application and are suitable for the prevailing road conditions. Low rolling resistance and retread tires should be used when they meet these safety and performance criteria. For tire balancing, the size of wheel weight used should be the appropriate size for the tire, thus reducing the likelihood of wheel weights falling from tires. Lead-free wheel weights should be used when possible.

Used tires should be disposed of properly, typically directed to the scrap tire market where they can be recycled into other useful products or burned in combustion turbines for energy recovery. Never dispose of tires in landfills where they may catch fire and contaminate air, water, and soil (EPA, 2005). Landfill tires also provide a breeding ground for mosquitoes and other disease carrying insects. Never allow used tires to be resold as the condition of the used tires may vary greatly and can be unsafe.

Related Documents

EPA, Occupational Exposures and Environmental Releases of Lead Wheel-Balancing Weights, 2005 - **http://www.leadfreewheels.org/OPPT-2005-0032-0036.pdf**
Detailed study by the U.S. EPA on worker health impacts from installing lead wheel weights.

EPA, Profile of the Rubber and Plastics Industry, 2nd Edition, 2005
Contains detailed explanation of tire components and manufacturing process.

Environmental Health Perspectives, Lead Loading of Urban Streets by Motor Vehicle Wheel Weights, 2000
http://www.ehponline.org/members/2000/108p937-940root/root.pdf
Detailed study of lead exposure from wheel weights in Albuquerque, New Mexico.

Best Practices

Social and environmental problems with tires and wheel weights can be reduced through a range of best practices that include forming a stakeholder team, compiling and tracking data, and improving maintenance and usage. Best practices for tire and wheel weight management can be integrated into broader green fleet programs, thereby achieving efficiencies and maximizing effectiveness. See the Responsible Purchasing Guide for Light-Duty Fleet Vehicles for information on designing a green fleet policy.

Form a Stakeholder Team

Form a Tire Procurement Team drawn from staff in purchasing, maintenance, management, and drivers. This Team is responsible for conducting research, developing and implementing a plan, and reporting on progress. This Team can be a stand-alone body or a sub-group of a green fleet team.

Compile Inventory and Establish Baseline

A tire and wheel weight inventory provides information that can be used to compare progress towards responsible tire and wheel weight management over time. Data from a baseline year can be compared with subsequent years to assess progress and identify areas for improvement. The tire and wheel weight inventory can be a stand-alone dataset or integrated into the institution's broader fleet vehicle inventory tracking system.

There are numerous data points that can be tracked and it will be the responsibility of the Tire Procurement Team to determine how to balance the administrative costs of collecting and tracking these data with the benefits of having a comprehensive inventory. Data points can include:

- Number of tires in use and the associated brand, model, number of miles, and replacement schedule.
- Type of vehicle each tire is mounted on and the estimated and actual fuel economy of that vehicle.
- Air pressure of each tire.
- Purchase information for each tire including vendor, date of purchase, and whether the tire is original equipment or a replacement.
- Number and type of wheel weights attached to each wheel.

Update data periodically and conclude with information on how each tire and wheel weight was disposed of.

Set Goals

Set goals for proper tire and wheel weight procurement, use, and disposal. These goals should be clearly stated in an official organization policy and should include goals for the following:

- Purchase of retread and/or low rolling resistance tires.
- Use of lead-free wheel weights.
- Proper inflation, tire rotation, inspection during inflation check and alignment, and monitoring of rated and actual fuel economy of vehicles on which the tires are mounted.

- Proper disposal of tires to retreaders or the scrap market.
- Proper disposal of lead weights to a reprocessing facility.

Adopt Policy
A responsible tire procurement policy will establish official targets and responsibilities for tire and wheel weight procurement, use, and disposal. The policy should clearly state institutional goals (see Set Goals, above) and can establish a training program for purchasers, maintenance staff, and drivers to help them understand the importance of the goals and practices included in the policy. The policy should include a system for tracking and reporting on progress toward the stated goals. Senior management should sign off on this policy.

This policy can stand-alone or can be integrated into a broader green fleet policy. See the Responsible Purchasing Guide for Light-Duty Fleet Vehicles for sample green fleet policies and the Policies section of this Guide for sample tire procurement policies.

Evaluate Standards and Specifications
The National Highway Traffic Safety Administration sets safety and performance standards for tires sold in the U.S.

There is no official standard or certification for demarcating low rolling resistance tires at this time, although both the federal government and the State of California are working on tire efficiency programs. There are standards for rolling resistance testing procedures. When specifying for tires, request rolling resistance data obtained by the Society of Automotive Engineers SAE J1269 (steady state) or SAE J2452 (stepwise coast-down) testing procedures, referring to the Standard Reference Condition (SRC).

Federal Standard 117 addresses performance, labeling, and certification of retreaded tires for passenger vehicles. The goal of the standard is to ensure that retreaded passenger tires are at least as safe as original equipment.

See the Standards section of this Guide for more information.

See the Specifications section of this Guide for a collection of sample tire and wheel weight bid and contract documents from leading institutions.

Improve Practices
Be sure to follow the vehicle recommendations for proper maintenance and tire rotation. Make sure that all four tires on a vehicle are the same size and speed rating, and ideally the same make and model. The size and speed rating should match manufacturer recommended tire for each vehicle. All tires, including the spare tire, should be inflated to manufacturer specifications.

Different wheels use different weight systems. Be sure to use the correct type of wheel weight to reduce or eliminate weight loss during service life.

Practices for increasing efficiency and reducing the impacts of tires include:

- Reduce trips. Driving less will reduce fuel costs and extend vehicle life.
- Plan routes. Proper route planning can reduce total miles traveled and avoid roads with rough surfaces.

- Reduce vehicle loads. Removing unnecessary weight from the vehicle (e.g., files, luggage, and equipment) decreases tire rolling resistance and improves fuel efficiency.
- Keep tires fully inflated. Check inflation pressure at least one time each month and after the tires have been at rest for at least three hours. Each 1-psi drop in a typical light-duty tire's pressure increases rolling resistance by 1-2 percent (NAS, 2006). Low pressure also increases the risk of tire failure
- Properly rotate and align tires. Rotating tires promotes even wear and can extend the life of tires. A properly aligned tire will be perpendicular to the road. Misaligned tires have higher rolling resistance and wear out faster (NAS, 2006).
- Train staff on proper driving and tire care. Training can include guidance on trip and weight load reduction, tire maintenance, and driving styles. Training materials should communicate benefits such as how particular practices can improve fuel efficiency, reduce likelihood of tire failure, and keep lead wheel weights from falling off of tires.

End-of-Life

A disposal decision must be made after a tire's useful life. Tires can be refurbished and sold as a "retread" if tread is low but core structure is still intact. Tires sent to recycling and disposal markets can be used for civil engineering, consumer products, and energy production. Used tires should not be sent to a landfill.

Lead wheel weights should be sent to smelters and recyclers at the end of their useful life. When possible, lead wheel weights should be replaced with lead-free alternatives.

Measure Progress

Measure, track, and report on progress toward goals. In addition to the inventory (see Compile Inventory and Establish Baseline, above), progress on improving practices should also be tracked. This information can be compiled by the Tire Procurement Team and reported on an annual basis. Reporting can be done on a stand-alone basis or as part of an institution's broader green fleets report.

Cost, Quality, and Supply

This section addresses the cost, quality, and supply of low rolling resistance (LRR) tires, retread tires, and lead-free wheel weights.

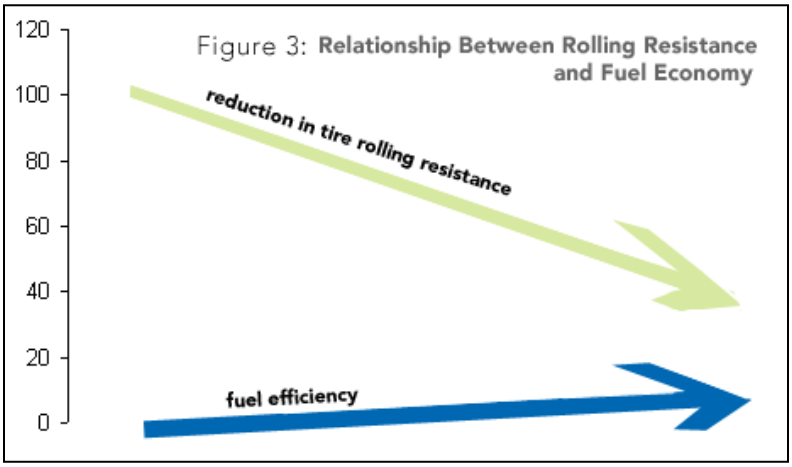
The environmental impacts of recycled rubber content are not evaluated here. However, it is worth noting that tires contain an average of five percent recycled rubber content (CIWMD, 2004). A detailed report on recycled-content tires from the California Integrated Waste Management Board is available under Related Documents at the end of this section. This Guide also does not provide an in-depth discussion of "run-flat tires" – increasingly popular tires that can travel at high speeds at zero inflation. Run-flat tires have higher rolling resistance and are heavier than conventional tires, thus reducing fuel efficiency (NAS, 2006).

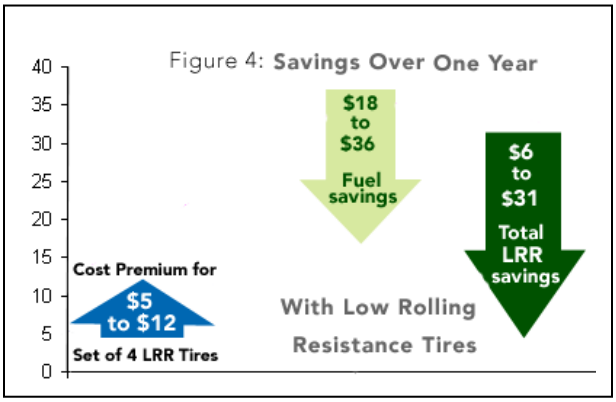
Note that replacement tires should meet the vehicle manufacturer's recommended speed and performance rating. Consult the vehicle owner's manual and tire information placard typically found on the driver's side door jamb to determine the proper tire size, speed rating, and recommended inflation pressure to use. Never substitute a lower speed rated tire (excepting winter tires) than those specified by the vehicle manufacturer.

Also note that the most cost-effective way to improve the environmental performance of tires is to maintain proper tire pressure. See **http://www.fueleconomy.gov/feg/maintain.shtml** for the fuel economy benefits of tire inflation and other maintenance practices.

Cost

Low Rolling Resistance Tires. The National Academy of Sciences concluded that there is no observable relationship between rolling resistance and purchase price, when comparing LRR tires and the average replacement tire (NAS, 2006). In testing for the State of California, Ecos Consulting found that LRR tires can cost $5 to $12 more per set of four at the point of purchase than low-end conventional tires of similar size (CEC, 2003). Ecos also found that LRR tires are often less expensive than high-end performance style tires (the tire in the Ecos dataset with the highest rolling resistance, a trait common with performance tires, also had the highest purchase price).





LRR tires improve vehicle fuel economy. For each 10 percent reduction in tire rolling resistance, vehicle fuel economy improves by 1-2 percent (NAS, 2006) (see Figure 3). Replacement tires with low rolling resistance can typically

reduce a vehicle's fuel consumption by 2 to 6 percent compared with standard tires, resulting in annual fuel cost savings of $18 to $36, when gasoline costs $3 per gallon (NRDC, 2004; NAS, 2006) (see Figure 4).

Retread Tires. Although there is no comprehensive purchase price data for light-duty vehicle retread tires, the price is generally comparable to the lowest cost new tires on the market and lower than the price of tires from leading brands. For the most common passenger vehicle tire, a typical retread will cost around $30. A typical retread for a light-duty truck tire will cost around $60 (TRIB, undated). On average, retread tires last as long as new tires (ITRA, 2001).

Lead-Free Wheel Weights. Alternatives to lead wheel weights include steel, zinc, and high specific gravity plastics (TURI, 2006). Lead-free weights are sold as original equipment on many new vehicles at no additional charge. When ordered in large quantities, alternatives, particularly steel wheel weights, can have a comparable price to lead (PPRC, 2007). Other preferable alternatives, such as zinc, cost more than lead (TURI, 2006).

Quality

The Federal Highway Traffic Administration has minimum requirements for tire strength, heat-resistance, endurance, and low-pressure performance that all tires sold in the U.S. must meet. See the Standards section of this Guide for more information.

Low Rolling Resistance Tires. When looking at the correlation between tire rolling resistance coefficients and other tire characteristics, the National Academy of Sciences found that LRR tires demonstrate similar traction and tread wear to conventional tires (NAS, 2006). Ecos Consulting reported that performance variability is due to tire design rather than rolling resistance (CEC, 2003). In Consumer Reports' most recent new-car testing, some cars and trucks with LRR tires as original equipment sacrificed grip, although in testing aftermarket all-weather tires, Consumer Reports found that it is possible to get a very good performing tire with low-rolling resistance compared to other replacement tires (Consumer Reports, undated(a)).

Information on the durability of LRR tires is mixed. On the one hand, Ecos Consulting found "no strong correlations between tire rolling resistance and longevity" (CEC, 2003). Yet they also found evidence that tires sold on new vehicles, which are typically LRR, tend to have shorter lifetimes than replacement tires. Replacement tires with low rolling resistance typically have greater durability than LRR tires sold on new vehicles. Premium replacement tires can typically offer better all weather grip, longer tread life, and relatively low rolling resistance (Consumer Reports, undated(b)).

Retread Tires. Retread tires are widely used in a variety of applications, including passenger airplane tires, 80% of which are retreads (ITRA, 2001). The process and materials for producing retreads are similar to original equipment manufacturing (EPA, 2005). Retread tires in light, medium, and heavy-duty applications show durability consistent with new tires. In addition to extensive field performance, laboratory tests also demonstrate that retread tires have comparable durability with conventional tires. Retread tires do not impact the driving experience (ITRA, 2001).

Lead-Free Wheel Weights. Lead-free wheel weights do not impact the safety of the tire or vehicle (TURI, 2006). There are other social and environmental problems though. Plastic and zinc wheel weights, for instance, each have environmental and human health impacts that make them less desirable than steel weights as a substitute for lead weights (PPRC, 2007).

Steel wheel weights can corrode and require a sealant such as zinc or plastic (TURI, 2006). Zinc wheel weights are corrosion-proof, but can be difficult to distinguish from lead and can contaminate supplies of lead wheel weights going to smelters. Zinc is also an air and water pollutant that can be dangerous to humans (CDC, 2005).

Steel wheel weights with thin zinc or plastic sealants are the most environmentally preferable substitute for lead wheel weights currently available.

Supply

There are tens of thousands of individual types of tires on the market sold by a range of manufacturers with numerous brand names and lines (NAS, 2006). Tires sold as original equipment (OE) are usually designed specifically for the operating characteristics of the particular vehicle they are sold with, whereas replacement tires are generally designed for broad applications. Moreover, there is a trend in the tire industry for OE and replacement tires to be high-performance tires, which tend to have higher rolling resistance (EPA, 2005).

Low Rolling Resistance Tires. LRR tires come standard on most new vehicles since this helps automakers improve their fuel economy rating (CEC, 2003). In fact, the rolling resistance of tires on new vehicles decreased by nearly half between 1980 and 1994 alone. Although LRR tires are widely used, they are not typically manufactured or marketed as replacement tires (CEC, 2003). Most replacement tires are usually around 20 percent less efficient than the tires sold on new vehicles (MDGA, 2007).

Note: the 2007 Energy Bill requires the federal government to develop rules within two years for tire efficiency reporting by manufacturers (GPO, 2007). Actual reporting will not likely begin until a year or two after the rules are released.

The primary measure of tire rolling resistance is the “rolling resistance coefficient,” or RRC. SAE J1269 and SAE J2452 are two testing procedures most commonly used for measuring rolling resistance, with SAE J1269 being the more widely accepted method (see Standards section of this Guide) (CEC, 2007). Although manufacturers typically do not disclose the RRC of their tires, this number can be requested in bid specifications. Note: the 2007 Federal Energy Bill requires manufacturers to disclose tire efficiency within two years (GPO, 2007).

The RRC for new tires is typically between 0.007 and 0.014, with smaller numbers representing lower rolling resistance (NAS, 2006). In 2003, Ecos Consulting tested rolling resistance of 51 different tire models in four sizes, and concluded that an RRC of less than 0.0105 could be considered low rolling resistance (Green Seal, 2003). See the Products section (available in the online version of this Guide) for the test results.

The Rubber Manufacturers Association produces an annual factbook on tires that includes information on tire rolling resistance (RMA, undated). Green Seal published the results of the best 15 tires that Ecos Consulting tested on behalf of Green Seal in 2003 (Green Seal, 2003). Consumer Reports publishes results of rolling resistance tests on passenger tires in their annual tire reports for all season, performance all season, and ultra performance tires, and SUV and pickup truck all season and all terrain tires (Consumer Reports, undated(b)). The State of California is compiling a tire database with rolling resistance numbers scheduled for release in 2008 (CEC, undated).

Since LRR tires are not readily identifiable in the marketplace, methods for obtaining them include:

1. Request data from vendors on tire specific RRCs using approved testing methodologies (see page 20 of the Rhode Island bid spec in the Specifications section of this Guide).
2. Specify for replacement tires with characteristics that tend to reduce rolling resistance, such as:
    a. Larger rim diameter
    b. Shallower tread
    c. Lower speed rating
3. Exclude performance tires from contracts unless they are needed for a specific purpose, such as emergency vehicles.
4. Specify for manufacturers' environmental demarcations such as the Michelin Green X - **http://www.michelin-green-meter.com**.

Retread Tires. Over seventeen million retread tires are sold in the U.S. each year, mostly for heavy-duty vehicles such as semi trucks and trailers, buses, and airplanes (CIWMB, undated). Estimates suggest that millions fewer replacement tires would be purchased each year if the retread market for light-duty vehicles were fully developed (EPA, 2005).

Forty-seven states currently have tire vendors that sell retread tires for light-duty trucks. Texas, California, and Pennsylvania have the largest number of these retread vendors, with 97, 81, and 74 vendors, respectively. Nine states have vendors that sell retread tires for cars:

- Pennsylvania - 12 vendors
- Iowa – 5 vendors
- North Carolina – 3 vendors
- Illinois – 2 vendors
- Ohio – 2 vendors
- Alabama – 1 vendor
- New York – 1 vendor
- Tennessee – 1 vendor
- Washington - 1 vendor

See the Products section (available in the online version of this Guide) for a full listing of light-duty retread tire vendors in the United States. Note: these listing are current as of February 2008. Updated listings can be viewed at **http://www.retread.org/Guide/**.

Lead-Free Wheel Weights. Lead-free wheel weights come standard on many new vehicles - see the Products section (available in the online version of this Guide) for a listing of 2006 model year vehicles sold with lead-free weights. In fact, approximately 50% of new cars sold in the U.S. in the 2006 model year had lead-free wheel weights (Ecology Center, undated(b)). These include models from Buick, Cadillac, Chevrolet, Hyundai, Nissan, Pontiac, Saturn, Subaru, and Toyota. Noteworthy vehicles include:

- Chevrolet Malibu, Silverado, and Suburban
- Saturn Aura
- Hyundai Elantra
- Nissan Altima

- Toyota Camry, Avalon, and Prius

See the Products section (available in the online version of this Guide) or **http://www.leadfreewheels.org/models.shtml** for a full listing.

Lead-free wheel weights are used by fleets in Maine and Washington, are being tested in Minnesota and Michigan, and will soon be tested in Virginia and by the U.S. Air Force and Postal Service.

Steel wheel weights are currently produced by companies such as Hennessey Industries and Perfect Equipment (PPRC, 2007). Perfect Equipment also produces zinc wheel weights. For more than a year, King County, Washington has used a product called Xactbalance, which is a tape-on wheel weight made of a PVC shell filled with small steel balls. Recently, Xactbalance released a new product with a polypropylene shell rather than PVC. This weight is thinner and results in less wheel and brake rotor interference than was possible with the previous design on certain vehicles. See the Products section (available in the online version of this Guide) for more information on these products.

Related Documents

California Integrated Waste Management Board, Increasing the Recycled Content in New Tires, May 2004
http://www.p2pays.org/ref/34/33385.pdf
90-page report looking at trends and opportunities for producing tires with recycled content rubber.

Policies

Many institutions already have responsible tire policies that establish official targets and responsibilities for tire and wheel weight procurement, use, and disposal. These policies typically state institutional goals for tires and wheel weights and include systems for tracking and reporting on progress toward these goals. Policies can also establish a training program for purchasers, maintenance staff, and drivers to help them understand the importance of the goals and practices. This policy can stand-alone or can be integrated into a broader green fleet policy.

Note: PDF versions of these policies are available online at **http://www.responsiblepurchasing.org/purchasing_guides/tires/**.

Model Policy > RPN Model Tire & Wheel Weight Maintenance, Purchase, and End-of-Life Policy, 2008 (see Addendum I)
Policy language covering tire management; procurement of low rolling resistance tires, retread tires, and lead-free wheel weights; and end-of-life management of tires and wheel weights.

More Sample Policies

Federal

Bureau of Land Management, Fleet Management Plan, 2003
Policy requiring BLM Managers to collect and monitor vehicle data, including tire inflation, and to use retread tires. See page 5 for tire inflation and retread tire requirements.

White House, Executive Order 13149: Federal Fleet and Transportation Efficiency, 2000
This guidance document summarizes key features of E.O. 13149. Page 23 encourages Agencies to purchase retread tires and/or tires containing a minimum of 5 to 10 percent post consumer recovered rubber.

State

California, Assembly Bill 844, 2003
Legislative act requiring tire manufacturers to report on rolling resistance and fuel economy of replacement tires. Also requires the State to develop and implement an energy efficient replacement tire program.

California, Retread Tires Policy, undated
Public contract code for the State of California for purchasing recycled content products such as retread tires. A clause on Page 4 requires use of retread tires on state vehicles. A clause on Page 5 lists requirements for retread tire casings and retreading process.

California, Senate Bill 1170, 2001
State legislation requiring state agencies to purchase the most efficient replacement tires available. Also included are requirements to 1) conduct research on the costs and benefits of low rolling resistance and retread tires, 2) develop testing procedures for measuring tire efficiency, and 3) develop a tire efficiency rating system.

California EPA, Transportation Policy, undated
Section 5.2 requires use of retreaded and/or longer life tires, decreased tire rolling resistance, and proper tire inflation.

Maine, Lead-Free Wheel Weights Policy, 2006
Executive Order titled “Promoting Safer Chemicals in Consumer Products and Services.” Section III requires state agencies to purchase safer alternatives to products including lead wheel weights. Section III, paragraphs 1 and 2, address lead-free wheel weights and require that lead free wheel weights be requested for all state vehicles serviced in state-owned and private garages. A temporary exception can be made if a vendor only has lead wheel weights and needs time to transition to lead-free wheel weights.

Montana, Fuel Efficient Tire Replacement Program, 2007
This draft policy template sets energy efficiency standards for replacement tires. Elements include a goal of implementing a fuel efficient tire replacement program for state fleet vehicles by 2009 and by 2011 requiring that all replacement fleet tires are low rolling resistance (LRR). Targets and strategies are enumerated for fleet vehicles and private passenger vehicles, including labeling standards for tires and marketing campaigns for the program.

New Hampshire, Clean Fleets Policy, 2007
Page 5 of this document contains policy provisions on tire pressure and rolling resistance. Each tire’s pressure is to be checked at least once each month and during particularly cold weather. Tire’s are to be inflated to the ideal pressure listed in the owner’s manual, rather than the level listed on the sidewall of the tire. Replacement tires should be low rolling resistance.

Rhode Island, Green and Clean State Vehicles, 2005
Executive Order requiring fleet managers to investigate the purchase of low rolling resistance replacement tires. Requires purchasers to request rolling resistance data in bid and contract specifications.

Texas, Vehicle Management Plan, 2003
Page 12 requires that tires are included in the annual inventory of vehicles and parts. Page 15 requires regular tire rotation and weekly air pressure checks. Page 16 requires using recapped (i.e., retread) tires when possible as well as proper disposal of used tires.

Washington, Alternatives to Lead Wheel Weights, 2007
State legislation that requires the use of lead free wheel weights on replacement tires by June 30, 2008 for all state-owned vehicles and by June 30, 2009 for all registered vehicles in Washington. The policy begins with a detailed statement about the problems with lead wheel weights, includes definitions, and establishes responsibility for implementation and enforcement.

County
Alameda County, CA, EPP Model Policy, 2006
This model policy covers a full range of products including tires. Section 3.1.2 specifically refers to remanufactured (i.e., retread) tires, Section 3.1.10 addresses take-back provisions for used equipment such as tires, and Section 3.6.8 prohibits the purchase of products with lead such as wheel weights.

Metro Region, OR, EPP Policy, 2006
Section 2.04.560 on page 58 requires that specifications give preference to retread tires over new tires if the tires meet cost, quality, and supply criteria.

City
Albany, CA, EPP Policy, 2007
Overarching EPP policy with a clause requiring purchase of remanufactured (i.e., retread) tires.

Chapel Hill, NC, Green Fleets Policy, 2005
Section V, paragraph (i) requires staff to conduct frequent tire pressure tests.

San Leandro, CA, EPP Policy, 2004
Paragraph 3.1.2 requires purchase of remanufactured (i.e., retread) tires.

Santa Rosa, CA, EPP Policy, 2007
Section 1.1 requires purchase of remanufactured (i.e., retread) tires. Pages 13 and 15 have language justifying this requirement.

Educational Institution
University of California, Policy on Sustainable Practices, 2007
Section IV, paragraph a. requires the purchase of the most efficient replacement tires available.

University of Florida, EPP Policy, 2003
Overarching EPP policy that lists remanufactured (i.e., retread) tires as preferred products.

Specifications

Many institutions are shifting their purchases of tires and wheel weights to responsible alternatives. Below is a collection of bid and contract specifications for LRR tires, retread tires, and lead-free wheel weights.

Note: PDF versions of these specifications are available online at **http://www.responsiblepurchasing.org/purchasing_guides/tires/**.

Model Specification > Rhode Island, Low Rolling Resistance Tire Specs, 2005 (See Addendum II)
Twenty-page bid solicitation requiring that all bidders identify the rolling resistance coefficient (RRC) of their tires and identify whether their tire is a low rolling resistance tire, in accordance with Green Seal and SAEJ1269 (see Standards section of this Guide). Tires must have an RRC of less than 0.0105 in order to qualify as low rolling resistance. Political subdivisions in Rhode Island are eligible to participate in this contract. Page 20 includes a short list of tire models and RRCs.

Model Specification > New Hampshire, Retread Tire Bid Specs, 2007 (See Addendum II)
Three-page bid spec for retread tires that requires bidders to have a quality control program and be members of reputable tire industry trade groups. Vendors must conform to federal specification ZZ-T-441 (see under Federal, below).

Model Specification > Washington, Lead-Free Wheel Weights Contract, 2007 (See Addendum II)
Contract for vehicle parts and supplies including wheel weights. Page 3 summarizes addition of lead-free and steel wheel weights to portions of the contract. Pages 7 and 10 provide pricing rates for lead-free and steel weights from particular vendors.

More Specs

Federal
Federal Specification, Retread Tire Spec ZZ-T-441H, 1986
Frequently cited federal specification for retreaded tires. This detailed standard became effective in 1986 and was officially listed as “inactive” in September 1998. Section 3 (pages 5-21) lists requirements for production facilities, materials, casing inspection and selection, processing, repairing, finished tire characteristics, and marking and labeling. Section 4 (pp. 21-44) lists quality assurance provisions including responsibility for quality inspection, inspection of materials and components, and measuring provisions for tire tread depth and hardness.

State
Kansas, Tire Contract, 2004
This contract contains multiple provisions for retread tires. A clause regarding inclusion of the cost of tire pickup in a retread tire price can be found under the “Prices” heading on page 9. Timelines are stated for the pickup of tires for retreading and the return of retreaded tires under “Post Award Notifications” on page 10. Requirements for retreader qualifications are listed under the “Group IX” heading on page 13. Retread specifications for particular tire types are on pages 13-14. Retread and repair pricing begins on page 21.

North Carolina, Retread Tire Contract, 2007
Six-page contract including language for quality assurance, tire inspection, retread method, and pricing for retread and repair.

South Dakota, Retread Tire Contract, 2007
Six page contract with tire models and retread prices and tread specifications.

Washington, Retread Tire Specs, 2007
Pages 12-14 provide detailed specs for retreading.

West Virginia, Retread Tire Contract, 2007
Pages 10-13 contain detailed specs for vendor qualifications and quality control. Specs are listed for the type of rubber used and tread depth.

Western States Contracting Alliance, Low Rolling Resistance Tire RFP, 2006
Contract for tires, tubes, and services containing provisions for tire rolling resistance. Pages 7-8 list the tires included in the bid and specifically gives preference to low rolling resistance (LRR) tires. Section 2.2 on page 10 contains two paragraphs describing the reasons for specifying LRR tires and requiring bidders to identify whether or not their offered tires are LRR. In addition, bidders are asked to provide fuel economy estimates for their tires. Vendors are required to take scrap tires back after useful life (p. 12).

City
Antioch, CA, Tire RFQ, 2005
Detailed specifications begin on page 6. Item 4 gives a 10 percent cost preference to tires that contain recycled content. In Section IV (Required Information) on page 10, venders are asked to provide alternate pricing for retread tires. This RFQ contains a clause requiring contractors to pay their staff at prevailing wages established by the State of California (p. 15).

Manchester, NH, Retread Bid Invitation, 2007
Section 2 on pages 17-18 contain bid specifications for retread tires.

Savannah, GA, Scrap Tire Disposal Bid Invitation, 2005
Request for bids for the removal and disposal of discarded scrap tires from the City of Savannah's vehicle maintenance facility, with detailed specifications beginning on page 8. Disposed tires will be tracked from pickup to disposal to ensure proper disposal.

Business
Goodyear Tires, Retread Specification Guide, 2003
Twelve-page bulletin with recommended specifications for preparing a tire retread and repair bid.

Standards

This section discusses industry standards for tires, beginning with federal standards for all vehicle tires and continuing with standardized testing methods for LRR tires and quality standards for retread tires. We also discuss the Green Seal standard for fleet maintenance. There are no standards for lead-free wheel weights.

Federal Tire Standard. The National Highway Traffic Safety Administration sets safety and performance standards for tires. Standard number 109 specifies size dimensions and laboratory tests for new tires. For a copy of this standard, see **http://www.fmcsa.dot.gov/rules-regulations/administration/fmcsr/fmcsrruletext.asp?section=571.109**.

Low Rolling Resistance Tires. There is no official standard or certification for demarcating low rolling resistance tires. In addition, tire manufacturers are not required to test the rolling resistance of tires or to disclose the results of any tests conducted. There are, however, standards for rolling resistance testing procedures.

The Society of Automotive Engineers has two widely accepted procedures for measuring tire rolling resistance – SAE J1269 and J2452. Both testing procedures have common features, such as the testing of wheel diameter, inflation, surface texture, and ambient temperature (NAS, 2006). Advantages and disadvantages of different testing techniques are covered in SAE J1270. (Note: for a detailed overview and comparison of these testing procedures, see pages 137-145 of NAS 2006 and p. 10 of CEC 2006, in the Endnotes section of this Guide.)

In a report for the State of California, Ecos Consulting found that the SAE J2452 testing procedure was more complete and sophisticated than J1269 (CEC, 2003). Nevertheless, there is growing consensus that J1269 is a preferential marketplace standard since it is easier and lower cost than J2452 and does not yield significantly in accuracy. See the California Energy Commission hearing proceedings from December 2007 for a complete discussion of why J1269 is preferred (CEC, 2007).

> SAE J1269 – Rolling Resistance Measurement Procedure for Passenger Car, Light Truck, and Highway Truck and Bus Tires. **http://www.sae.org/technical/standards/J1269_200609**

> SAE J2452 – Stepwise Coastdown Methodology for Measuring Tire Rolling Resistance. **http://www.sae.org/technical/standards/J2452_199906**

> SAE J1270 – Measurement of Passenger Car, Light Truck, and Highway Truck and Bus Tire Rolling Resistance - **http://www.sae.org/technical/standards/J1270_200609**

The International Standards Organization (ISO) also has a tire rolling resistance testing procedure for tires – ISO 8767. This testing procedure is similar to SAE J1269 and is used by the German Government and Blue Angel environmental labeling program (CEC, 2003).

> ISO 8767 – Passenger car tyres – Methods of measuring rolling resistance - **http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=16179**

Retread Tires. Federal Standard 117 addresses performance, labeling, and certification of retread tires for passenger vehicles. The goal of the standard is to ensure that retread passenger tires are at least as safe as original equipment. Detailed requirements for tire labeling

are specified by the standard. Retread tires that meet this standard have a DOT embarkation. Purchasers of retread tires should only purchase tires that meet this standard.

> Federal Standard 117 – Retreaded pneumatic tires - **http://www.responsiblepurchasing.org/UserFiles/File/Tires/Standards/Federal%20Standard%20117_Retreaded%20Pneumatic%20Tires.pdf**
> Laboratory Procedures Manual for Federal Motor Vehicle Standard 117 – **http://www.responsiblepurchasing.org/UserFiles/File/Tires/Standards/Testing%20Procedure-117-01.pdf**

Other Standards and Programs
Green Seal has a standard for fleet maintenance that requires retread tires and proper disposal of tires. To date, only three fleet service companies are certified and they are all U.S. Postal Service facilities. The standard can be downloaded at **http://www.greenseal.org/certification/standards/fleetvehiclemaint.cfm**. A list of certified facilities can be viewed at **http://www.greenseal.org/findaproduct/index.cfm#fleet**

Products

The online version of this Guide contains listings of: 1) rolling resistance coefficients for nearly 200 tires, 2) vendors of light-duty retread tires, 3) a listing of 2006 model year vehicles sold with lead-free wheel weights, and 4) available lead-free wheel weights. For details, visit **http://www.responsiblepurchasing.org/purchasing_guides/tires/**.

Handy Facts

- Ninety-five percent of the energy consumed during a tire's lifecycle is consumed while in use on a vehicle (CEC, 2003)
- Between 10 and 20 percent of the energy created in a vehicle engine is used to turn the wheels. One-third of this energy is lost due to rolling resistance. (NAS, 2006)
- Each 1-psi drop in a typical light-duty tire's pressure increases rolling resistance by 1-2 percent (NAS, 2006).
- Replacement tires with low rolling resistance (LRR) can reduce a vehicle's fuel consumption by 2 to 6 percent compared with conventional tires (NRDC, 2004)
- LRR tires come standard on most new vehicles, since this helps automakers improve the fuel economy rating of their vehicles, but are not typically manufactured or marketed as replacement tires (CEC, 2003)
- In 2003, Ecos Consulting tested rolling resistance of 51 different tire models in four sizes, and concluded that a rolling resistance coefficient (RRC) of less than 0.0105 could be considered low rolling resistance (Green Seal, 2003).
- The 2007 Energy Bill requires the federal government to develop rules within two years for tire efficiency reporting by manufacturers (GPO, 2007). Actual reporting will not likely begin until a year or two after the rules are released.
- The Society of Automotive Engineers testing procedure, SAE J1269, is the preferential method for measuring tire rolling resistance (CEC, 2007).
- 7 to 8 gallons of oil are required to manufacture a new light-duty vehicle tire, while a retread tire only requires 2 to 3 gallons (ITRA, 2001)
- If the retread market for light-duty vehicles were fully developed, millions fewer new replacement tires would be purchased each year (EPA, 2005)
- Light-duty vehicles in the U.S. have roughly 4.5 ounces of lead clipped onto tires for wheel balancing (EPA, 2007)
- Around 2,000 tons of lead is dropped onto U.S. roadways every year as wheel weights fall from vehicle tires, mostly in urban environments due to poor road conditions and less fluid driving styles (e.g., potholes, more turns, more stops and starts) (USGS, 2006)
- Alternatives to lead wheel weights include weights made from steel, zinc, copper, tin, and plastic/PVC (Ecology Center, undated)
- In 2003, approximately 290 million scrap tires were generated in the U.S. with over 230 million of these tires absorbed into the scrap tire market and the remaining 60 million tires disposed of in landfills and other locations (EPA, undated(a))
- About 80 percent of waste tires are currently recycled or reused, compared to about 11 percent in 1990 (NAS, 2006)
- Roughly half of fleet managers in the U.S. dispose of their lead wheel weights by sending them directly to smelters or other recyclers; although at least 4,000 tons worth of disposed lead wheel weights are unaccounted for each year in the U.S. (USGS, 2006)

Definitions

Alignment	adjusting the angle of a vehicle's tires so that they are perpendicular to the road and parallel to each other.
All-season tires	tires designed for use across a range of weather conditions rather than for a particular type of weather (e.g., winter tires).
Balancing	adding of wheel weights to tires to compensate for imperfections resulting from the manufacturing process.
Dioxins	chemical compounds classified as persistent, bioaccumulative, and toxic (PBTs) by the EPA.
End-of-life management	process by which products are disposed of after their term of useful service expires.
Energy efficient	product that performs more work per unit of energy as compared to all similar products.
Hazardous substance	1. material posing a threat to human health and/or the environment, that can be toxic, corrosive, ignitable, explosive, or chemically reactive, 2. substance that must be reported to the EPA if released into the environment.
High-performance tires	tires designed for higher speeds and greater traction. Typcially have higher rolling resistance than other types of tires.
Lead	soft, heavy metal used in tire wheel weights that can cause brain and kidney damage when ingested.
Lead-free wheel weights	tires that improve vehicle fuel efficiency by reducing rolling resistance. LRR tires come standard on most new vehicles but are not not widely marketed as replacement tires.
LRR tires	see "Low rolling reistance (LRR) tires"
OEM tires	tires sold as original equipment on new vehicles. Often OEM tires are LRR tires.
Recapped tires	see "Retread tires"
Replacement tires	tires purchased to replace OEM tires.
Retread tires	used tires with core structure still intact and a new layer of rubber tread applied using similar techniques to OEM tire manufacture. Light-duty retread tires require 2 to 3 gallons of oil to produce whereas new light-duty tires require 7 to 8 gallons.
Rolling resistance	the amount of contact between tires and the road surface. Rolling

	resistance is influenced by tire inflation and design, vehicle load and speed, and road surface. Each 10% reduction in rolling resistance improves vehicle fuel economy by 1-2%.
Rolling resistance co-efficient (RRC)	quantitative measure of a tire's rolling resistance. RRCs for new tires are typically between 0.007 and 0.014 (NAS, 2006), with a lower number representing a lower rolling resistance. An LRR less than 0.0105 can be considered "low" rolling resistance (Green Seal, 2003).
Rotation	periodic movement of tires to new wheel positions to promote even wear.
Run-flat tires	tires with reinforced sidewalls that allow the vehicle to continue traveling at speeds upwards of 40 mph for a limited distance even with no inflation.
SAE 1269	widely accepted rolling resistance testing procedure designed by the Society of Automotive Engineers.
Speed rating	speed at which a tire can safely operate.
Steel	hard, strong allow of iron and carbon that can be used as a substitute for lead wheel weights. Steel can corrode when exposed to water and air, thus steel wheel weights typically require a thin coating of zinc or plastic.
Tread	grooved surface of a tire that can vary in depth and pattern based on tire design.
VOC	see "volatile organic compounds"
Volatile organic compound (VOC)	organic compound that typically vaporizes at room temperature and participates in atmospheric photochemical reactions.
Wheel weight	blocks of heavy material, typically lead, affixed to tires for balancing. Each light-duty tire typically has 4.5 ounces of lead clipped to it. Around 2,000 tons of lead wheel weights fall off of vehicles each year in the United States.

Endnotes

CDC – Center for Disease Control. Public Health Statement – Zinc. August 2005. Available at **http://www.atsdr.cdc.gov/toxprofiles/tp60-c1-b.pdf**.

CEC – California Energy Commission. Proceedings from the Transportation Policy Committee Workshop before the California energy Resources Conservation and Development Commission. December 2007. Available at **http://www.energy.ca.gov/transportation/tire_efficiency/documents/2007-12-07_workshop/2007-12-07_TRANSCRIPT.PDF**.

_____2003. California State Fuel-Efficient Tire Report: Volume II. January 2003. Available at **http://www.energy.ca.gov/reports/2003-01-31_600-03-001CRVOL2.PDF**.

_____Undated. California Fuel Efficient Tire Program. Available at **http://www.energy.ca.gov/transportation/tire_efficiency/index.html**.

CEH – Center for Environmental Health. Polluted Highways, Poisoned Waters – Lead in Wheel Balancing Weights. August 2007. Available at **http://www.cehca.org/documents/wheel_weights.pdf**.

CIWMB – California Integrated Waste Management Board. California Waste Tire Generation, Markets, and Disposal: 2005 Staff Report. February 2007. Available at **http://www.ciwmb.ca.gov/publications/Tires/62006017.pdf**.

_____2004, Increasing the Recycled Content in New Tires. Available at **http://www.p2pays.org/ref/34/33385.pdf**.

_____Undated. Waste Tire Marketing Guide. Available at **http://www.ciwmb.ca.gov/Tires/MarketGuide/**.

Consumer Reports. Undated(a). **http://blogs.consumerreports.org/cars/2007/11/michelin-tire-r.html**. Viewed on November 21, 2007.

_____Undated(b). Tire Ratings. Available at **http://www.consumerreports.org/cro/cars/maintenance-accessories/index.htm**.

Ecology Center. What Is the Problem With Lead Wheel Balancing?. **http://www.leadfreewheels.org/problem.shtml**. Undated(a). Viewed November 28, 2007.

_____Undated(b). Wheel Weight Survey 2006. **http://www.leadfreewheels.org/models.shtml**. Viewed March 6, 2008.

EPA – Environmental Protection Agency. Management of Scrap Tires. **http://www.epa.gov/epaoswer/non-hw/muncpl/tires/basic.htm**. Undated(a). Viewed on November 28, 2007.

_____Undated(b). Waste Minimization. **http://www.epa.gov/epaoswer/hazwaste/minimize/leadtire.htm**. Viewed October 15, 2007.

_____Undated(c). Lead. Available at **http://www.epa.gov/epaoswer/hazwaste/minimize/factshts/lead.pdf**.

_____October 1997. Air Emissions from Scrap Tire Combustion. Available at **http://www.epa.gov/ttn/catc/dir1/tire_eng.pdf**.

_____February 2005. Profile of The Rubber And Plastics Industry, 2nd Edition. Available at **http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/rubber.html**.

Goodyear. Radial Tire Production. **http://www.goodyeartires.com/about/testing/radial.html**. Undated, viewed November 28, 2007.

GPO. Government Printing Office. Energy Independence and Security Act of 2007. December 2007. Available at **http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_public_laws&docid=f:publ140.110.pdf**.

Green Seal. Choose Green Report – Low Rolling Resistance Tires. March 2003. Available at **http://www.greenseal.org/resources/reports/CGR_tire_rollingresistance.pdf**.

ITRA – International Tire & Rubber Association Foundation, Inc. Understanding Retreading. 2001. Available at **http://www.retread.org/PDF/UnderstandingRetreading.pdf**.

MDGA - Maryland General Assembly. Environment – Energy-Efficient Replacement Tires. 2007. Available at **http://mlis.state.md.us/2007RS/fnotes/bil_0008/hb0608.pdf**.

NAS - National Academy of Sciences. Tires and Passenger Vehicle Fuel Economy: Informing Consumers, Improving Performance – Special Report 286. 2006. Available at **http://www.nap.edu/catalog/11620.html**.

NRDC – Natural Resources Defense Council. Fuel-Efficient Replacement Tires – Guidelines for Transforming the Marketplace. May 2004. Available at **http://www.iea.org/textbase/work/2005/EnerEffTyre/hwang_Fuelefftire.pdf**.

PPRC - Pacific Northwest Pollution Prevention Resource Center. Lead Free Wheel Weights. February 2007. Available at **http://www.pprc.org/research/epp/LeadFreeWheelWeights.pdf**.

RMA – Rubber Manufacturers Association. Tire Industry Factbook. Undated. Available at **https://www.rma.org/publications/market_information/index.cfm?PublicationID=11325**

Tekasakul, Perapong, Tekasakul, Surajit. Environmental Problems Related to Natural Rubber Production in Thailand. April 2006. Available at **http://www.jstage.jst.go.jp/article/jar/21/2/122/_pdf**.

TRIB – Tire Retread Information Bureau. RETREADS – Best Buy in Recycling. **http://www.retread.org/packet/index.cfm/ID/21.htm**. Undated. Viewed October 2, 2007.

TURI – Toxics Use Reduction Institute. Lead and Lead Compounds. June 2006. Available at **http://www.leadfreewheels.org/Master5ChemWWAlts.pdf**.

UNCTAD – United Nations Conference on Trade and Development. Opportunities and constraints for the internalization of environmental costs and benefits into the price of rubber. 1997. Available at **http://www.unctad.org/trade_env/test1/publications/manchester.pdf**.

_____1998, Rubber and Environment. Available at **http://www.unctad.org/en/docs/psitcdtedd5.en.pdf**

USGS – United States Geological Survey. Stocks and Flow of Lead-Based Wheel Weights in the United States. 2006. Available at **http://pubs.usgs.gov/of/2006/1111/2006-1111.pdf**.

Addendum I: Model Policy

RPN MODEL POLICY
DECEMBER 2007

ENERGY EFFICIENT TIRES &
LEAD-FREE WHEEL WEIGHTS

WHEREAS, (organization name) is dedicated to, environmental protection, efficient use of resources, sound fiscal policy, sustainable economic development, and public health;

WHEREAS, the use of fossil fuel in motor vehicles has significant impacts on the environment contributing to the emission of greenhouses gases, nitrogen oxides, air toxics, and other pollutants;

WHEREAS, properly inflated, rotated, and balanced tires last longer and contribute to fuel efficiency;

WHEREAS, standard replacement tires are less fuel-efficient than low rolling resistance tires;

WHEREAS, standard replacement tires require significantly more energy to produce than retread tires;

WHEREAS, 2,000 tons of lead wheel weights fall from vehicle tires every year in the U.S. and degrade the environment and human health;

WHEREAS, improper end-of-life management of tires and wheel weights leads to environmental and public health problems;

WHEREAS, low rolling resistance tires, retread tires, and lead free wheel weights for light duty vehicles are readily available in the marketplace and are of equal safety and performance quality as compared to conventional tires and wheel weights; and

WHEREAS, (organization name) should take the lead in promoting the efficient use of energy and natural resources to protect and enhance the environment, public health, and the economy.

NOW, THEREFORE, I, (executive name), by the authority vested in me as (executive title and institution), do hereby order as follows:

I. TIRE INVENTORY AND MAINTENANCE

Fleet operators shall:

1) Include tires and wheel weight data as part of vehicle inventory;
2) Rotate tires at manufacturer-recommended intervals;
3) Require drivers to inspect tire air pressure weekly;
4) Assist drivers by providing a tire gauge in each vehicle

II. LOW ROLLING RESISTANCE TIRES

Fleet operators and purchasers shall:

1) Investigate the use of low rolling resistance specifications for the purchase of replacement tires for the fleet's light duty passenger vehicles and trucks;
2) Require bidders on replacement tire contracts to submit information on rolling resistance using an appropriate Society of Automotive Engineers test procedure;
3) Purchase low rolling resistance replacement tires when possible; and
4) Exempt emergency vehicles from this provision.

III. RETREAD TIRES

Fleet operators and purchasers shall:

1) Investigate the use of retread specifications for the purchase of replacement tires for the fleet's light duty passenger vehicles and trucks;
2) Require bidders to demonstrate compliance with Federal Specification ZZ-T-441H;
3) Purchase retread replacement tires when possible; and
4) Exempt emergency vehicles from this provision.

IV. LEAD-FREE WHEEL WEIGHTS

Fleet operators and purchasers shall:

1) Require the use of lead-free wheel weights on light-duty replacement tires installed by (organization name) owned service garage(s), with preference for steel wheel weights; and
2) When wheels are installed or serviced by independent service garage(s), require use of lead-free wheel weights, with preference for steel wheel weights.

V. END-OF-LIFE MANAGEMENT

Fleet operators shall:

1) Properly dispose of used tires by:
    a. Selling them as used tires;
    b. Selling them to a vendor for retreading; or
    c. Directing them to the scrap tire market for proper resource recovery and disposal
2) Properly dispose of wheel weights by directing them to smelters or other recyclers; and
3) Require documentation from vendors verifying the way in which tires and wheel weights were disposed.

VI. REPORTING

Fleet operators shall:

1) Report, at least annually, on progress towards goals stated in this policy;
2) Include tire and wheel weight reporting in related fleet vehicle reports;
3) These reports shall be distributed to the Executive and Environmental Management departments.

This Policy shall take effect immediately upon the date hereof.

Addendum II: Model Specifications

Sample Low Rolling Resistance Tire Spec: Rhode Island

BID NUMBER: B05166

TITLE: TIRES, AUTO AND LIGHT TRUCK
BID OPENING DATE AND TIME:
06/02/2005 11:15 AM

BIDDERS MUST IDENTIFY THE ROLLING RESISTANCE COEFFICIENT (RRC) AND INDICATE IF RRC QUALIFIES AS A LOW ROLLING RESISTANCE TIRE IN ACCORDANCE WITH GREEN SEAL ENVIRONMENTAL PARTNERS AND SAEJ1269 TESTING PROCEDURE. TO QUALIFY AS LOW ROLLING RESISTANCE THE RRC SHOULD BE LESS THAN .0105. A TABLE OF EXAMPLES OF APPROVED TIRE MODELS IS ATTACHED.*

TIRES: AUTOMOBILE AND LIGHT TRUCK AS PER ATTACHED SPECS

*See page 5 of http://www.greenseal.org/resources/reports/CGR_tire_rollingresistance.pdf

Sample Retread Tire Spec: New Hampshire

1.0 **SCOPE**: THIS SPECIFICATION COVERS THE STATE OF NEW HAMPSHIRE REQUIREMENTS FOR RETREADING TRUCK TIRES, SIZES 11R22.5 TUBELESS AND 11R24.5 TUBELESS. ONLY PRE-CURE RETREADS OF THE BANDAG GRIPPER TREAD DESIGN PROCESS WILL BE EXCEPTED.

2.0 **BIDDER QUALIFICATIONS:** BIDS WILL BE ACCEPTED ONLY FROM BIDDERS USING RETREAD MANUFACTURERS HAVING A CERTIFIED QUALITY ASSURANCE INSPECTION FACILITY PROGRAM (QAIFP), BELONGING TO INTERNATIONAL TIRE AND RUBBER ASSOCIATION (ITRA), AND THE TIRE ASSOCIATION OF NORTH AMERICA (TANA).

ALL MATERIALS, WORKMANSHIP AND RETREAD SHOP PRACTICES SHALL CONFORM TO THE MOST RECENT EDITION OF FEDERAL SPECIFICATIONS ZZ-T-381 AND ZZ-T-441. CERTIFICATES OF COMPLIANCE WILL BE REQUIRED WITH SUBMISSION OF THIS BID.

BIDDER SHALL FURNISH EVIDENCE OF PRODUCT LIABILITY INSURANCE POLICY OF NOT LESS THAN $2,000,000.00 TO BE SUBMITTED PRIOR TO AWARD.

3.0 **PRODUCT:**
BRANDS BID MUST APPEAR ON GSA'S QUALITY PRODUCT LIST OR (CATL) COOPERATIVE APPROVED TIRE LIST FOR MEDIUM TRUCK RADIAL TIRES.

ONLY PRE-CURE BANDAG GRIPPER TREAD DESIGN PROCESS WILL BE ACCEPTED. MINIMUM TREAD DEPTH SHALL BE 22/32".

4.0 **PICKUP/DELIVERY**:
BIDDER SHALL PICK UP CASINGS WITHIN THREE (3) WORKING DAYS OF REQUEST AT NH STATE HIGHWAY GARAGE IN CONCORD DURING NORMAL WORKING HOURS AND RETURN COMPLETED RETREADS WITHIN FIVE (5) WORKING DAYS OF PICK UP. ALL TRANSPORTATION CHARGES SHALL BE BORNE BY THE BIDDER. STATE WILL NOT CALL BIDDER FOR PICK UP OF LESS THAN FIVE (5) CASINGS.

5.0 **REPORTING**:

ANY TIRE CASING DEEMED UNUSABLE MUST BE RETURNED TO ITS PICK UP POINT WITH A NRC (NOT RETREADABLE CASING) DOCUMENT. THE NRC DOCUMENT SHALL LIST ALL PERTINENT INFORMATION AS TO WHY THE TIRE CASING WAS REJECTED.

BIDDER SHALL FURNISH A FULL REPORT TO THE USING AGENCY ON A QUARTERLY BASIS LISTING THE TOTAL NUMBER OF TIRES SUBMITTED FOR RETREADING, PERCENT RADIAL, NUMBER OF TIMES DEEMED UNFIT FOR RETREADING, FAILURES BY TIRE MANUFACTURER, FAILURES BY RETREAD MANUFACTURER, AND ALL WARRANTY CREDITS.

IN ADDITION, THE REPORT SHALL INCLUDE THE FOLLOWING INFORMATION ON EACH TIRE: CASING BRAND CODE, RADIAL (R), TIRE SIZE, LATEST RETREAD DOT CODE, RETREAD BRAND CODE, RETREAD DESIGN, OUT OF SERVICE REASON, ORIGINAL TREAD DEPTH (32NDS), REMAINING TREAD DEPTH (32NDS), AND ANY RECOMMENDATIONS BASED ON OBSERVATIONS TO PROLONG TIRE WEAR.

6.0 **RETREADS**:
TREAD BUFF RADIUS AND TREAD DIAMETER SHALL CONFORM TO EACH TIRE MANUFACTURER'S DESIGN SPECIFICATIONS.

7.0 **WARRANTY:**
ALL RETREADING/REPAIRS COMPLETED BY THE BIDDER SHALL BE WARRANTED TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR THE LIFE OF THE TREAD. CREDITS SHALL BE ISSUED FOR THE RETREAD, AS WELL AS, THE CASING ACCORDING TO THE FOLLOWING PERCENTAGE TABLE:

TREAD DEPTH REMAINING CREDIT
100% - 50% 100%
49% & BELOW PRORATE

8.0 **REPAIRS:**
NAIL HOLES SHALL BE REPAIRED AT NO ADDITIONAL CHARGE.

ONLY ONE SECTION REPAIR (WITHIN REPAIR LIMITATIONS) WILL BE ACCEPTED PER RADIAL TIRE.

Sample Retread Lead-Free Wheel Weight Spec: Washington

SUMMARY:

Administrative Changes, effective April 20, 2007:

1. To add Lead Free and Steel Wheel Weights to CarQuest portion on contract at 50% off Jobber.

2. To add Lead Free and Steel Wheel Weights to Napa portion on contract at Discounts available are contingent upon the size of the order placed on a single invoice. For order level one (1), i.e., $0.00 to $1999.99, = LIST less 44% (approx) for Lead Free and Steel Wheel Weights. For order level two (2), i.e., orders of $2000.00 and up, = Blue Jobber or LIST less 54% (approx*)* Lead Free and Steel Wheel Weights. These products will be FOB local store.

3. All existing terms and conditions as well as pricing will remain unchanged.