



King County Environmental Purchasing Program

Plastic "Lumber" and Other Recycled Plastic Products

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Introduction

Recovering waste plastics and using the recovered material to manufacture new products has been a challenge for plastics industries. Plastics manufacturing processes rely on sophisticated chemical engineering and are highly subject to disruption by contamination. The large number of resins, foreign chemicals such as colorants, strengtheners and plasticizers used in manufacturing plastic contribute to the problem. In many cases, incompatibilities between plastics make recovery impractical.

Despite these challenges, plastics recycling is becoming economically viable in a number of areas. The Polyethylene Terephthalate (PET) used in many soft-drink bottles, for example, can now be economically recovered from post-consumer waste streams and the resulting recycled resin used in the manufacture of new soft-drink bottles, polyester fiber for textiles and carpet, and other applications. Research is underway in industry and government to improve the recyclability of plastics to reduce waste and to use resources efficiently.

Usage History and Experience

King County agencies have used and evaluated several recycled plastic products, including plastic "lumber", can-liners, , [bench slat](#) replacement, bollards, and other products.

Since 1997, Parks Division has installed playground structures made with recycled plastic, steel, and aluminum. In the past year, five parks received these new playground structures.

In 1998, Parks Division purchased 10 recycled plastic picnic tables for a total of \$4,000, using a contract maintained by the State of Washington.

The Division also used plastic lumber in 1998 for engraved posts at 17 campground sites and 8 water stations at the Tolt River Campground and Parks personnel are testing the plastic to determine how well this material will endure contact with soil and water. Wooden posts in this environment have a 4-5 year replacement schedule and the recycled plastic may greatly reduce replacement costs.

Stadium Administration Maintenance Division personnel use recycled plastic lumber to replace wooden 4"x4" "[channel boards](#)" to secure the Kingdome artificial turf. The performance of this material is superior to that of virgin lumber and

has demonstrated a longer replacement schedule and lower life cycle cost. The Kingdome saves over \$5,000 each year by using this material. This application has generated interest from stadia around the country and has been adopted by both the Minneapolis Metrodome and B.C. Place in Vancouver B.C. Canada. The stadium has also used recycled plastic for sign-blanks and for "skid pads" for the feet of portable bleachers, both with good results.

Plastic Traffic Control Equipment is purchased by the Traffic and Planning and Roadside Safety sections of Roads Division. They purchase recycled plastic traffic delineators, traffic cones, and channelizers manufactured with recycled tire-rubber bases.

The Bridge Unit of the Roads Division is testing \$7,000 worth of plastic lumber for use in repairing timber bridges. The vendor worked with County engineers to reinforce and modify the product to meet performance requirements. Long-term performance will be monitored in the normal course of Bridge Unit's performance program, but initial results indicate that plastic lumber deflects excessively ("deflection of reinforced recycled plastic lumber is still about 5 times greater than wood"), which will limit its use to applications with low structural requirements. In a November, 1996 report to the Marketing Commission, which funded the project, the unit supervisor wrote "the product certainly has merit, although it is not ideal for the application of replacement of wingwall dimensional lumber". Other user reports indicated that the material was too expensive, was not readily available, and lacked industry standards.

The Renton Maintenance Facility of the Fleet Administration Division now specifies recycled plastic lumber for [truck-bed sideboards](#) its dump-trucks. When the Division required new trucks to be outfitted with recycled plastic, the truck-equipment vendor adopted this material as a standard option because of its superior performance and lower life-cycle cost. The division is retrofitting all of its virgin-lumber truck equipment with material supplied by this vendor, with expenditures for over 40 sideboards totaling nearly \$6,000. Quality old growth fir is scarce and easily damaged, but recycled plastic is very impact resistant. The replacement schedule for these boards has been reduced to 17 a year, compared to 53 a year when wood was used. This represents a savings of \$2,500 a year in material costs.

In 1998, Roads Maintenance section purchased 80 pieces of recycled plastic lumber for \$2,800, for a walkway leading to the beach at the Boeing Creek Bridge. This project was completed for the Water and Land Resources Division. Applications in which lumber makes frequent or extended contact with soil and water represent ideal opportunities for the beneficial use of plastic lumber. Unlike costly chemically treated wood, plastic lumber does not require replacement every few years or much maintenance.

Transit Division has adopted the use of recycled plastic lumber with 50% wood fiber as an element in the fabrication of its bus shelters, replacing the "clear" Douglas Fir formerly used. This application may consume significant amounts of material, as Transit Division maintains over 6,000 shelters. The Division purchased 275 boards for \$5500 last year.

In 1998, Transit Division purchased 14 recycled plastic benches at a cost of over \$3,500. These benches are being used in a pilot project on property where the bus routes don't warrant a bus shelter. Transit maintenance personnel expect that maintenance costs will be lower with these new benches. Images of these and other recycled plastic park furnishings can be found at the program web-site at www.metrokc.gov/procure/green/images.htm

The City of Seattle has used recycled plastic lumber for signposts and pier-decking and a [pedestrian bridge](#) in city parks.

Bid and Contract Specifications

King County agencies purchase plastic lumber through term- contracts with local vendors. This section contains excerpts from the provisions of the Invitation-To-Bid that resulted in these contracts.

Plastic lumber contract provisions - Solid Waste Division

Sections below contain excerpts of a "blanket purchase agreement" contract established by the King County Solid Waste Division for the supply of recycled plastic lumber for the Parks Division.

Descriptive Data and Specifications

Bidder shall submit complete descriptive data and specifications, including a statement of warranty, for the equipment offered. Bid must include (a) manufacturer's recommended design criteria, covering, at a minimum, spanning, tensile strength and compressive strength, and (b) information on what, if any, technical assistance will be available after purchase.

Samples

Each bidder shall submit as part of the bid package a sample of the plastic lumber to be supplied. The dimensions of the sample should be approximately 2"x4"x6". It should be of the required color and should show the finished surface of the lumber so that suitability of appearance can be judged. Each sample should be labeled with the name, address, and phone number of the supplier.

Scope of Work

Through a grant from the Department of Ecology, the King County Solid Waste Division (KCSWD) has been working with the King County Department of Parks (Parks Department) on a model recycling program for King County parks. As part of this project, the KCSWD is soliciting bids for the production and delivery of plastic lumber to be used for parking stops, bollards, and repair of picnic tables. The Parks Department will install the lumber and will evaluate its performance as part of this project.

Technical Specifications for Plastic Lumber

A. General:

1. The plastic lumber shall be new and of the latest model design of a company regularly manufacturing such equipment.
2. Recycled Content: 75% minimum recycled content overall; 50% post-consumer material.
3. Appearance: The lumber shall be free of splinters. It generally shall be smooth to the touch, with no discernable contaminants such as paper, foil, or wood.
4. Color: All lumber shall be colored either dark brown or redwood, and the color shall be present throughout the material. The color of each piece shall be generally consistent with the others.

B. Specifications:

Description (Nominal Size)	Estimated Quantity
6" x 8" x 8'	Up to 250
3" x 12" x 8'	Up to 80
4" x 4" x 12'	Up to 25
2" x 4" x 8'	Up to 25

Warranty

The minimum acceptable warranty shall be that the contractor will repair or replace all merchandise which fails due to defective materials at no cost to King County during the first year after acceptance of all work by the County.

Award criteria

All bids to provide and deliver plastic lumber must include written responses to all the items listed below. All contracts will be awarded on an overall unit basis best cost to King County.

Liquidated damages

The acts or omissions in the left hand column below constitute a breach of this contract; the amount in the right hand column below are set as liquidated damages. Liquidated damages may be deducted from the final payment to the contractor.

Action or Omission	Liquidated Damages
(1) Late delivery	A reduction in unit price of 1% for every work day which exceeds the delivery time specified in this ITB.
(2) Damaged merchandise	Full cost of prompt replacement of the damaged item, including return shipping fees.
(3) Falsification of recycled content	Full refund of purchase price and all shipping fees, and the full value of replacement units, regardless of supplier.

Eligibility for award

To be eligible for award, bidder must be a bona fide manufacturer or distributor of the plastic lumber

offered, able to perform warranty service/repair.

Plastic lumber contract provisions - Stadium Administration

Plastic lumber was used in place of the 4" x 4" lumber that was previously used in the "channel" system that secures the artificial turf. Contact King County Stadium Administration, (206)296-3155, for more information, or link to Product Performance Summaries -- [Recycled Plastic Lumber: Kingdome Project](#). Following are contract excerpts.

Technical Specifications

A. General

1. The plastic lumber shall be new and of the latest model design of a company regularly manufacturing such a material.
2. Freight. For bid purposes: FOB to the Kingdome, 201 S. King Street, Seattle WA 98104-2832.
3. Recycled Content: 75% minimum recycled content overall; 50% post-consumer material. The lumber should be 100% plastic profiles of HDPE, LDPE and PP. The material should have no discernable contaminants such as paper, foil or wood.
4. Appearance: The lumber should be free of splinters and generally smooth to the touch.
5. Color: All lumber should be colored grey with a UV inhibitor. The color of each piece should be generally consistent with the others.
6. Density: Material shall contain no more than 3% air voids.
7. Actual Dimensions: 3 1/2" X 3 1/2" X 8'
8. Quantity Needed: 214 ea @ 3 1/2" X 3 1/2" X 8' = Total length 1712 feet



Plastic lumber contract provisions - Equipment Shop, Fleet Administration

Recycled plastic truck sideboards 16' long
one piece construction 3" x 9-1/4" x 16'
round one long edge/square one long edge
For more information, look at the [product evaluation](#) for this material.



Recycled Plastic Pedestrian Bridge

Meadowbrook Pond Pamela Miller, Project Manager
(206)684-5179

The Meadowbrook Pond project presented the City of Seattle with a challenge: they needed a foot-bridge across a stormwater retention pond and to cover a Metro sewer pipe, but were not permitted to use treated lumber because Thornton creek is being rehabilitated as a salmon stream. They concluded that "plastic lumber" could meet this challenge, but found that this presented a long list of unknowns:



Plastic lumber is very new to the marketplace, so industry standards for performance qualities have not yet been developed; each manufacturer's product performs differently; building codes do not address its use; It is not widely available; and there is little experience with the material among engineers, designers, or contractors.

Despite all these uncertainties, the City went ahead with the concept and the result is a bridge that looks good and is expected to save tax-dollars (in the long run) by reducing maintenance and replacement costs.

Materials: (size, cost and vender information)

The recycled plastic materials that were used to construct the bridge cost roughly double the expected

cost for standard treated lumber. Bob Lewis, NW Regional Sales Manager, Shrader Lumber Co., 360/757-4416 sourced three different kinds of plastic lumber for this project:

- Recycled plastic 8"x8"s, reinforced with four steel bars (re-bar), were used for pilings and support members. The cost was approximately 1.5 times the cost of treated lumber.
- Fiberglass reinforced recycled plastic 2"x8"s were used for the joists, at a cost of about 2.7 times that of treated lumber.
- Recycled plastic/wood composite 2"x6"s were used for decking at a cost of about twice that of treated lumber.

Because there is little experience with these materials, the project team faced many design issues. The performance characteristics of plastic lumber are unfamiliar, and very different than those of wood. Because there are no tried-and-true industry standards or specifications, they needed to evaluate the properties of each product individually and design to accommodate them.

The design team members (names and numbers listed below) have each indicated that we may call them to discuss this project and their experiences with plastic lumber. There is no better source of good information than the people who have actually worked with the material. The contractor, Don Robinson of Whatcom Construction, for example, liked the decking material, and plans to use it again, but he is not convinced that the other elements were worth their cost.

Manufacturers:

- pilings: Plastic Pilings, (909)874-4860 (California)
- deck: Trex, (800)BUY-TREX (Virginia) <http://www.trex.com>
- joists: Trimax, (516)471-7777 (New York)
- Rep: Bob Lewis, Shrader Lumber Co., (360)757-4416

Hosts:

- City of Seattle, Public Utilities Department:
- Pamela Miller, Project Manager, (206)684-5179 (pamela.miller@ci.seattle.wa.us)
- Rex Allen, Project Engineer, (206)684-5068
- John Gardiner, Structural Design Engineer, (206)684-5146

Contractor:

- Don Robinson, Whatcom Construction (360)671-7858

For More Information

Specific information on applications described in this publication may be obtained by contacting:

[American Society for Testing and Materials](#) (ASTM)
Customer Services
(610) 832-9585
(610) 832-9555 (fax)

King County Stadium Administration
201 South King Street
Seattle WA 98104
(206)296-3155

Leo Griffin
King County Roads Operations Section
155 Monroe Ave NE
Renton, WA 98056
(206)296-8139

Bob Toppen
King County Department of Transportation

155 Monroe Ave NE
Renton, WA 98056
(206)296-8159

Pamela Miller, Project Manager
City of Seattle
(206)684-5179

Further information may be available through the following main menu selections:

[King County Recycled Content Supply Contracts](#)
[Resources for Buyers](#)
[Standard Paragraphs for Contracts](#)

Vendor Information

Local vendors (Seattle/King County area):

Environmental Home Center (206)682-7332 Seattle, WA (distributor)
Recycled Plastic Marketing (RPM), (425)867-3200 Redmond, WA (distributor)
Schrader Lumber (425)377-1550 Everett, WA (distributor)
Weyerhaeuser (800)562-0908 or (253)854-3550 (distributor)
White Cap Industries (206)783-8400 Seattle, WA

More Vendors:

AERT, manufacturer of ChoiceDek (wood/plastic composite) (501)750-1299 Akron, OH
[BTW Industries, Inc.](#) (888)685-7570
[Earth Care Recycled Plastic Site Furnishings](#) (800) 65-EARTH
[Eaglebrook Plastics, Inc.](#) (312)491-2500
[Envirowood](#) (888)357-8392
[Hammer's Plastic](#) (800) 338-1438
[Phoenix Recycled Plastics](#) (610)940-1590
[The Plastic Lumber Company](#) (800) 886-8990
[Plastic Pilings](#) (909)874-4080
Polywood - structural plastic (800)915-0043
[Trex](#) (800)BUY-TREX



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