

Abstract

The amount of CCA treated wood being removed from spent residential decks is increasing at a tremendous rate. While most spent CCA treated wood is being disposed in landfills, further useful and environmentally beneficial alternatives have to be met. This research estimated the percentage of recoverable lumber from spent CCA decks that can be recycled into other usable products. Six residential decks were removed from service, by either demolition or deconstruction procedures. It was found that 86% of the CCA treated wood from the residential decks could be recovered as reusable CCA treated lumber. Chemical and mechanical properties of the removed CCA treated wood were also analyzed. The chemical retention of the deck material proved that most of the spent CCA treated wood could be used in above ground applications. The stiffness of spent CCA treated wood from residential decks was approximately equal to that of recently treated CCA wood. The strength properties were slightly lower than recently treated CCA wood probably due mainly to physical and climatic degradation. Products were then produced that could be successfully utilized by recycling centers or community and government organizations. Products manufactured included, pallets, picnic tables, outdoor furniture, residential decks, and landscaping components. Waste management, recycling, and government organizations were interviewed to determine what markets and barriers exist for recycled CCA treated products. Most landfill and recycling facilities do not currently sort or recycle CCA treated wood, citing the main reason as a lack of a viable market. Potential users were interested in the material but cited they did not know where to locate the material. A communication barrier exists between the waste management industry, recyclers, and users; which is preventing the successful recycling of CCA treated wood from spent residential decks.

Objectives

1. Determine the volume of CCA treated wood that can be recovered and the most feasible products that can be produced from discarded CCA treated wood.
2. Determine mechanical and chemical properties of used CCA treated residential decks.
3. Recognize barriers that exist for landfills, recycling centers, and organizations in reusing CCA treated wood.

Methodology

1. Volume and area measurements and piece count of the deck components were obtained from six decks prior to removal.
2. Four residential decks were demolished and two deconstructed.
3. After deck removal "unusable" areas of the lumber were removed, and the amount of recovered lumber was determined for all decks and components.
4. The chemical retention levels of the decking and joists of the recovered decks and recently treated wood were obtained following AWWA guidelines and then compared.
5. The strength properties of 30 decking samples per deck and recently treated wood were tested following ASTM designation: D 198-99 and then the data was compared.
6. Products from the recovered lumber of the removed decks were manufactured, with emphasis placed on practicality to produce and use.
7. Landfills, recycling centers, and potential users were interviewed to identify obstacles for the successful reuse of recovered CCA treated wood.

Chemical Retention Analysis

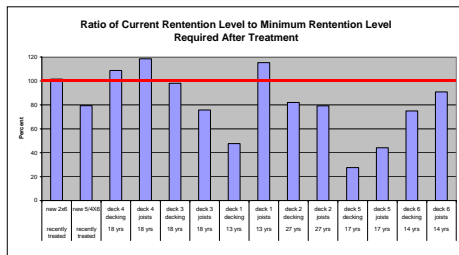


Figure 1. Ratio of minimum required at treatment and current CCA chemical retention.

Results

Deck Recovery

Table 1. Service time and size of decks used in study (Note: deck #3 and #4 were deconstructed).

Deck No.	Time In-Service (years)	Deck Size (square feet)
1	13	239
2	27	150
3	18	200
4	17	210
5	17	160
6	14	360
Average	17.7	220

Table 2. Volume, in dbft, of deck components prior to removal

Component	Volume (Bd.Ft.)	% of Total
Decking	1789	38.4
Railing	810	17.4
Stairs	387	8.3
Joists	1359	29.2
Posts	261	5.6
Lattice	32	0.7
Misc.	15	0.3
Total	4654	100.0

Mechanical Strength Analysis

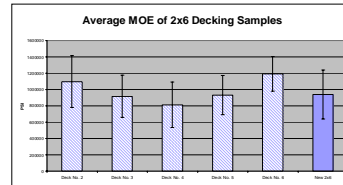


Figure 2. Average MOE values and distribution of 2x6 decking samples. Striped bars represent samples that were statistically equal to or greater than the new 2x6 samples at an alpha level of 0.05.

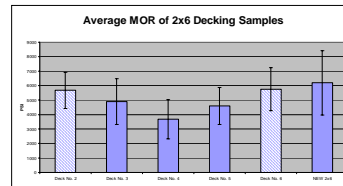


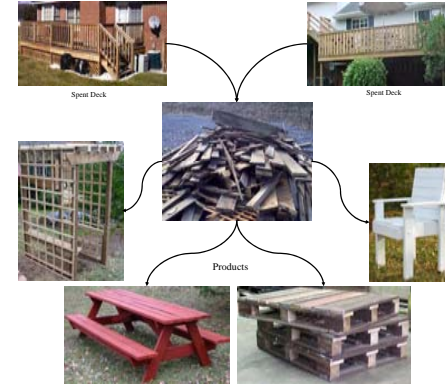
Figure 3. Average MOR values and distribution of 2x6 decking samples. Striped bars represent samples that were statistically equal to or greater than new 2x6 samples at an alpha level of 0.05.

Table 5. Material, hardware, costs, and time needed to produce several products from recovered CCA treated wood from removed residential decks

Product	Material (Bd.Ft.)	Total Board Feet	Hardware	Cost of Hardware	Workers Hours
Porch Swing	2x4 (8.4), 5/4x4 (14.8)	23.2	3-1/2" & 2" screws, 3-1/2" lag screws, 3-1/2" lag bolts	\$8.69	2.5
Chair	2x4 (6.7), 1x4 (4.4)	11.1	2-1/2" screws, 3-1/2" lag bolts, 3-1/2" lag	\$8.71	3
Trash Container	1x4 (5.1), 2x2 (1.8), Lattice (12.4)	8.9	1-3/4" screws, 1-1/4" corner bracket, 5-1/2" leg screws, 3-1/2 lag bolts, 3" & 2-1/2"	\$2.00	4
Trellis	2x6 (22), 2x4 (7), 4x4 (81.7), 2x8 (15.4), 2x2 (7.5)	133.6	screws	\$28.70	27
Planter Box	5/4x6 (4.5)	4.5	1-3/4" screws, 1-1/4" nails	\$1.20	1.5
Planters	2x4 (12)	12	3-1/2" & 2-1/2" nails	\$0.60	2
Patio Table	4x4 (18.4), 2x2 (12.4), 5/4x6 (12.4), 1x6 (0)	39.6	2" & 3" screws, 6" lag screws	\$18.00	8
BBQ Table	2x4 (6.5), 2x4 (6.2)	12.7	2-1/2" & 3" screws, 3-1/2" lag bolts	\$18.31	8.5
Porch Railing	2x2 (10), 2x4 (8.1), 4x4 (8.2)	26.3	all thread, 2-1/2" nails	\$6.75	8.5
Saw Horse	2x8 (108.6), 4x4 (108.6), 4x4 (86.8)	246.4	joint hangers, 2-1/2" screws, 1-1/2" nails	\$26.18	22
Deck	2x6 (10.3), 1x6 (2)	12.5	3-1/2" & 2-1/2" nails	\$0.36	1.5
Block Pallets	1x4 (5.1), 1x6 (5), 5/4x6 (9.7), 4x4 (8)	23.3	2-1/4" and 1-5/8" spiral shank nails	\$4.83	2.25
Stringer Pallets	2x4 (8.3), 1x4 (5.1), 1x6 (4)	14.4	5-1/4" spiral shank	\$2.92	1.75



Second-Life Products From CCA Treated Wood Recovered From Residential Decks



Conclusions

- Owners of the spent decks were the most satisfied with the low amount of insect infestation.
- Owners of the spent decks were the least satisfied with the overall aesthetics.
- Following typical deconstruction practices, rather than demolition, did not result in a higher percent of treated wood recovered from removed residential decks.
- It was found that approximately 85% of the CCA treated wood obtained from a spent residential deck is recoverable for other uses.
- The highest volume and most successfully recovered deck components were 2x6s and 2x8s.
- Stiffness values were similar, but strength values were lower for recovered CCA treated wood compared to newly treated wood.
- Chemical retention values for recovered CCA treated wood were lower than expected; however, retention levels met the specifications for aboveground applications.
- The largest impediment in the recycling of CCA treated wood appears to be a lack of awareness and communication between links in the supply chain; i.e., homeowners, contractors, landfills, and consumers.

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