
Characterization and potential recycling of home building wood waste

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ABSTRACT

Construction waste represents a significant portion of landfill waste, estimated as 17% of the total waste stream. Wood construction waste of a 2000 square foot single family home we found to be 1500-3700 lbs of solid-sawn wood, and 1000-1800 lbs of engineered wood products (EWP). Much of the solid-sawn lumber and EWPs could be recycled into several products. Through a partnership with an EarthCraft House (A “Green” housing system) certified builder, the authors have determined the wood construction waste generated for recently built houses at a new green housing development. The purpose of this study is to quantify the construction waste and explore options for the reuse or recycling of these wood products. The EarthCraft House certification system rewards these activities and discourages landfilling. Wood products studied included solid-sawn lumber, oriented strand board, particleboard, LVL, and preservative treated wood. We will present the results from 6 houses including solid and grinding recycling options. We will mention some other national certification systems such as LEED for Homes and the NHBA system.

1 INTRODUCTION

Construction waste from home building represents a significant portion of landfill waste in both Construction and Demolition Landfills (C&D) and in Municipal Solid Waste Landfills (MSW). The waste can be 17% of the waste stream. Wood construction waste of a 2000 square foot single family home from our research can be 1500-3700 lbs of solid-sawn wood, and 1000-1800 lbs of engineered wood products (EWP). This is extremely wasteful and not good for the environment. It needs to be addressed with practical solutions.

We have a history of working together to reduce wood waste and increase wood reuse and/or recycling. Our R&D team includes the US Forest Service wood utilization research project in Blacksburg, VA and faculty in the Department of Wood Science and Forest Products at Virginia Tech also in Blacksburg, VA.

For this effort, we worked with a local home building company to evaluate their wood construction waste and develop and recommend recycling options to keep wood waste materials out of landfills. We had previously successfully worked on wooden pallet recovery, repair, reuse, and recycling R&D for over 20 years. We have also completed R&D on the recovery, reuse, and recycling of used preservative treated wood from demolished outdoor decks.

We entered into a partnership with the EarthCraft House (A “Green” housing system) certified builder, to determine the wood construction waste generated for each house at their new green housing development. The builder is using advanced wood and engineered wood products and systems as well as advanced energy systems. The purpose of this phase of our study was to quantify the construction waste and explore options for the reuse and/or recycling of these wood products. A second phase will be to analyse the construction processes, and resulting waste and work with the builder to reduce his overall wood waste for future homes.

2 WHAT IS “GREEN” BUILDING

Green building is the practice of increasing the efficiency with which buildings use resources (energy, water, and materials) while reducing building impacts on human health and the environment during the building's lifecycle, through better siting, design, construction, operation, maintenance, and removal. Waste material recycling is a preferred and rewarded practice in green building (you get points for doing it).

3 WHAT IS EARTHCRAFT HOUSE?

EarthCraft House is a residential green building certification program that serves as a blueprint for energy- and resource-efficient homes. The EarthCraft House certification system rewards energy- and resource-efficient homes and recycling activities while discouraging landfilling of waste. EarthCraft House is considered a regional program and can be compared to national programs such as LEED for Homes by the US Green Building Council (USGBC) and the National Green Building Standard by the National Association of Home Builders Green Program (NAHB Green). EarthCraft House was developed by the Atlanta Home Builders Association and the Southface Energy Institute in Atlanta, Georgia.

To be certified in Virginia, the building has to complete training from EarthCraft Virginia. Next they must plan and build a home to meet the minimum requirements for an EarthCraft House with oversight and inspections by an EarthCraft Technical Advisor. This would include a pre-drywall inspection and a finished house inspection to include home and heating and cooling system tightness inspections. There are three possible levels of certification. The building expenses go up as the certification level goes up.

4 STUDY OVERVIEW

With an EarthCraft House certified developer in Blacksburg, VA, we are quantifying the amount of OSB, treated lumber, and spruce (spruce/pine/fir) dimension lumber waste during home construction and determining potential uses for discarded material as an alternative to landfilling. As the homes are being built, we are collecting the wood waste and storing it in a used container where we can collect separately the waste for three homes. After the three homes are finished, we move the trailer to our laboratory setting and analyze and in some cases process the waste. We take another trailer to the housing site to continue to collect more waste from other homes.

5 WOOD WASTE RESULTS

Initial results are presented in Table 1 for the first 6 homes in the development. Figure 1 shows the house on Lot #47 during construction and the waste by major wood products used. To help normalize the results waste per square foot of building construction is presented in Table 1. The spruce lumber and OSB pounds per square foot results are very variable. Spruce lumber has a range of .58 to 1.98 pounds of waste per square foot of living space in the homes. OSB has a range of .5 to .9 pounds of waste per square foot of living space. Preservative treated wood waste ranged from .03 to .29 pounds per square foot.



Figure 1 Example of the amount of wood waste generated from new home construction on Lot #47

The treated wood range of waste values can be explained by the size of the decks and needed stairs by house. Some homes needed far less wood to build the stairs and deck. The treated wood was also used for sill plates, but normal waste for sill plates is low.

The range of waste for OSB and spruce is more complicated. The biggest factor other than the fact that the homes being built were new designs for the builder was the fact that different framing subcontractors were used for some of the homes. The builder had could not control much of the waste. Repeat building of a house and precutting in a central area could help reduce the waste per square foot of living space.

Table 1. Weights of spruce, OSB, and treated wood waste material from the first six homes

Lot #	living space (Sq. Feet)	Spruce Weight (lbs)	Spruce (lbs/sq. ft.)	OSB Weight (lbs)	OSB (lbs/sq. ft.)	Treated Wood (lbs)	Treated Wood (lbs/sq. ft.)
1	2,634	3,100	1.18	2,380	0.90	214	0.08
34	2,634	1,540	0.58	2,287	0.87	71	0.03
41B	1,936	2,770	1.43	1,685	0.87	375	0.19
43	1,685	1,985	1.18	1,048	0.62	496	0.29
47	2,036	3,134	1.54	1,419	0.70	417	0.20
48	1,840	3,641	1.98	915	0.50	392	0.21

6 RECYCLING OPTIONS

The two major recycling options are to make solid-wood and fiber products as shown in Figure 2. Solid-wood products range from converting waste OSB (structural plywood substitute) into shelving, pallet parts, treads for stairs, and many other uses. The waste structural and treated wood can be finger jointed for reuse in other home building or to make finger jointing molding products. We used a minimum length when determining if the structural lumber waste could be finger jointed. The remaining waste would be sent to a grinder to be reduced to fiber.

The second option is to grind the waste with horizontal or tub grinders to various forms of mulch. The mulch can be used to control erosion at the building sites and then mixed with the soil after the home is completed. The mulch could also be used for temporary driveways and walkways during construction to reduce mud transfer into the home under construction. The mulch could also be sold as bioenergy or animal bedding.

Most of the shelving that we produced from the waste OSB as shown in Figure 2 was donated to a local Habitat for Humanity store. They sold the pieces for \$.50 each to help raise funds to build homes for underprivileged families.

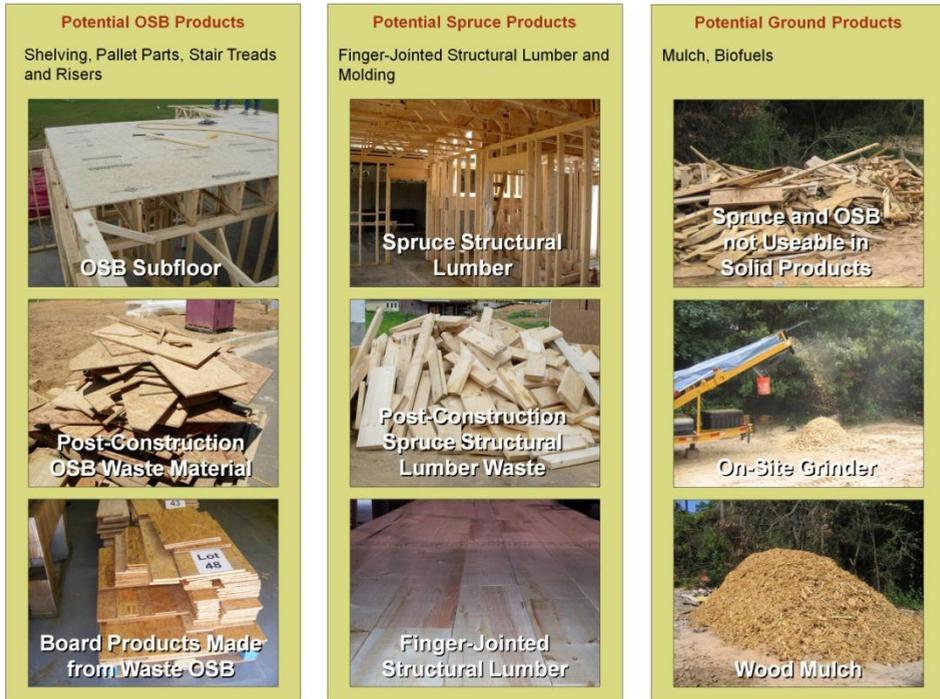


Figure 2. Wood products and wood waste generated from new home construction and some recycling options

7 RECYCLING RESULTS

The two major Initial results indicate that 50-60% of the OSB waste material (Figure 3) as well as 35-50% of the treated lumber waste can be recycled into solid useable products (This project is in the second year of a five year project and much more recovery, reuse, and recycling data will be generated). The spruce lumber pieces were on average much shorter and we estimates that only 8-18% could be finger jointed for solid useable products. If other potential products of different sizes and shapes are developed, the recovery yield could increase significantly. The remaining materials (OSB and lumber) can be processed for biofuels and mulch.

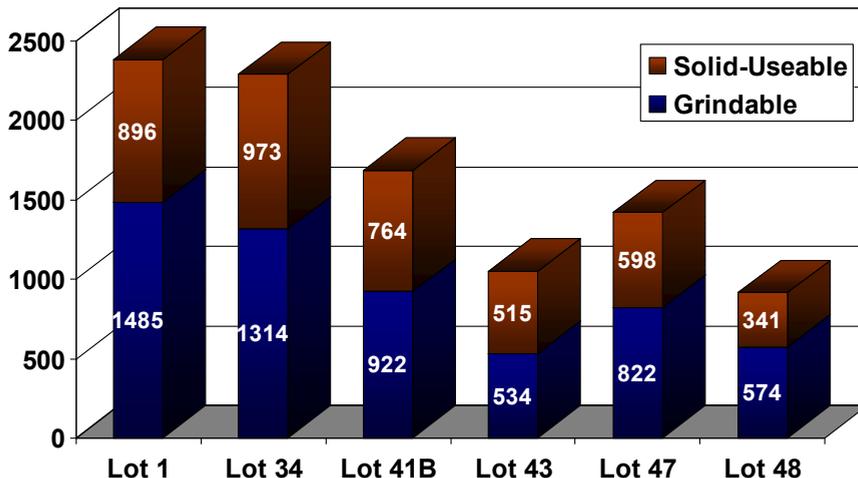


Figure 3. Weights of solid useable and grindable OSB material from new home construction

8 SUMMARY AND CONCLUSION

Wood construction waste from home building can be a major burden on landfills in the United States. To discourage this practice “Green” building systems are rewarding builders that recycling wood construction waste. To aid in this practice we have been working with a “Green” builder (EarthCraft House) to quantify the construction waste and explore options for the reuse or recycling of these wood products. Wood products studied included solid-sawn lumber, oriented strand board, particleboard, LVL, and preservative treated wood.

We presented the waste results from the first 6 houses and solid and grinding recycling options for the waste materials. The wood construction waste of a 2000 square foot single family home was found to be 1500-3700 lbs of solid-sawn wood, and 1000-1800 lbs of engineered wood products (EWP). Oriented strand board was the major engineered wood product used in the home building. Wood waste ranged vastly from house to house due to different subcontractors, house design and that fact that these were not repeat building of a home design. Solid and fiber recycling options were presented. The materials can be used and not landfilled. We recommend a central recycling facility and a central cutting facility together to reduce waste and to process the construction waste. We plan to start working with the builder on the next step of reducing the construction waste.