



**Used Building Materials & More**

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## **Case Study Report #4, 520 Ridgeway Bellingham, WA** **5-Bedroom Residential Dwelling, Circa 1970**

### **Site Description:**

Case Study #4 is comprised of a mid-sized ranch home with a walk-out, finished basement and an unattached storage building/workshop. The footprint of the house covers nearly 1333 square feet. The home is scheduled for demolition due to difficulties



renovating the structure to fit the homeowner's needs—the homeowner purchased 520 Ridgeway with plans to renovate incorporating passive and active solar technology as well as other sustainable technologies, in an attempt to create a “green” dwelling. Unfortunately, the required renovations proved to be extensive enough that it became more efficient to deconstruct and rebuild than to work with the existing structure. It was chosen as a *RE Store* project and as the final case study largely because the *RE Store*, as an ecologically-driven

non-profit, fits well into the scope of the homeowner's project. Additionally, 520 Ridgeway provides a good example of an average urban dwelling whose layout, aesthetic, and size has simply become outdated. 520 Ridgeway also contains a large volume of high-quality material that should prove to be both easily quantifiable and readily marketable.

The house is conventionally-framed, and should prove to be easily deconstructed. The only unconventional aspect of the house's construction was the builder's use of a 32 linear feet, 18 inch thick I-beam running longitudinally through the house and resting on beams, acting as support for the main floor.

**Roof:** The roof of the house consists of a single layer of recyclable composite shingles (1911.42 square ft.) and tar paper attached to another 1900+ square ft. of 1” x 10” shiplap. The trusses are built from roughly 2680 linear feet of 2” x 6” fir, and should be 95% salvageable.

**Interior:** The interior walls were sheathed with 6106.25 square ft. of non-recyclable gypsum board, which contributes a significant amount to the dump costs. The exterior and stud walls are built from 4975 linear ft. of 2" x 4" as well as 38 linear ft. 2" x 8" fir studs, and should prove to be 70% salvageable. The floors are the highest value salvage item: over 625 square ft. of high-quality 2 1/4" x 3/4" red oak flooring, which should prove to be 80% salvageable. There is an additional 160 square ft. of 3/4" plywood under the laminate flooring in the kitchen which should prove 100% salvageable.



The entire upper floor is built upon approximately 1159 linear feet of 2" x 10" fir decked with the same shiplap (1330 square ft.) found in the roof. The floor joists should prove to be at least 90% salvageable, whereas the ship lap may be at best 50% salvageable, due to a limited market for such material and the difficulty of successful removal.

**Exterior:** The exterior of the house is sided with approximately 1354 square ft. of 10" beveled cedar siding, which should be 85-90% salvageable, and an additional 411 square ft. of cedar lap siding, which should be 70% salvageable. At both the front and rear of the house there are small decks, containing roughly 385 square ft. of 1" x 4" cedar, which should prove to be 90% salvageable and +/- 200 linear feet of 2x 6" pressure-treated cedar, which will be land-filled, as the chromium arsenate used as weather-proofing renders this material unsalable.

The total volume of this building is estimated to be 65% salvageable and includes, most notably:

- Over 620 square feet high-quality red oak flooring
- Solid oak-faced kitchen cabinet set
- Approximately 4975 linear feet 2" x 4" fir lumber
- Approximately 2680 linear feet 2" x 6" fir lumber.

The following report will quantify all material salvaged as well as provide comparisons to estimated salvage potential. Note that a small amount of salvageable material is always lost due to market fluctuations, deconstruction methodology, or damage. The salvaged material will be quantified according to volume/quantity, weight and market value. The debris remaining after salvage and due to deconstruction will be sorted and recycled in the best manner that the industry allows, or placed in a landfill as necessary.

## **Comparisons to Conventional Demolition:**

Local demolition contractors, *T n' T Recovery* and *Silver Rain*, projected costs, labor, and disposal fees— under a traditional, machine-based demolition scenario— to amount to the following:

	<b><u>Labor</u></b>	<b><u>Disposal</u></b>	<b><u>Total Service</u></b>
<i>T n' T Recovery:</i>	\$640	\$2700	\$3340
<i>Silver Rain:</i>	\$2600	\$4000	\$6600
<i>The RE Store:</i>	\$9800	\$2200	\$12,813 inc. tax

### **Disposal**

The estimated yardage of construction and demolition (C&D) debris is as follows:

*Silver Rain* estimated the total yardage of C&D to amount to be 220 yds. Of that 220yds., *Silver Rain* anticipated that 200 yds would be placed in a landfill, and only 20 yds. (of brick, steel, lumber, and copper) would be recycled. *Silver Rain* also anticipated that 10% of the structure would be available for re-use.

*T n' T Recovery* estimated the total yardage of C&D to be 140 yds. and proposed to haul the C&D debris to the region's premier recycling sites, estimating 75%, or 105 cubic yards to be recycled, the remaining estimated yardage to be placed in a landfill.

Note that the actual volume of debris to be disposed of by *The RE Store* after salvage consists of approximately 18,340 lbs. of C&D debris recycled as “clean wood” at local wood recycling facilities, 32,705 lbs. of reusable material diverted from the waste stream and made available to the community at *The RE Store's* retail outlet, 10 cubic yards/ 2390 lbs. of composite shingles recycled at *American Roofing Recyclers* in Marysville, WA and only 52 cubic yds ./ 22,880 lbs. C&D placed in a landfill.

### **Labor**

*T n' T Recovery* proposed the use of an equipment operator for two days/32 hours and as well as drivers for hauling the recyclable waste.

*Silver Rain* proposed the use of an equipment operator for 16hrs and would contract the debris hauling.

*The RE Store* employed up to 8 skilled deconstruction laborers for a total of 472.65 hours.

### **Fuel**

*T n' T Recovery* estimated the use of 110 gallons of diesel fuel for their excavators, and an unknown quantity of fuel for transportation of debris, equipment, and laborers.

*Silver Rain* estimated the use of 30 gallons of fuel for their excavators and an unknown quantity of fuel for transportation of debris, equipment, and laborers.

*The RE Store* consumed 15.127 gallons of fuel, and drove its work trucks approximately 185 miles over the course of three weeks to transport laborers and materials.

### **Description of Process:**

Prior to *The RE Store* beginning work on 520 Ridgeway, 1 yd of asbestos-contaminated floor tiles were removed from the basement of the house by an experienced outside contractor. After abatement, the first stage in the deconstruction process involved salvaging all reusable and high-value items from the interior and exterior of the property. In the specific case of 520 Ridgeway, this included: Removal of eight pre-hung interior doors and three pre-hung solid mahogany doors, removal of a 16 pc. kitchen cabinet set, removal of all trim, and salvage of the oak flooring from the upper level of the home.

After salvage, the deconstruction crew began removal of the gypsum board from the stud walls and ceilings. Once the gypsum board was stripped from all of the interior rooms, the non-load bearing walls were knocked out and the blown-in and fiberglass insulation removed and disposed of. To speed cleanup, tarps were laid out over the floors and up the walls to catch the insulation as it spilled from between the ceiling joists. The full tarps were then pulled outside the house and emptied into the garbage dumpster.

Once the interior was thoroughly gutted, the roof was ready to be removed. At first inspection, the roof of 520 Ridgeway was thought to be comprised of only one layer of composite shingles, which were quickly and easily removed. However, an additional layer of torch-down roofing was found beneath the top layer of shingles that was untested for asbestos. After samples were taken and tested by an outside contractor, it was determined that there was asbestos present in the felt paper beneath the torch-down, and abatement was scheduled and work ceased on the roof structure, until abatement could be completed.



The deconstruction team then shifted focus to removal of the cedar siding and dismantling of the cedar decks. Unfortunately, the cedar deck boards turned out to be all pressure-treated with chromium arsenate, so weren't salvaged for resale, and instead disposed of. As the work was being completed on the roof and on the decks and siding,

additional deconstruction team members were working inside to remove all of the drywall nails that were left in the studs and joists, as this is done most easily, at times when the manpower is available, with the framing members of the walls, floors, and ceilings still in place.

Abatement was completed over the following weekend, so work could be continued on the roof structure of the house the following Monday. Using “bangers,” a type of slide-hammer nail-puller, three members of the field crew worked on the roof to remove the nails from the shiplap sheathing, which was determined to be in good enough shape and easy enough to de-nail that it was worth salvaging. Once the nails were all pulled, the lengths of shiplap were passed down to waiting crew members who de-nailed and stacked the material according to length, in anticipation of a focused load-out.



- Note that every effort is made to keep like lengths of materials together throughout the deconstruction process to maintain de-nailing, loading, and measuring efficiency.



Once the ceiling joists and rafters were completely exposed, they were cut at the point they connected with the exterior walls and processed for denailing and load-out in the same manner as the shiplap sheathing.

The deconstruction team then focused on removing all interior walls by cutting the top plate of each wall from its connection to the adjoining exterior wall and/or interior wall and collapsing the cut section of wall. Once on the floor, it is knocked/ pried apart with bars and heavy hammers, each board assessed for value and then sorted for de-nailing and load-out or placed in the C&D recycling dumpster.

The walls comprising the shell of the structure were then collapsed and dismantled in the same fashion, utilizing ropes to pull down the larger, heavier walls, and employing supports fashioned from salvaged lumber when necessary to prevent remaining walls from falling in and harming members of the deconstruction team.

Once the walls of the upper story were all dismantled, the shiplap comprising the floor structure was removed by both prying from above and knocking boards loose from below. What boards came up easily were set aside for re-use, while the majority were placed in the wood recycling bin. Once the floors were removed, the joists were cut out

in the same manner as the rafters and processed for denailing and load-out. Once the joists were removed, all remaining basement walls were removed in the same manner as the walls from the upper story were knocked apart.

The only remaining structural element at this point was a 30 ft. steel I-beam, which was lowered from its anchor in the wall with a forklift and left on site to be reused by the builders.

- The salvaged lumber was processed in a different manner than it normally would be during this project. Whereas normally, de-nailed material would be loaded directly onto waiting trucks or trailers, during this case study, it was staged on site and stacked according to length and type of material. Once all material was salvaged, stacked, banded and measured, it was loaded in large stacks onto waiting trucks and trailers with a rented forklift, which proved an efficient method, and one that will be repeated when a project where security and space are not an issue arises again.

At this point the deconstruction crew is ready for final sight cleanup. The poured concrete foundation and the brick fireplace is left behind to be removed and recycled by an outside contractor, but the exposed earth around the foundation walls is raked and cleaned to the crew lead's satisfaction.

- Note that the deconstruction crew also carries out daily clean-up operations to prevent debris from being blown into neighbor's property.

It should be noted that several extra steps were taken during the load out/ measuring process in order to satisfy the terms of the case study. Each item or group of items needed to be carefully weighed and measured as it was unloaded and priced at *The RE Store's* retail outlet, requiring additional labor from members of the field crew. Special forms, used to document the weight of the material, were used in addition to those normally used to document material's volume and value, requiring more time for paperwork.



### **Findings:**

Unlike conventional machine-based demolition, deconstruction practices place an emphasis on saving materials for reuse, and recycling the remaining debris, in addition to maintaining economic viability. The hoped-for end result should: exhibit a minimum use

of the local landfill; fulfill the local community's need for inexpensive, high-quality building materials; and provide a venue for the creation of jobs for local semi-skilled laborers.

The viability of re-use depends on finding a market for the material. *The RE Store* is a self-sufficient non-profit organization dedicated to saving re-usable building materials from the landfill by selling items at its retail outlet. It has been successful for 11 years, proving an established market and broad clientele base. It is also capable, through its retail outlet, of housing materials until a market arises.

## **Materials Recovered**

*(Complete details of materials saved can be seen in project spreadsheets.)*

The “actual salvage value” of materials differs from estimated salvage potential due to the loss of material from damage incurred by deconstruction methodology, impossibility of salvage due to the manner in which the building was constructed, and loss of estimated value due to poor salability. By deconstructing these buildings by hand, *The RE Store* saved 32,705 lbs. of material valued at \$7,339.53 directly for re-use, recycled 19,940 lbs. of debris, disposed of 96.6 lbs of material with the WA State Disposal of Toxics, Recycled one microwave oven, weighing 75.4lbs, with *Total Reclaim* in Seattle and sent only 22,880 lbs. to the local landfill—recycling or salvaging for resale 70.63% of the entire building.

Under the scenario presented by *Silver Rain*, 10% of the building would have been available for reuse, 10% would have been recycled, and the remaining 80% of the C&D would have been placed in a landfill.

The total real volume of the building should be seen as the combined volumes of the salvaged materials and the C&D debris. The total real volume is estimated around 140 cubic yards, or 78,087 lbs. This real value can be compared with the bid estimates, and industry-standard weight-to-volume conversion ratios. This report shows that, due to *The RE Store's* deconstruction methodology, 42% of the entire structure was salvaged directly for resale, including: 90% of the interior finish, 73.7% of the dimensional lumber, and 44.25% of the exterior siding, windows, and doors. (Unfortunately, the windows were not salvaged for resale, but did contain value as recyclable aluminum. Additionally, the cedar siding proved exceptionally difficult to remove, and a great deal was damaged during salvage.) *The RE Store* also managed to save over 95% of the oak flooring and 49.2% of the 1” x 10” shiplap sheathing, salvaging for resale over 79% of all salvageable materials. The *RE Store* recycled a total of

## **Summary of Results**

- *Square Footage of structure's footprint: 1333 sq. ft.*
- *Total volume of structure: 140 cubic yards*
- *Total weight of structure: 78,087 lbs.*
- *Combined weight of salvaged materials: 32,705 lbs.*

- *Percentage salvaged: 42%*
- *Combined weight of recycled materials: 20,730 lbs.*
- *Percentage recycled: 27%*
- *Weight Land-filled: 22880 lbs.*
- *Percentage Land filled: 29.9%*
- *Estimated Value of recycled material: \$7339.53*
- *Value per square foot: \$5.51*
- *Weight per square foot: 58.6 lbs.*
- *Value per pound of salvaged materials: \$.22/ lb.*

## **Expenses**

The main expense occurred during deconstruction was labor. Up to 8 skilled deconstruction laborers were paid approximately \$5211.8 for 472.65 hours of labor, not including benefits or accounting for L&I expenses and taxes. Fuel cost amounted to only \$47.04 to fuel 4 vehicles for a combined total of 185 miles. Tool costs were slight, amounting to only \$10 for the rental of two extra nail pullers, and an additional \$140.79 for the rental of a forklift.

It should be noted that often *The RE Store* uses a “hybrid” method of deconstruction to maintain economic viability, incorporating a track hoe to handle marginal materials and debris, and to minimize labor costs.

*The RE Store*, due to its status as a 501(c)3 non-profit, offers the client the added benefit of a tax credit for the total value of their donation of salvaged building materials. In the case of 520 Ridgeway, this credit carried an estimated value of \$7,339.53.

## **Further Findings**

In almost all demolition scenarios, salvage and/or deconstruction methods can be incorporated to varying degrees. Throughout the building/demolition industry, deconstruction methods are gaining support due to growing costs of disposal, and ethics shifting towards sustainability. Hopefully we will see a time when salvage practices are mandated industry-wide.