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**Case Study Report #2, 183 “C” St. Blaine, WA**  
**Commercial Building, Circa 1970**

**Site Description:**

Case Study #2 was a 10,000 square foot commercial/office building located in the northwest corner of Whatcom County. 183 “C” St. was chosen as a *RE Store* project because it was a large, fairly modern building comprised of many reusable and recyclable materials. Although the building was scheduled for demolition due to its growing liability and maintenance issues, it contained no asbestos and very little rot or pest damage. The large volume of like materials generated for resale was both very marketable, and easily quantifiable, as the majority of salvaged material was dimensional lumber and plywood. The building also contained many commercial, extruded aluminum doors and windows, which were either readily available for re-use or easily dismantled for their high-value aluminum components. There were also a number of large metal desks and office chairs left behind from previous tenants that could be easily reused or recycled.



The building appears to have been constructed in three stages:

- The initial 2,500 square foot building was constructed of concrete block walls with a flat roof.
- A 4,500 square foot unattached structure, conventionally framed with a flat roof, was built nearby and annexed at a later date.
- Finally, the two buildings were connected and sheathed with plywood and sheet metal siding to maintain visual contiguity.

**Roof:** The building supported a flat roof of three different levels. It yielded a large volume of recyclable roof products: re-usable butyl rubber liner, solid foam insulation, fasteners, and plywood. It was built over 2”x12” rafters, supported by a central glue-laminated beam measuring 5”x18” in girth.

**Exterior:** The exterior was clad with sheet metal siding over plywood sheathing, and in some places contained “firewall” gypsum board over standard 2”x6” framing lumber.

**Interior:** The interior was comprised of a concrete slab floor with glued-down carpet and gypsum board wall sheathing. Many framed partition walls yielded a large number of interior doors, trim and 2”x4” lumber. Ceiling tiles and 2’x4’ fluorescent lights were salvaged for resale as the local market allowed, and the remaining quantity were recycled and/or disposed of properly. A great deal of tin was also recycled from the ceiling tile support grid.

The total volume of the building was estimated to be 70% salvageable and contains, most notably:

- 3,148’ of 2”x12” lumber,
- 510’ of 2”x10” lumber,
- 5,200’ of 2”x 4” lumber,
- 6,000 square feet of plywood,
- 2,700 square feet of sheet metal siding,
- 10,000 square feet of roofing material and solid foam insulation.

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

### **Comparisons to Traditional Demolition:**

Two local demolition contractors, *T n T Recovery* and *Freeman and Sons* projected costs, labor, and disposal fees— under a traditional, machine-based demolition scenario— to amount to the following:

	<b>Labor</b>	<b>Disposal</b>	<b>Total Service</b>
<i>T n T Recovery:</i>	\$5,700	\$4,150	\$9,850
<i>Freeman and Sons:</i>	\$10,500	\$ 0	\$10,500
<i>The RE Store:</i>	\$6,728	\$3,500	\$10,228

## **Disposal**

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

<i>T n T Recovery:</i>	388 cubic yards/116.5 tons,
<i>Freeman and Sons:</i>	400 cubic yards,
<i>The RE Store:</i>	90-120 cubic yards.

*T n T Recovery* proposed to haul the C&D debris to the region's premiere recycling sites, estimating 384 cubic yards to be recycled as hog-fuel, the remaining estimated yardage to be land-filled.

*Freeman and Sons Inc.* proposed using a local wood recycler, *RDS Inc.*, who would have placed four 100-yd. boxes on site, with an unknown minor quantity of C&D debris to be recycled, and the majority to be land-filled.

Note that the actual volume of debris to be disposed of by *The RE Store* after salvage consisted of approximately 180 cubic yards recycled at *Recovery One*— a recycling facility at the Port of Tacoma that accepts and sorts mixed C&D debris— 30 cubic yards of metal recycling, and 5 cubic yards of debris placed in a landfill.

## **Labor**

*T n T Recovery* proposed the use of an equipment operator for three days and the use of an additional laborer for two days, as well as drivers for hauling the recyclable waste.

*Freeman and Sons* proposed employing an equipment operator for three days.

*The RE Store* employed up to six skilled deconstruction laborers for a total of 613.5 hours.

## **Fuel**

Both *T n T Recovery* and *Freeman and Sons* estimated the use of 78 gallons diesel fuel for their excavators, and an unknown quantity of fuel for transportation of debris, equipment, and laborers.

*The RE Store* consumed roughly 85 gallons of gasoline, and drove its work trucks approximately 700 miles to haul labor and materials.

## **Description of Process:**

The earliest stages of the deconstruction process involved salvaging all reusable and high-value items from the interior and exterior of the property. In the specific case of 183 “C” St., this involved, within the structure: emptying all partition rooms of furniture; pulling and de-nailing all trim and baseboard; removing all interior doors and jambs from their wall openings; removing all bathroom fixtures, EXIT signs, hot water heaters, cabinetry breaker boxes; and salvaging one furnace.

The deconstruction crew then began removal of acoustic ceiling tiles and support grid. 340 lbs. of ceiling tiles were sorted for quality and saved for reuse, while the remaining tile were placed in a landfill. The metal support grid was placed in an on-site metal recycling bin.

The deconstruction team then removed all gypsum board from the interior partition walls. Once the gypsum board was removed and the insulation from each wall sorted and bagged for reuse, the base plate and top plate of each partition wall section were cut from adjoining exterior and/or interior wall and then collapsed in order to salvage the 2”x 4” wall studs. Once on the floor, the wall section was 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.

- Note that every effort is made to keep like lengths of material together throughout the deconstruction process to maintain de-nailing, loading, and measuring efficiency. When de-nailing, it is best to de-nail the longest lengths first, and then load them directly onto the waiting truck or trailer, ensuring a neat and stable load.

Once the false ceiling was completely removed and walls stripped of gypsum board, the deconstruction crew then began removal of the fiberglass insulation from the ceiling, incorporating the use of a wheeled scaffold. All undamaged insulation was sorted and bagged for resale, the remaining material placed in a recycling dumpster.

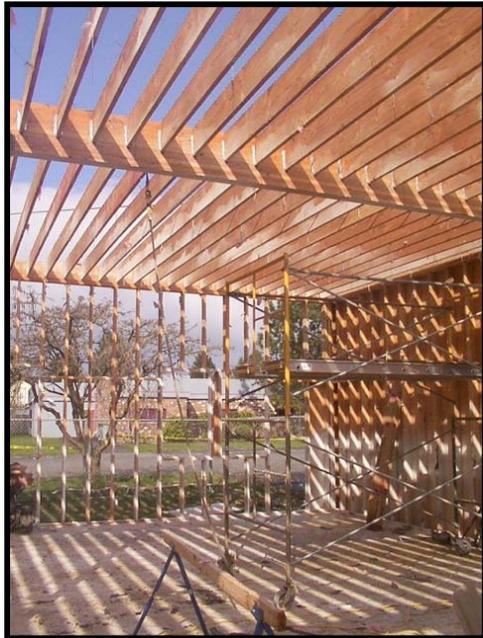
Concurrent with removal of ceiling insulation, the deconstruction crew removed electrical wiring and conduit, as well as salvageable metal gas and water lines, sorting them according to type of metal for later recycling.



When the interior of the building was completely stripped, members of the field crew began removal of the sheet metal siding. The field crew worked in pairs to ensure safety and to maintain quality of material as it was being removed and loaded onto waiting trucks.

The next stage required removal of the roof structure. The flat roof was covered with several layers of rolled torch down roofing over plywood and in other areas by reusable butyl roofing. The rolled roofing was first cut into roughly 4ft. wide sections with a utility knife and/or power circular saw and then peeled from the plywood. The sections of roofing material were then dropped into a recycling bin. The butyl roofing was cut into 4’-6’ wide strips and rolled and bound for resale.

- Note that refrigerant was reclaimed and compressors disconnected from two rooftop air conditioning units by an outside contractor; the air conditioning units were then recycled for their scrap value.



The next stage involved removing the plywood from the roof supports. This was done with bars from above until it could no longer be done safely, at which time the plywood was pried from below from wheeled scaffolding. Once each piece was removed, it was handed down to a waiting crew member who moved it to a designated de-nailing area, where it was de-nailed and loaded onto waiting trucks by the remaining crew member/s.

- Note that carts were used whenever appropriate while handling material, in order to handle larger amounts of material at once, maintain efficiency and reduce fatigue.

After plywood salvage, the field crew was ready to remove the 2”x 10” and 2”x 12” ceiling joists. The joists were cut from their hangers and lowered by ropes to the ground, where they were de-nailed and stacked in anticipation of an on-site purchase and pickup. The field crew utilized a forklift to remove the remaining heavy glue-laminated support beams.



Once the roof support was completely removed, the exterior walls were ready to be collapsed. As much of the plywood sheathing was removed as possible from the shell before the exterior walls were pulled down. The walls comprising the shell of the structure were then collapsed and dismantled in the same fashion as the interior walls, utilizing ropes to pull down the larger, heavier walls, and employing supports fashioned from salvaged lumber to prevent remaining walls from falling in and harming members of the deconstruction team.

A large excavator was then brought in to remove the remaining cinder block and poured concrete superstructure, the rubble transported for recycling by an outside contractor. At this point the deconstruction crew was ready for final sight cleanup: the poured concrete foundation was left undamaged, but the surface within and around the foundation was raked and swept clean to the crew lead’s satisfaction.

- Note that the deconstruction crew also carries out daily clean-up operations to prevent debris from migrating into neighboring property.

## **Findings:**

### **Materials Recovered**

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

*The RE Store salvaged almost 50,000 lbs. of re-usable material during the course of the project, the majority of which was transported to its retail outlet in Bellingham, although 13,000 lbs. of 2"x12" lumber was sold on-site. Approximately 86% of the dimensional framing lumber, 92% of the siding and 71% of the plywood sheathing was saved for re-use. Unfortunately, only 65% of the commercial aluminum doors and windows were saved for reuse, as the market for this type of material is rather lean. However, the component value of the extruded aluminum comprising the frames of the doors and windows was high enough to warrant removing all steel fasteners and disassembling the window and door units—the aluminum could then be recycled as a premium “clean, extruded aluminum.” Under a conventional scenario, the un-salable windows may have been entirely land-filled, or, at best, sorted on an industrial recycling line as a lower-grade material.*

*The RE Store contracted T n T Recovery to haul 180 cubic yards of C&D to the region’s premiere recycler, Recovery One, recycling an estimated 178.2 cubic yards, or 76,080 lbs. of C&D. The RE Store also sorted, on-site, 7,300 lbs. of clean metal to be recycled, not including an additional 265 lbs of copper that was recycled at a later date.*

The actual salvage value of materials differed from estimated salvage potential due to 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. The total material saved for re-use weighed 47,060 lbs. and brought in an estimated net of \$ 10,407.00.

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 was estimated around 303 cubic yards, or 134,842.41 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, 34.9% of the original volume was saved directly for re-use, 64% recycled, and 1.1% placed in a landfill. Under the scenario presented by *T n T Recovery*, 0% of the building would have been saved for re-use, but up to 95% recycled, and only 5% placed in a landfill. Under the scenario presented by *Freeman and Sons*, 0-3% may have been saved for re-use, 20% would have been recycled, and 80% of the resulting C&D debris would have been placed in a landfill.

## Summary of Results

- *Square footage of structure's footprint: 10,000*
- *Total volume of structure: 303 cubic yards*
- *Total weight of structure: 134,842.41 lbs.*
- *Combined weight of salvaged materials: 47,060 lbs.*
- *Percentage salvaged: 34.9%*
- *Combined weight of recycled materials: 83,380 lbs.*
- *Percentage recycled: 64%*
- *Weight land-filled: 1483.26 lbs.*
- *Percentage land-filled: 1.1%*
- *Estimated value of recycled material: \$10,407.23*
- *Value per square foot: \$1.04*
- *Weight per square foot: 13.48 lbs*
- *Value per pound of salvaged materials: \$.22/ lb.*

## Expenses

The main expense occurred during deconstruction was labor. Up to six skilled deconstruction laborers were paid a combined total of \$5552.67 for 543.5 hours of labor, not including benefits and L&I expenses. Fuel was also a significant cost, amounting to \$242.52 and 113.19 gallons of gasoline to fuel two vehicles over roughly 700 miles.

The fossil fuels consumed by *The RE Store* deconstruction crew was higher than the projected fuel consumption of both the bids of *Freeman and Sons* and *T n T Recovery*, due to the distance to the job site *The RE Store* crew was required to travel daily. 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.

Tool rental costs amounted to \$228.90. Contracting an outside contractor to haul and recycle 71yds of concrete and rubble amounted to an additional expense of \$954.32.

*The RE Store*, due to its status as a 501(c)3 non-profit, offers the client the added benefit of a tax deduction for the total value of their donation of salvaged building materials. In the case of 183 C. St., this donation carried an estimated value of \$8500.00.

## Further Findings

In almost all situations, salvage and/or deconstruction methods can be used 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.