
Diverting 94% of Waste From Landfill Saves Money on Hospital Demolition Project: Ottawa, Ontario

When the client told the contractors involved in the demolition of a 14,000 m² urban hospital that at least 50 percent of the CRD waste would have to be diverted from landfill, they said "No problem." And they meant it! Through careful deconstruction and salvage techniques, sorting of materials, and an on-site auction, an astonishing 94 percent of the total volume of materials - 10,000 tonnes - was diverted from landfill.

Project Description

The existing three-storey hospital was made up of several buildings of varying heights and vintages, the oldest being 70 years old. The facility was completely demolished, including footings and foundation. As the hospital had been in operation just prior to the demolition, most of the equipment and materials were in good condition. Much of the electrical and mechanical equipment was sold in a pre-demolition auction.

Salvage crews went into the building once the abatement of hazardous materials in the building was complete. The demolition contractor physically inspected the properties, prioritizing and marking the items for reuse. These items were deconstructed by hand and taken to the demolition contractor's facility for future sale or use.

The contractor's main concern at the start of the project was the large volume of concrete and brick rubble. On-site processing equipment reduced the rubble to standard sizes for granular fill. The fill was then sold, with a portion going to the contractors involved in the construction of the new facility.

The demolition contractor's understanding of the value of the materials in the building undoubtedly contributed to the success of this project, but effective planning and skillful waste management also played a key role. The detailed waste management workplan identified a schedule of activities, site layout, and bin location. The team was carefully instructed in proper techniques and workmanship, and selective demolition took place before the heavy equipment moved on site. Materials in and around the site were handled with care, maximizing reuse and recycling opportunities. The salvaged materials were then stockpiled in small quantities, brought to the ground level by hand in small bins, and transported via truck to the larger material bins on site.

Materials Collected

Reused: newer windows ➤ most doors, frames, hinges and hardware ➤ roof insulation from a 1986 addition ➤ red clay brick ➤ some trees and vegetation on the site ➤ steel platforms and structural elements ➤ full-size acoustical tile units ➤ various washroom fixtures ➤ plywood ➤ wood framing ➤ steel doors with frames ➤ hardwood flooring ➤ thermostats and controls ➤ smoke detectors ➤ electrical and mechanical equipment

Recycled: cast-in-place concrete and concrete/terra cotta block ➤ brown clay brick ➤ windows not designated for reuse ➤ structural steel and metal cast iron and copper piping ➤ electrical wiring ➤ various wood products

Costs/Benefits:

Over 5,000 red bricks from the hospital were carefully salvaged, cleaned by the contractor, and donated to the hospital's owner, who sold them for \$10 each in a fundraising drive and netted more than \$50,000 for the organization. The remaining 55,000 bricks salvaged by the contractor are expected to sell for approximately 40 to 60 cents each.

The quantities and market value of some materials, such as the brick and concrete, made it economically viable to rent the equipment required to demolish and process the concrete on site, avoiding double handling and transportation costs. The more than 3,300 m³ of concrete recycled into granular fill had a value of over \$100,000. Equipment that was in good condition and free from hazardous materials also proved to be profitable, with one generator selling for \$25,000. More than 450 reusable metal doors, complete with frames and hardware, were salvaged by the contractor, with a potential resale value of \$45,000 to \$54,000.

The demolition contractor was quick to point out that savings like these come with a cost. The additional work and time required to deconstruct portions of the building and salvage materials added approximately 30 percent to the cost of labour. For the most part, though, the value of the materials harvested and the reduction in tipping fees of approximately \$50 to \$60/tonne more than compensated for this cost. The one important exception to this was the wood, as the recovered wood was particularly labour intensive to denail. In a market where a similar, new product is inexpensive, the salvage wasn't cost-effective.

Tips for Replication

- Develop a waste management workplan before the start of work on site. Planning details such as site layout and bin location, materials source separation techniques, and tracking documents will help to solve problems before they start and ensure a smooth project.
- Consider an on-site auction to sell off items such as electrical and mechanical equipment before demolition activities begin. Several factors influence an auction's potential for success. A reputable auction house should help to identify if an auction is right for your project.
- Use careful deconstruction techniques to salvage materials and equipment in the best condition possible. This work must be completed prior to the heavy demolition phase, often by hand or with small tools and equipment.
- Ensure that bins are correctly sized and label them clearly to avoid material contamination. To avoid overflow and possible damage or disposal into waste bins, arrange to have full bins picked up in a timely manner.

PROJECT SUMMARY		
Classification:	Demolition	
Project Size:	14 000 m ²	
Project Budget:	\$1.2 million	Work Force: 15 Labourers + 5 Machine Operators
Start Date:	September 2000	Completion Date: June 2001
WASTE MANAGEMENT COST COMPARISON		
Waste Management Expenses	3Rs (\$)	Traditional Disposal (\$)
Coordination / Instruction/ Administration	45 000	45 000
Labour and Human Resources	556 800	480 000
Waste storage, handling and removal (includes bin rental)	118 200	165 480
Total Waste Management Expenses (1)	720 000	690 480
Waste Management Revenues and Saving		
Aluminum sold for recycling	8 200	6 500
Brass sold for reuse and recycling	223	150
Bricks sold for reuse and recycling	11 000	N/A
Iron sold for recycling	7 500	6 000
Concrete blocks sold for recycling	3 600	N/A
Copper sold for recycling	9 000	7 200
Doors sold for reuse	29 700	4 000
Crushed concrete sold for reuse	67 360	N/A
Generator sold for reuse	25 000	25 000
Electrical panels sold for reuse and recycling	3 000	1 500
Precast concrete sold for recycling	1 800	N/A
Sinks / toilets sold for reuse	3 000	N/A
Windows sold for reuse	2 700	1000
Rubble used on site as backfill	12 000	12 000
Total Waste Management Revenue and Savings (2)	184 083	51 350
OVERALL WASTE MANAGEMENT COSTS	(1) - (2)	\$535 917
Project Waste Management Cost (\$ per m²)		\$44.80
Percentage of Total Project Costs		52%

Waste Diversion Summary			REUSE		RECYCLING		LANDFILL	
Material Category	Volume (M ³)	Percent Of Total Volume	Material Volume (M ³)	Reuse Percentage	Material Volume (M ³)	Recycling Percentage	Material Volume (M ³)	Landfill Percentage
CONCRETE	3521	39.5%	2.6	0.0%	3368.4	37.8%	150	1.7%
WOOD	852	9.6%	2.0	0.0%	850.0	9.5%	0	0.0%
STEEL	604	6.8%	7.8	0.1%	596.2	6.7%	0.0	0.0%
COPPER	6	0.1%	0.0	0.0%	6.0	0.1%	0.0	0.0%
IRON	22	0.2%	0.0	0.0%	22.0	0.2%	0.0	0.0%
OTHER METALS ¹	3	0.0%	0.1	0.0%	2.9	0.0%	0.0	0.0%
MASONRY	1780	20.0%	90.0	1.0%	1600.0	18.0%	90.0	1.0%
MECHANICAL	260	2.9%	32.0	0.4%	228.0	2.6%	0.0	0.0%
ELECTRICAL	189	2.1%	59.0	0.7%	113.0	1.3%	17.0	0.2%
FINISHES ²	462	5.2%	10.5	0.1%	10.5	0.1%	441.0	5.0%
ROOFING ³	156	1.8%	43.0	0.5%	0.0	0.0%	113.0	1.3%
DOORS & WINDOWS	227	2.5%	113.0	1.3%	111.0	1.2%	3.0	0.0%
SPECIALTIES	24	0.3%	12.0	0.1%	10.0	0.1%	2.0	0.0%
INSULATION	750	8.4%	25.0	0.3%	0.0	0.0%	725.0	8.1%
MISC. MATERIALS	50	0.6%	0.0	0.0%	0.0	0.0%	50.0	0.6%
TOTALS	8906	100%	397	4.5%	6918	77.6%	1591	17.9%

¹ Other metals includes aluminum, brass, and miscellaneous scrap.

² Finishes also includes fixtures and some furnishings.

³ Roofing material includes roof insulation and ballasts.