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Construction Waste Reduction

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This case study presents the strategies and outcomes of implementing a plan to divert waste from the landfill and back into the supply chain during construction for building demolition waste reduction.

Innovation in manufacturing often results in the need for new or updated manufacturing facilities. The upfront cost of bringing new products to market also carries hidden environmental costs. The demolition and renovation of these facilities requires the removal of building material that is typically discharged into landfills and carries a serious environmental impact. Construction waste and demolition debris are considered to be industrial waste. Some of this waste is dumped in municipal solid waste landfills along with household garbage, some is incinerated in combustion facilities, but most goes into landfills dedicated to construction waste.[1] While hazardous waste is regulated by the U.S. Environmental Protection Agency (EPA), most construction waste is considered to be non-hazardous and is regulated by individual states, making it difficult to track.[2] Of the estimated 545 million tons of non-hazardous waste managed by the solid waste industry in the US every year, more than half is industrial waste.[3]

Most of this non-hazardous waste that is allowed in landfills can be diverted. Construction waste is deemed to be diverted if directed back into use with little or no modification (materials reuse) or re-directed back into the manufacturing process through recycling (materials are used as raw materials to generate new products).

Recently, Ceva Biomune, CRB Engineers & Builders (CRB), and Demolition Interior Specialists, Inc. (DIS) teamed up to reduce the environmental impact of their project, Project Radical, in Lenexa, KS. Project Radical is a full renovation of an existing warehouse into a 33,000sf, two-story space which includes offices and BSL-2 laboratories. Ceva Biomune's decision to remodel rather than build a new facility not only reduced the amount of building fabric to be disposed of, but was more economical. After researching the local municipality's code requirements and "grandfathering" programs, the design team committed to reusing the existing building. Although the extensive demolition was required to repurpose the building, the design and construction teams were able to divert 90% of the demolition waste, providing a successful case study.

Before a strategy to divert the demolition waste was establish, CRB Builders estimated the demolition would take four weeks to complete. With taking time to salvage, catalogue, and arrange hauling of removed elements, demolition took five weeks. Negative labor cost impacts from extending the schedule by a week were nullified through revenue from selling recycled materials and by reduced landfill tipping fees. Although there is additional work required to use alternative methods of demolition, these efforts not only lowered the cost of demolition, it also reduced the project's environmental impact Unneeded materials were sold to be reused, whether in another project or to be incorporated into a manufacturing process. Items that were not sellable were given to a reuse organization as charitable donations.

All debris removed from the job site was evaluated to fit into three basic categories; reduction, reuse, or recycling. Anything that could not fit into one of those categories was sent to the landfill. DIS compiled and utilized a network of local and national reuse and recycling service providers to cycle material back into the supply chain.

The idea of renovating a building that is at the end of its usefulness is a very sustainable concept in terms of reduction. The more of the existing building that is left intact, the more waste is reduced. Because a wrecking ball was not used during demolition, it was possible to leave major building elements such as the roof and structural steel intact. The simple act of reusing the building itself and maintaining these existing elements created an estimated cost savings of $500,000.

Many building components can be reused in other construction. Architectural items such as cabinets, light fixtures, hardware, metal stairs and platforms, windows and doors-including frames, if removed carefully, can be reinstalled. The same is true for furniture and some finishing materials, including wood trim and flooring. It is common practice to reuse expensive equipment such as air handler units, compressors, and chillers. However, reuse strategies also can be applied to smaller HVAC, plumbing, and electrical items such as sinks, toilets, faucets, diffusers, junction boxes, outlets, fittings, and valves. With forethought and knowledge of available resources, a new project can be designed to incorporate used or salvaged building elements in the new construction.

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Because Project Radical was converting a warehouse into a clean space for laboratories, it was not appropriate to reuse the existing interior elements in the renovation area. Materials identified for potential reuse were sold or donated as architectural salvage to be reused in building projects by schools, religious organizations, and other non-profit programs and charities – both public and private. For example, some items were given to Habitat Restore to be sold to the general public at discounted prices. Donations were documented by affidavit and created positive tax implications for the owner. Other architectural salvage not donated was reserved for personal reuse by the client or project staff. By the end of the demolition phase, 110 cabinets, 100 wooden joist, 49 wooden trusses, 6 chairs, and a water heater had been salvaged and put back into the building supply chain for a total of 23,750 pounds (10,772.8 kg) of diverted waste.

Materials that could be returned to the manufacturing process as raw materials or modified for reuse in other applications were recycled. These items could be separated on-site through waste separation programs, or hauled away from the construction site commingled. The sorting process was primarily done by hand by the demolition company which specializes in construction waste diversion and reuse. 1,132,524 pounds (513,704.2 kg) of concrete were removed from the existing building and sold to a local concrete company to be crushed and used as aggregate in new concrete. 36,360 pounds (16,492.6 kg) of valuable metals, found in copper piping, steel, and copper wire, were sold to a metal recycling company. 17,720 pounds (8,037.7 kg) of removed wood products were also sold to a recycling company. Typically, gypsum wallboard would be recycled to be introduced back into the production stream or used as a soil conditioner. However, there are currently no companies in Kansas that process gypsum wallboard. The team determined that the environmental and financial benefits would be negated by the embodied energy and cost required to haul the drywall waste to another state for recycling.

In the end, the team's waste reduction strategies paid off. Of the more than 1.3 million pounds (609,916 kg) of construction waste and demolition debris generated during the building of Project Radical, more than 1.2 million pounds (548,981 kg) – more than 90 percent – were diverted from landfills. The steps taken by CRB, DIS, and Ceva, serve as an example of waste reduction management becoming an effective strategy to lower cost and materials while protecting the environment and its natural resources.

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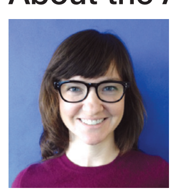

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