Demolition Reuse and Recycling

Harley-Davidson Museum
Milwaukee, Wisconsin

March – May 2006

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March 2007

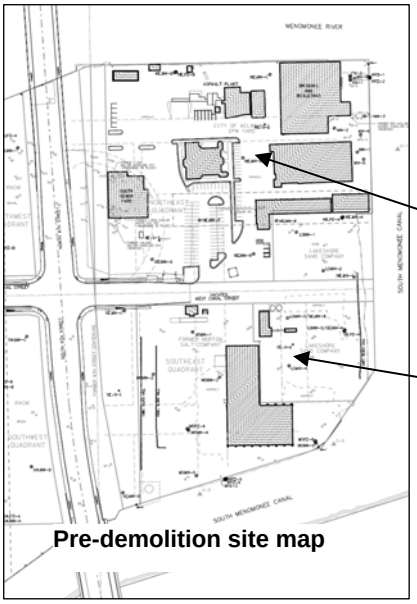
1.0 INTRODUCTION

The Harley-Davidson Museum site is situated on approximately 20 acres of land that was previously comprised of five former industrial and commercial properties adjacent to the intersection of Sixth and Canal Streets in Milwaukee, Wisconsin. The Museum development will feature exhibit space as well as a restaurant, café, retail shop, meeting space, special events facilities, and the Company's archives. Ground breaking for this development occurred on June 1, 2006. The Museum is expected to open to the public in the summer of 2008.

Proposed Harley-Davidson Museum site plan

The majority of site demolition to make way for new construction occurred during March through May 2006. The purpose of this report is to summarize routine and unique salvage, reuse and recycling operations that occurred during site demolition and the planning and stakeholder cooperation required to ensure these salvage and reuse opportunities were optimized. These activities not only reduced the amount of demolition debris that would have otherwise been sent to a landfill, but provided resources at little or no cost to end users in need. Additionally, reuse of miscellaneous components and materials conserved resources and energy, versus manufacture of new materials/components for the same application.

2.0 SUMMARY OF DEMOLITION ACTIVITIES



Pre-demolition site map

Harley-Davidson retained The Sigma Group (Sigma) to plan and coordinate site demolition activities. Sigma assisted H-D with pre-demolition planning, contractor bidding and selection, and demolition oversight activities.

The property and structures north of Canal Street and east of Sixth Street, known as “Tracer Yards,” had been occupied by the City of Milwaukee Department of Public Works (DPW) from the 1950s until February 2006. The property and structures south of Canal and east of Sixth Street were historically occupied by the Morton Salt and Lake Shore Sand companies, but were vacant at the time of property transfer.

Tyler Company, Inc. (Tyler) of Milwaukee was selected to perform the above ground demolition and Edgerton Contractors, Inc. (Edgerton) of Oak Creek was selected to perform the below ground demolition. Due to Edgerton's involvement in Milwaukee's Marquette Interchange highway project, additional recycling and reuse opportunities were realized. Edgerton leased the south portion of the Museum site from H-D to store and crush aggregate material (clean concrete and asphalt) from the Marquette Interchange project. As discussed in Section 3.0, the majority of crushed material remains on site and is being used for road base and backfill during Museum construction.

Traser Yards demolition

To accommodate the schedule associated with concrete and asphalt storage from the Marquette Interchange, and since the south portion of the site was vacant, demolition of the Morton Salt and Lake Shore Sand structures occurred in November 2005, prior to demolition of the DPW portion of the site (north of Canal St.). Demolition of the Traser Yards site occurred during March through May 2006.

An added benefit of Edgerton's involvement included their ability to provide clean fill from the Marquette Interchange project at no charge for subsequent Museum site construction activities. During May through August 2006, Edgerton transported approximately 79,000 cubic yards of clean soil from the North Leg and Core portions of the Marquette Interchange project, located only a few miles from the Museum site. This material was used not only to bring the overall site to above the flood plain elevation, but also as a Wisconsin Department of Natural Resources (WDNR) approved environmental remedial cap to eliminate the direct contact exposure pathway to site contaminants.

Use of this material from the Marquette Interchange required the appropriate timing and coordination of Marquette Interchange and Museum construction activities, as well as assurance from the Wisconsin Department of Natural Resources that the material from the Marquette Interchange was exempt from solid waste regulation and suitable as fill material for the Museum site. Reuse of this soil as Museum site fill not only generated a direct project cost saving associated with the complimentary nature of the material itself, but also energy and cost savings associated with the relatively close location of the donor site to the Museum site, versus other potential recipient sites that may have required additional transportation.

3.0 DEMOLITION WASTE REUSE AND RECYCLING

During pre-demolition planning, Sigma recognized the potential for several unique reuse and recycling opportunities beyond building materials of deconstruction (concrete/aggregate, metals and wood) that are normally realized by demolition contractors. To realize these opportunities required significant planning and coordination including:

- Identification of end users;
- Timing of salvage operations within the scope of the overall demolition;
- Skilled contractors with the appropriate licenses and insurance coverage;
- Available storage space prior to use; and
- Donation of labor and expenses during salvage.

The following paragraphs summarize customary building materials recycling activities during demolition conducted by Tyler and Edgerton, as well as some unique salvage opportunities realized as a result of up front planning and coordination by Sigma.

3.1 Aggregate Recycling

Early on in Museum project planning, it was recognized that there would be a significant need for aggregate material to be used as engineered backfill behind the new perimeter dock wall, road base for the new roads and other miscellaneous site applications. Sigma assisted with identifying Edgerton's need to store and crush material from the Marquette Interchange project with the need for aggregate during Museum construction. Sigma facilitated the lease of the southern portion of the future Museum site to Edgerton for storage and crushing operations that would ultimately provide H-D with the appropriate recycled aggregate material for construction.

Between December 2005 and October 2006, Edgerton crushed approximately 150,735 tons of aggregate from the Marquette Interchange project in addition to concrete, bricks and asphalt generated from on-site demolition activities. The following table summarizes the types of recycled aggregate generated at the Museum site and their ultimate end use.

Table 1: Crushed Aggregate Reuse Quantities

Crushed Material	Quantity (tons)	End Use
1-1/4 inch dense graded	59,726	On-site road base
1-1/4 inch asphalt	18,599	On-site road base
3 inch minus	12,373	On-site dockwall backfill
5 inch minus	60,037	Off-site sub-base for new Marquette Interchange highway

By leasing the south portion of the site to Edgerton, H-D was able to obtain almost all of their on-site construction aggregate needs by reusing crushed aggregate generated from the on-site demolition and the Marquette Interchange project, versus purchase and use of new aggregate material. This helped reduce the demolition waste stream and project costs, and minimize use of natural resources.

3.2 Other Building Materials of Deconstruction

In addition to aggregate materials, Tyler and Edgerton salvaged steel, copper, aluminum and wood/beams during deconstruction of on site buildings for subsequent transport to others in the reuse/recycling markets. Table 2 summarizes the quantities of building materials salvaged.

Table 2: Salvaged Building Materials

Material	Quantity	Salvage Co.	End Use
Wood laminate beams	40 – 40 ft beams	Pal Steel	Trusses/Rafters
Steel	523 tons	Miller Compressing	Scrap metal
Copper	2,720 pounds	Standard Scrap Metal	Scrap metal
Aluminum	5,450 pounds	Standard Scrap Metal	Scrap metal
Wood beams (douglas fir)	33,500 board feet	Duluth Timber Co.	Architectural uses

Salvaged wood and beams

Removed concrete foundations; aggregate storage for crushing in background

3.3 Asphalt Plant Equipment

As part of infrastructure support, the City of Milwaukee DPW operated a small asphalt plant at the site. During pre-demolition planning, Sigma contacted Payne & Dolan, a construction services company specializing on asphalt pavement services, to solicit interest in salvage of the asphalt plant equipment. Payne & Dolan identified Dinsick Equipment Corporation (Dinsick) of Plainfield, Illinois as an interested party. Dinsick is a dealer of new and used asphalt plants and components. Sigma coordinated several site visits with Dinsick, which ultimately resulted in their proposal to purchase the rotary aggregate dryer and thermal fluid heater assembly.

Asphalt plant rotary aggregate dryer and burner assembly

Thermal fluid heater equipment

Removal of this equipment required close coordination with Tyler, the demolition contractor. As part of their contract with H-D, Tyler was responsible for all aspects of above ground demolition, including recycling and reuse. Therefore, to support the recycling opportunity at the asphalt plant, several administrative, scheduling and prepatory challenges had to be addressed.

Dinsick retained Hennes Services, Inc. (Hennes) of West Milwaukee to remove the equipment from site. Prior to equipment removal, Tyler required Hennes provide: 1) an insurance certificate naming Tyler, Sigma and H-D as additional insureds; and 2) a health and safety plan.

Prior to removal of the aggregate dryer, the metal canopy structure above the dryer required removal by torching supports at approximately 15 locations. Upon further inspection, the supports were coated with paint that required assessment for lead content prior to torching activities that had the potential to create lead exposures above the established threshold. Sigma collected samples of the paint for laboratory analysis of lead content and results indicated that the coating was characterized as lead-based. Therefore, the coating required removal in accordance with OSHA Lead in Construction Standards prior to torching the supports in those locations. Sigma coordinated with Balestrieri Environmental (Balestrieri), a contractor with personnel trained to remove lead paint and also a subcontractor to Tyler on the project for asbestos removal.

The thermal fluid heater assembly was used to heat and circulate oil used to keep asphalt tanks at appropriate temperatures. Prior to salvage of this equipment, it was necessary to remove the oil from the equipment and associated lines. Sigma retained OSI Environmental, Inc. (OSI) to remove oil from the heater assembly as well as miscellaneous oil from site elevators and gear boxes. Prior to oil removal, Sigma collected a representative samples for laboratory analysis of

volatile organic compounds and polychlorinated biphenyls. Results were used to determine oil recycling characteristics. During April 26 through May 1, 2006, OSI removed approximately 595 gallons of oil from the site, the majority of which came from the thermal fluid heater system. The recycle value of the oil was used to offset costs associated with reclamation.

Following completion of the above prepatory activities, Hennes coordinated with Tyler on the appropriate time period for equipment removal so as not to disrupt overall site demolition activities. The aggregate dryer and thermal fluid heater assemblies were removed from the site on May 9 and 10, 2006. The salvage value of this equipment was greater than the scrap metal value and was ultimately credited to the project.

3.4 Miscellaneous Building Components

Although the Traser Yards site had been occupied by the City of Milwaukee DPW since the 1950s, several of the buildings were constructed relatively recently. The Traser Yards Headquarters building was constructed in 1990 and therefore, many of the building components and materials were compatible with components and materials that are used today. Sigma recognized a need for these materials at several not-for-profit organizations including St. Paul Lutheran Church and School in Grafton, Wisconsin and Living Word Lutheran High School in Jackson, Wisconsin.

Demolition of Traser Yards Headquarters building

Sigma contacted Steinke Services, Inc. (Steinke) of Saukville, Wisconsin, to conduct salvage operations at the Traser Yards Headquarters building prior to demolition. Steinke was subject to the same insurance, health and safety, and demolition scheduling requirements mandated by Tyler as was Hennes for asphalt plant equipment salvage. Scheduling was critical as this was the first site building planned for demolition with other critical path activities to follow. Table 3 is a summary of components and materials salvaged from the Traser Yards Headquarters building and their realized or intended end use.

Table 3: Miscellaneous Components and Materials Salvaged From Traser Yards Headquarters Building

Component/Material	Approx. Quantity	End Use
2'x2' lay in light fixtures and lamps	200	Eight classrooms in St. Paul school
Drinking fountains	4	Units and parts at St. Paul school
Maple bench tops (locker rm)	12	Ozaukee Co. 4H bookcase project and countertop
Metal bench posts (locker rm)	30	Support posts for new deck seating and future locker room projects at St. Paul or Living Word schools.
Modine hot water heaters	6	To be determined
LED exit lights/signs	10	Replace units at St. Paul church/school as they fail
Emergency shower	1	To be determined
Eye wash stations	2	Future use in school laboratories
Parking signs	5	To be used at St. Paul church/school
Misc. electrical parts		In stock for replacement at St. Paul as required
Misc. hardware	4 buckets	In stock for replacement at St. Paul as required

Re-lamped 2 x 2 light fixtures at St. Paul school

The light fixtures used in the classrooms at St. Paul school not only provided increased illumination, but are also much more energy efficient than those that they replaced. The school replaced 48 – 2 lamp wrap around fixtures using 90 watts per fixture with 26 – 2 x 2 fixtures from the Traser Yards Headquarters building that use 64 watts per fixture. To date, fixtures have been replaced in two school rooms with plans for replacement in six additional rooms. When completed, reuse of the fixtures and lamps from Traser Yards Headquarters will save St. Paul school approximately 20,000 kilowatts per year in energy consumption and associated costs or 61 percent versus use of the old lamps.

Reused drinking fountains replace leaking units St. Paul school

Drinking fountains contain ozone depleting refrigerants and under Wisconsin Administrative Code NR 488, these refrigerants may not be released to the atmosphere during salvage or recovery operations. They must be properly recovered using approved equipment operated by qualified technicians. The entity recovering these refrigerants must be registered with the WDNR and supply documentation to whomever receives the scrapped equipment that the refrigerants were properly removed. Steinke personnel met these requirements during salvage of the drinking fountains.

Maple bench tops form new countertop

Reused metal support posts in new deck seating

An additional factor that made these unique reuse opportunities successful was that Steinke was able to provide off-site storage for these components and materials until their respective end uses became available. Steinke also donated their labor and expenses to remove the components and materials from the Traser Yards Headquarters building and transport them to storage or their appropriate end use locations.

Maple bench tops into new bookcase
Ozaukee Co. 4H project

Electric panel and circuit breakers supply power to additional classroom equipment

3.5 Locust Trees

Relocated locust trees

As part of site demolition, eight mature locust trees were planned for removal. Attempts to coordinate their on-site future use were unsuccessful since the final grade across the site was being increased by 3 to 5 feet and the effort to temporarily relocate the trees and maintain them for the two year Museum construction period was deemed impracticable. Therefore, the trees were destined for likely disposal at a landfill.

Sigma retained Trees On The Move of New Berlin, Wisconsin to relocate the trees from the Museum site to Sigma's office location approximately 0.5 miles west on Canal Street.

Based on historic environmental assessment at each site, the trees were being transplanted from an environmentally impacted site, to a similarly environmentally impacted site in the Menomonee Valley. Therefore, approximately five cubic yards of soil excavated from Sigma's location to accommodate tree plantings was transported to a licensed landfill for disposal.

4.0 SUMMARY AND CONCLUSIONS

In summary, site demolition activities associated with construction of the Harley-Davidson Museum presented a variety of unique salvage, reuse and recycling opportunities in addition to the classic salvage of building materials (steel, aluminum, copper, wood, etc.). These included:

- Aggregate recycling and reuse from on- and off-site locations;
- Salvage of asphalt plant equipment including a rotary aggregate dryer and thermal fluid heater assembly;
- Salvage of miscellaneous building components to be used by non-profit organizations including light fixtures, drinking fountains, hot water heaters, LED exit signs, and other miscellaneous materials and parts; and
- Salvage and off-site transplant of eight mature locust trees.

To realize these unique opportunities required the cooperation and commitment of project team members with the appropriate skills, knowledge and experience, as well as training and administrative (license, insurance) requirements. Up front project planning including identification of end users and scheduling were critical to the recognition and success of these opportunities. With effort, these unique salvage and reuse activities: 1) reduced overall project disposal costs, 2) provided overall project cost savings in reuse of aggregate materials, 3) reduced use of natural resources to manufacture new materials, components, etc., and 4) offset future resource and energy costs for end users.