On-Site Grinding and Beneficial Reuse of Construction Waste At Hans Hagen Construction Site, Carver, Minnesota

December, 2002

Introduction

The Solid Waste Management Coordinating Board (SWMCB) of the Minneapolis/St. Paul Metro Region undertook a cooperative project to examine the potential for reuse and recycling of residential construction waste debris at the Hans Hagen development in the City of Carver, Carver County, Minnesota. This is a companion project to the similar projects completed at Pulte Home developments in Apple Valley and Chanhassen, Minnesota, through the SWMCB at the same time. This report provides information describing the project and evaluating the outcomes of reuse and recycling of construction waste debris at the Hans Hagen development in the City of Carver. This report will also be an appendix to the report, Construction Waste Project, prepared by URS Corporation for the SWMCB. Information on the project background, regulatory process, and on-site grinding process contained in that report on Demonstration Project No. 1 is also applicable to this project. The project participants are the same, but this report on the Hans Hagen Homes construction waste debris project is completed by SWMCB staff.

Project Description

Construction waste debris from home developments is most often disposed of in landfills, and many of these materials could be reused or recycled. SWMCB sought to determine if these waste streams could be retrieved, reused on site, or recycled. Hans Hagen Homes agreed that their development in the City of Carver could be a pilot site for the SWMCB project. Hans Hagen Homes has been a leading residential builder and land developer in the Minneapolis/St. Paul area for over 35 years. In addition to Hans Hagen Homes and SWMCB personnel, this project involved Construction Debris Management who is the dealer for the grinder and provided training, and Construction Waste Solutions (CWS) who provided the on-site project implementation. The City of Carver and Minnesota Pollution Control Agency (MPCA) were consulted for regulatory approval before project implementation

In the project, wood, brick, shingles, and cardboard were removed from the homes during the construction process from August to the end of October, 2002, by the developers and their subcontractors. The items were segregated at the construction site, and recycling or reuse opportunities were considered. Beneficial reuse on-site was the primary method employed. Lumber, oriented strand board, plywood, shingles, and brick were ground up, and land applied on site for erosion control and driveway base. The application of gypsum drywall to the soil was considered at the site based on the soil needs after testing. Cardboard was also collected and recycled. One issue at this site was compliance with erosion and stormwater requirements. Ground wood waste has potential to assist in erosion and stormwater controls.

Project Results and Evaluation

Solid sawn lumber, engineered wood, and pallets were ground up and used on-site for erosion control. Brick and shingles were ground together and used as driveway base. Data on the amounts of each type of waste collected, the time required for grinding and application, percent ground versus percent landfilled, and a description of application or end use was recorded on data

sheets by CWS during the project period. This information provided in the following tables includes the quantities and time for grinding and application of the wastes.

Table 1.0 Hans Hagen, Carver Site, Wood Ground and Applied

Material	Volume (cy)	Weight (tons)	Time (ton/hr)
Solid Sawn Lumber	110	16.5	0.9
Engineered Wood	163	24.5	0.87
Pallets	11.9	1.8	0.33
Total	284.4	42.8	2.1

Table 2.0 Hans Hagen, Carver Site, Brick Ground and Applied

Material	Volume (cy)	Weight (tons)	Time (ton/hr)
Brick	10	2.5	1.4

For the Hans Hagen project, wood waste labor included sawing by chainsaw, grinding, and application of the waste. Chainsaw operation and grinding involved two people while application involved one laborer. The amount of wood reused and beneficially applied was 284.4 cubic yards. This included 11.9 cubic yards of pallet wood. These volumes were calculated using the methods provided in the URS Construction Waste Project report. The amounts of time for preparing and applying sawn lumber, engineered lumber, and pallets are comparable to the Pulte Homes sites in the Construction Waste Project report. Ten cubic yards of brick were ground with 2 yards of shingles for use as driveway base. Cardboard collection was also completed at Hans Hagen Homes during this project, and a total of 288 cubic yards of cardboard was delivered to a local recycling facility.

Hans Hagen Homes find that waste generation is typically 80 cubic yards per home. As a total of 16 homes were completed during the time period of August to October, 2002, 1280 cubic yards of construction waste was generated and 584.4 cubic yards (wood, brick. shingles, and cardboard) or 46 percent of the waste was reused or recycled.

In the Hans Hagen Homes project, the wood wastes were primarily reused for temporary walkways on the jobsite, landscape mulch, and erosion controls along the roads and sidewalks, and around the units as splash protection. The developer reports that the reuse of ground wood and bricks and shingles was considered helpful and beneficial at the site, but the cost was found to be 20 % higher that traditional waste disposal. CWS is exploring ways to decrease the cost for residential construction waste debris management for Hans Hagen Homes, and this includes using BFI to pick up MSW and to recycle cardboard from the site. It is expected that the costs of reuse and recycling for residential construction waste debris from Hans Hagen Homes can be comparable to or less than traditional waste disposal.

The use of recycled mulch in the erosion controls required for this project was considered, but follow through was not possible due to changes in personnel in the City of Carver, according to Aaron Mlynek of the Carver County Soil and Water Conservation District. This is an area that could be further explored with developers and regulators. Erosion controls are very expensive, and the coupling of on-site waste reuse with accepted erosion control practices could save the developer money, increasing the attractiveness of on-site reuse of construction waste.

Waste gypsum drywall generation was not tracked in Hans Hagen Homes project. The application of gypsum drywall to the soil was considered at this site after soil testing was completed. This is discussed in greater detail in the URS Construction Waste Project report. The Hans Hagen Homes site in the City of Carver demonstrated a need for sulfur that could be supplied by waste gypsum drywall. The recommended application rate of 0.5 lb S/1000 square feet or about 22 lb/acre translated into a sulfur requirement in the soil that could be met by an application rate of 150 lb/acre of gypsum drywall, assuming the concentration of sulfur in drywall is approximately 15%. The application rate was then doubled to account for leaching and because this would be a one time application. CWS determined that the cost effective rate of application needed to be 1000 lb/acre, which is greater than the recommended rate, so gypsum drywall was not used for beneficial reuse at the site.

Recommendations

The recommendations reported in the URS report on the Pulte Homes demonstration project are also applicable to the Hans Hagen project. In addition, it is recommended that the use of construction waste debris for erosion controls be further developed to make it more acceptable to regulators. The beneficial reuse of gypsum drywall could also be further explored. On-site testing of soils early in the project development would determine the viability for this alternative.