
# Low Impact Construction Practices Technical Brief

***Green Guide for Health Care*** **Materials & Resources Credit 2.1, 2.2, 2.3 & 2.4**

## Overview

Although construction represents a relatively short phase of a health care facility's total life cycle, construction practices often set in motion long-lasting environmental impacts. All construction waste material sent to landfill or incineration is essentially lost to the global resource inventory. Construction on greenfield sites consumes land area, and construction practices in general may result in contaminants finding their way into soil, air and water. Poor site and material management practices represent unrecoverable project costs and lost value from the supply chain. Wasteful energy and water use patterns steal from the resources available to future generations and increase energy and water demand and costs for all consumers without offering anything of value in return. Further, global climate change is a reality exacerbated by unchecked burning of fossil fuels. Emissions that contaminate soil, air and water can result in adverse health consequences for workers and the surrounding community. Low impact construction management practices help minimize waste and potential undesirable cost overruns and long-term health impacts.

The *Green Guide for Health Care* credits that encourage responsible construction management are organized into two groups – Construction Waste Management credits (GGHC v2.2 Materials & Resources Credits 2.1 & 2.2) and Construction Practices credits (GGHC v2.2 Materials & Resources Credits 2.3 & 2.4).

**Construction Waste Management credits** encourage diversion of non-hazardous construction and demolition debris (50% for 1 point or 75% for 2 points). Projects can calculate their success by either weight or volume, but the calculation must be consistent throughout. The construction waste management program must comply with all applicable state and federal regulations for hazardous waste disposal (though hazardous waste is excluded from the credit calculation).

**Construction Practices credits** address topics that can help reduce the Ecological Footprint of the construction process itself. GGHC v2.2 Materials & Resources Credit 2.3 encourages the development and implementation of a Construction Practices Environmental Management System that addresses temporary facilities; delivery, storage, and handling; particulate control; moisture control; and, the designation of an environmental manager and training program. GGHC Materials & Resources Credit 2.4 encourages contractors to reduce utility, vehicle, and other emissions during construction.

### The Challenges

Impediments to developing and implementing low-impact construction practices may include regional factors, apathy, precedent and incorrect perceptions about cost. For example, a common obstacle to construction waste recycling is the absence of a mature recycling infrastructure. Where recycling infrastructure exists, it can reduce project cost through lower tipping fees, revenue sharing and gratis hauling for segregated waste. However, costs may exceed debris recycling budgets when construction waste recycling is poorly managed by field forces. In regions lacking a recycling infrastructure, construction waste recycling is all but impossible. The most economical recycling approach involves waste reduction (through practices such as purchasing only what is required, carefully sizing materials to avoid off-cuts, and avoiding packaging through coordination with the suppliers) and the cooperation of




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field labor in transporting waste to appropriate collection points on the site. Yet, there may be trade resistance to implementation. Planning the waste collection activity to coincide with the type of waste material generated at the site requires forethought.

Achieving the goals for other construction processes involves a thoughtful approach to procurement of material, equipment and subcontract services. If the project documents do not identify specific objectives, a Construction Manager will need to analyze alternative approaches to achieving the credits by determining which measures are the most cost effective and/or add value to the work, so that appropriate requirements and responsibilities can be included in subcontracts.

## Best Practices

### **Waste Reduction and Recycling** (GGHC v2.2 Materials & Resources Credits 2.1 & 2.2)

- Take a comprehensive view of construction waste produced by all trades on the project beginning with site clearing and excavation. Determine the waste products of each activity and the potential to avoid waste.
- Balancing the site's earthwork cut and fill to avoid haul-off or imported soil will achieve both reduced costs and minimal environmental damage.
- Use onsite material for backfill and paving base.
- Adopt purchasing procedures that promote minimal and/or returnable packaging.
- Survey local waste haulers to determine their level of experience in construction waste recycling.
- Contract for the required documentation to achieve the credit. If local haulers operate a transfer station, it may be just as economical to haul un-segregated waste. Include waste reduction and recycling obligations in contracts.
- Avoid waste by proper activity sequences, just-in-time delivery, pre-install inspections, and loss prevention practices.

### **Site & Materials Management** (GGHC v2.2 Materials & Resources Credits 2.3)

- Plan to minimize impacts for on- and off-site traffic.
- Consider the flow of material and workers through and around existing occupied space. Consider the possible impact to natural features and amenities of the site and implement protective measures.
- Develop a designated area for equipment washing, fueling and oiling activities and prevent spills from contaminating soil and water.
- Confine laydown and shakeout areas for project deliveries to minimum practicable areas.

### Infection Control

Project Owners are responsible for developing and implementing an effective infection control policy on their premises.

- Use an integrated team to conduct a construction practices workshop during the development of the design.
- Follow Joint Commission and Centers for Disease Control recommendations for Infection Control Risk Assessment.
- Evaluate potential risk exposures and develop management plans that are consistent with the Owner's infection control policy.
- Include appropriate requirements in project documents.




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*Common practices to reduce infection control concerns during construction include:*

**Dust control**

- Dampen dust-producing material on a regular basis to prevent airborne dust and particulate matter.
- Clean up promptly – a best practice is to vacuum drywall dust after sanding joints smooth.
- Proper ventilation and filtration.

**Fumes**

- Use low-emitting alternative materials and fuels.
- Use electric equipment.
- Proper ventilation and carbon filters – a best practice is to monitor and initiate correction of high fume levels.

**Noise**

- Establish a noise control plan.
- Ensure proper scheduling for noisy construction activities.
- Consider alternative construction methods that produce less noise.
- Relocate sensitive functions.
- Post and comply with decibel limits for noise-producing equipment.
- Provide ear protection for all site workers and visitors.
- Comply with equipment idling rules.

**Spills**

- Consider potential inside and outside spills.
- Prepare a wet clean-up kit.
- Establish abatement procedures.

**Waste**

- Negotiate reduced or returnable packaging.
- Establish segregated waste collection and loss prevention.

**Damage**

- Properly sequence construction activities.
- Negotiate just-in-time delivery.
- Require pre-install inspections.

**Energy**

- Install energy controls – a best practice is to segregate construction security and working lighting on different circuits. Feed work lighting from a single disconnect so that all work lights can be extinguished when no one is working. Use permanent electric equipment and a raceway system to feed temporary lighting circuits.
- Enclose portions of the project that are mechanically heated or cooled.
- Use low-emitting alternative fuel fleet vehicles.
- Provide energy efficient staff accommodations.

**Moisture**

- Implement a moisture control protocol – a best practice is to remove and dispose of any gypsum wall board that has been wet.
- Prepare a wet clean-up kit.




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- Protect materials in storage from moisture.
- Protect floor openings.

### **Utility and Emissions Control** (GGHC v2.2 Materials & Resources Credits 2.4)

The greatest opportunities for conserving resources and protecting human health and the environment during construction revolve around temporary heat and power, transportation and equipment.

- Using electric, propane, natural gas and/or biofuel powered construction equipment can reduce or eliminate emissions from unregulated off-road diesel powered machinery.
- Assigning a fleet of alternative fueled vehicles to contractors for their use in connection with the project can assist with achieving the necessary fraction of miles required to achieve the credit.
- Limit the number of vehicles that contractors are authorized to bring to the site, thereby controlling congestion and encouraging the consolidation of trips. Request that the General Contractor furnish one truck for scheduled "milk runs" to pick up and deliver shop drawings, mail, and supply house orders for all subcontractors.
- Provide temporary enclosure for conditioned areas to control the heat exchange and fuel consumed during temporary conditions.
- Use natural ventilation to the maximum practical extent for operations after the building is enclosed.
- Operate temporary conditioning on a controlled schedule and only when needed for ventilation or construction process.

## Benefits

### Health

Research has correlated significantly higher rates for serious disease in populations living near landfill sites.[1] [2] Disruption of the physical environment within and near hospitals due to construction and demolition has been linked to infection outbreaks. Byproducts of construction activity include: noise, vibration, dust and fumes from materials and equipment operation that may affect patient recovery and worker health. Health care workers, patients, visitors and the community-at-large benefit from the industry's implementation of low impact construction practices.

### Ecologic

Attention to the waste stream from construction and related activity keeps harmful materials out of the environment and conserves natural resources. Construction and demolition waste may contain contamination from common health care practices. PCBs (polychlorinated biphenyls), mercury, lead, and infectious material residues that are dormant within existing structures may be released to the environment during demolition, landfilling or incineration. Proper disposal practice and sensitive site management practices avoid environmental damage.

### Economic

The construction waste stream has value and can be managed as effectively as any other project activity. National waste haulers are pursuing this business aggressively and may offer reduced hauling charges or revenue sharing contracts for segregated waste. Carefully consider the risk reduction potential of low impact construction practices. Where there are significant risks with high probability of loss, review them

[1] Martine Vrijheid, "Health Effects of Residence Near Hazardous Waste Landfill Sites: A Review of Epidemiologic Literature," *Environmental Health Perspectives Supplements*, Volume 108, Number S1, March 2000.
[2] Stephen R. Palmer, Frank D. J. Dunstan, et. al., "Risk of Congenital Anomalies after the Opening of Landfill Sites," *Environmental Health Perspectives,* Volume 113, Number 10, October 2005.




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with the insurance underwriter and develop economic models that offer reduced premiums for implementing enhanced risk management.

## Case Studies

### GGHC v2.2 Materials & Resources Credits 2.1 & 2.2

On a recent project, Turner Construction Company developed a waste recycling program that diverted 96% of all construction waste from landfills (1,130 tons) and saved over $35,000 when compared with traditional hauling and tipping fees. In addition to qualifying for the two Construction Waste Management credits under the USGBC's LEED® for New Construction rating system, the project was awarded an innovation point for exceeding the 75% benchmark for LEED NC v2.2 Materials & Resources Credit 2.2 (minimum 95% diversion required for the Innovation point).

Turner arranged for the waste hauler to set multiple bins on the site. Subcontractors' field labor was responsible for depositing discarded steel, plastics, wood, metal studs and drywall scrap in the proper receptacle. The bins were removed when full and were delivered directly to the proper recycler for a flat hauling fee. Cash received for the recycled material was rebated to the project. Processed gypsum waste was reused on-site as a soil amendment to make clay soil more tillable. The waste hauler reported quantities of waste hauled and recycled monthly.

From the Owner's perspective, the key was convincing all of the subcontractors to adopt the program with enthusiasm. Some contractors were reluctant to participate when they understood the requirements for sorting and recycling. However, careful study demonstrated that the program could reduce costs and Turner provided the necessary training to the subcontractor community. Subcontractors were selected in part for their ability to function effectively with commitment to the program.

Every worker received a half hour orientation on sustainable construction practices. A rigorous air quality program was undertaken which included sealing air ducts throughout construction to keep particulate matter from contaminating the ductwork. No smoking was permitted on the site.

### GGHC v2.2 Materials & Resources Credits 2.3 & 2.4

On a congested urban site, Turner rented temporary office space in a nearby, underutilized building and stacked shipping containers up-fitted with interiors for subcontractor's field offices and temporary storage. Restrictions on street obstruction led to a coordinated delivery schedule that assured material supply just-in-time to meet installation needs. To control dust during finish installations, an industrial vacuum system was installed outside the building with temporary piping to points of use that were relocated as the activity moved through the building. Less labor was involved for this system than would have been required to track and maintain multiple portable HEPA filtered vacuum cleaners and their extension cords. Furthermore, dust was removed from the building rather than re-circulated by the exhaust of the individual units. A temporary roof installed at intermediate floors permitted finish installations to proceed on the lower floors without fear of water intrusion before the enclosure was complete on the upper floors. Wet cleanup stations were provided for every 10,000 square feet of floor area to facilitate prompt damage control from unintended spills. The Loss Prevention Manager and the Project Engineer responsible for GGHC/LEED® compliance shared responsibility for overseeing the environmental goals and the orientation of new workers reporting to the project.

To make temporary power and lighting energy conserving and cost effective, permanent electrical equipment was installed and energized as quickly as possible. A single switch for temporary lighting circuits allowed lighting for the entire site, except for security lighting to be extinguished by the superintendent after the last site tour of the day. Use of High Intensity Discharge (HID) sources provided more light with less power until interior construction began to compartmentalize a floor. Thereafter, portable work lights, string lights and finally permanent lighting provided the illumination necessary to complete interior construction and finishes. Energy Star rated equipment provided heating and air




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conditioning of temporary facilities, and permanent systems were placed in service early with proper precautions to maintain conditions for good quality finishes and system cleanliness.

All heavy construction equipment on the project was electrically powered or used liquid propane, compressed natural gas or bio-diesel fuel. Engines were stopped when the machinery was not working. The project was subject to noise monitoring requirements to avoid impacts to nearby residential property during morning, evening and night hours. The construction schedule was adjusted and extended so that noisy operations could be completed during appropriate periods. Blasting operations involved the use of special explosives.

## Resources

*In addition to the resources noted in the Green Guide for Health Care, the following may offer additional guidance:*

Texas Commission on Environmental Quality, http://www.tnrcc.state.tx.us/exec/sbea/rtol/index.html

U.S. EPA WasteWise Publication Directory, http://www.epa.gov/epaoswer/non-hw/reduce/wstewise/pubs.htm

Waste Management, http://www.wastemanagement.com/WM/services/overview.asp

*Tech brief authored by Jim Moler, PE, of Turner Healthcare. Reviewed by Tom McLaughlin, Turner Healthcare.*

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# Appendix A

## Example Construction Waste Management Tracking Document

### Waste Materials to be Reused/Recycled

| Waste Materials | Weight/Volume | Reuse/Recycle? | Send to which facility? | Notes |
|---|---|---|---|---|
| Land Clearing | | | | |
| Asphalt | | | | |
| Concrete | | | | |
| Metal | | | | |
| Wood | | Recycle | | |
| Debris | | | | |
| Glass | | | | |
| Clay brick | | | | |
| Paper/Cardboard | | | | |
| Plastic | | | | |
| Gypsum | | | | |
| Paint | | | | |
| Carpet | | | | |
| Organic (yard) matls | | | | |
| Other | | | | |




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