

Policy Options White Paper
Promoting Greater Recycling of Gypsum Wallboard from Construction and Demolition (C&D)
Projects in the Northeast

Prepared by the Northeast Waste Management Officials' Association (NEWMOA)¹
C&D Materials Workgroup²
Under Cooperative Agreement # X1 97190201 with the
U.S. Environmental Protection Agency (EPA)
September 2010

There are significant untapped opportunities for increasing recycling³ of construction and demolition (C&D) materials in the Northeast.⁴ To address this potential, eight state environmental agencies in the region have spent the past year collaborating through NEWMOA⁵ to examine options to promote greater recovery of an important C&D material – gypsum wallboard waste – for use outside of landfills and to develop this White Paper. The purpose of this Paper is to present viable policy options for these state agencies to consider for promoting greater gypsum recovery. It covers:

- Background information on the gypsum wallboard waste problem in the region
- A summary of the results of the research conducted by NEWMOA's C&D Materials Workgroup
- A description of possible policy directions that state agencies may want to pursue, some of the potential challenges, and possible next steps

Background

According to the NEWMOA Report, [*Construction and Demolition Waste Management in the Northeast in 2006*](#), a small portion of the waste materials from C&D projects, approximately 10 percent of estimated generation, is reused or recycled outside of the landfill environment.⁶ The analysis in the Report found that there has been an increase in the processing of C&D wastes in the Northeast in recent years. However, at many of the processing facilities the only material removed consistently at a significant percentage for use outside of landfills is metal.⁷ At some C&D materials processing facilities, processing consists only of grinding to reduce the volume of the waste. The C&D residuals that are produced are used as either grading or shaping material at closing landfills, or as alternative daily cover (ADC) at operating landfills – uses that are not sustainable over the long-term as landfills continue to close and new ones become more difficult to site and permit.

Drywall, otherwise known as wallboard, is a significant component of C&D materials as shown in Figure 1.

¹ See www.newmoa.org.

² The views expressed in this Paper do not necessarily reflect those of each of the NEWMOA-member states or the U.S. Environmental Protection Agency (US EPA). Mention of any company, process, or product name should not be considered an endorsement by NEWMOA, NEWMOA-member states, or the U.S. EPA

³ Throughout this Paper, the term “recycling” means recovery for reuse *outside the landfill* – the use of C&D materials for alternative daily cover (ADC) and/or shaping and grading material at landfills is not considered recycling in this Paper.

⁴ Based on the expertise and experience of members of the NEWMOA C&D Materials Workgroup, U.S. EPA information, and discussions with C&D waste processors and gypsum recyclers.

⁵ Funded under Cooperative Agreement #X197190201 with the U.S. EPA

⁶ NEWMOA, *Construction and Demolition Waste Management in the Northeast in 2006*, June 30, 2009, www.newmoa.org/solidwaste/CDReport2006DataFinalJune302009.pdf.

⁷ Ibid.

Figure 1
Components of C&D Waste⁸

Materials	Percentage by Weight
Plastics	2
Metals	5
Asphalt, brick, & concrete (ABC)	9
Drywall:	
Construction (new wallboard scrap)	6
Demolition/Renovation (old removed debris)	4
Roofing	11
Wood:	
Unadulterated (construction scraps & pallets)	11.5
Adulterated (painted, engineered, other)	20.9
Treated (pressure-treated)	1.6
Other	29

NEWMOA estimated 1.2 million tons of waste wallboard was generated in the Northeast in 2006, of which approximately 720,000 tons was new wallboard scrap from construction projects, and 480,000 tons was old wallboard removed from demolition and renovation projects.⁹ The main component of wallboard is gypsum. As waste wallboard is handled, it breaks and crumbles and becomes difficult to recover. As a result, the fines and other residuals generated from C&D materials processing typically contain significant quantities of gypsum. When these fines are used as ADC, the only outlet for the residual material other than more costly disposal, the gypsum can react and generate hydrogen sulfide gas.¹⁰ This gas has a noxious odor and can create a public health problem. All of the NEWMOA states have experienced public health and/or nuisance problems with hydrogen sulfide gas at landfills that use C&D residuals. An increase in the recovery of gypsum wallboard wastes, and C&D debris in general, for recycling and reuse outside of the landfill environment is needed to address these problems and create a more sustainable management system in the region.

The Environmental Commissioners of the New England states identified management of C&D debris as a priority for interstate cooperation at a May 2007 meeting. A follow-up letter circulated among the Commissioners stated that “management of C&D is a regional issue because of the movement of raw and processed C&D materials among the states” and that “differing state laws, rules, and policies play an important role in the ultimate fate of C&D in the region.”¹¹ They also recognized that “cooperation among states may help solve common problematic issues, such as C&D fines, gypsum wallboard, and products made from recycled C&D materials.”¹²

⁸ DSM Environmental, *2007 Massachusetts Construction & Demolition Debris Industry Study*, May 16, 2008 (www.mass.gov/dep/recycle/reduce/07cdstdy.pdf).

⁹ NEWMOA, *Construction and Demolition Waste Management in the Northeast in 2006*, June 30, 2009, www.newmoa.org/solidwaste/CDReport2006DataFinalJune302009.pdf.

¹⁰ Gypsum fines have a high surface area that is available to react under anaerobic conditions with the organic material and moisture available in landfills, and generates significant quantities of hydrogen sulfide gas.

¹¹ Letter from Thomas S. Burack, Commissioner, New Hampshire Department of Environmental Services to the Environmental Commissioners of CT, ME, MA, RI, and VT, dated September 20, 2007.

¹² Ibid.

The NEWMOA-member state solid waste program directors identified gypsum wallboard as a high priority material for promoting recycling at a May 2008 regional meeting on C&D waste management. They decided that a multi-state effort to facilitate the expansion of recycling markets for gypsum wallboard could provide two significant benefits:

- Reducing the public health problem of hydrogen sulfide gas emissions at landfills
- Increasing the sustainability of C&D materials management

In the fall of 2008, the EPA Resource Conservation Challenge (RCC) Program awarded a cooperative agreement to NEWMOA to develop a common understanding of the barriers and opportunities for increasing waste gypsum wallboard recycling in the region and identify policy options for states to implement. At that time, the solid waste management program director in each state assigned one or more senior staff to participate in NEWMOA's C&D Materials Workgroup to oversee the project. This Workgroup decided that the first step should be contacting companies that either use, or could potentially use, recycled wallboard to understand their needs and constraints. The following section presents the results of this research.

Recycling Gypsum Wallboard Waste in the Northeast

Overall, the benefits of recovering wallboard for recycling are numerous and include:

- Overall conservation of natural resources and landfill space
- Greenhouse gas emission reductions and other beneficial environmental impacts¹³
- Money saved by and green credits given to building owners and contractors
- Money saved by C&D materials processing facilities that remove gypsum wallboard for recycling through the avoided tipping fees that they must pay to landfill the materials and the market outlet for the fines and residuals they generate.¹⁴

During the spring and summer of 2009, NEWMOA's Workgroup arranged conference calls and site visits with several companies in the region that can use gypsum recycled from wallboard.¹⁵ The following sections provide an overview of the lessons learned from these interactions and supplemental research.

Gypsum recovered from wallboard currently has three major potential uses:¹⁶

- replacing a portion of virgin gypsum in making new wallboard
- adding to soil as a conditioning amendment
- replacing a portion of virgin gypsum in cement manufacturing

¹³ Life Cycle Assessment of Plasterboard, Waste & Resources Action Programme (WRAP), April 2008, www.wrap.org.uk/downloads/Life_Cycle_Assessment_of_Plasterboard.11266955.5313.pdf.

¹⁴ Recently many landfills stopped accepting C&D fines and residuals for ADC due to concerns about the potential for hydrogen sulfide gas generation. The fee charged by a landfill for use of C&D fines and residuals as ADC is less than the fee for disposal. If gypsum wallboard is removed for recycling prior to processing, gypsum content in the fines and residuals is minimal, and landfills can accept C&D fines for ADC.

¹⁵ The Workgroup visited or held conference calls with the following companies: USA Gypsum in Reinhart, PA; National Gypsum in Portsmouth, NH; GP Gypsum in Newington, NH; Dragon Cement in Rockland, ME; Lafarge Cement in Ravena, NY; and Gypsum Recycling America in Cambridge, MA.

¹⁶ Based on the expertise and experience of members of the NEWMOA C&D Materials Workgroup, information from the U.S. EPA, discussions with C&D waste processors and gypsum recyclers, and available literature.

The first two of these applications are suitable for new wallboard scraps – wallboard that has not been painted or otherwise adulterated. The third application is the only one that is suitable for old wallboard from renovation and demolition projects.¹⁷ As a result, large scale uses of wallboard removed from renovation and demolition projects presents challenges. Generation of old wallboard waste in the eight NEWMOA-member states exceeds the current capacity of cement manufacturers in the region to utilize this material.¹⁸

Virgin gypsum is a relatively inexpensive material. This combined with the logistics of segregation, collection, transport, and processing, present barriers to recycling a large percentage of gypsum wallboard waste in the region.¹⁹ A key factor that helps the economics of gypsum recovery is for builders to segregate the materials as early as possible – preferably prior to leaving the construction site. Once unused wallboard is mixed with other C&D materials, processors have difficulty separating the materials, and it breaks up and generates fines as it is handled. To promote on-site separation, some C&D materials processors have instituted differential pricing – charging less for loads that arrive pre-sorted. The C&D materials generator can segregate the new wallboard scrap and have it transported directly to a wallboard waste processor where the tip fee is lower than at a mixed C&D materials processor. Based on recent experience in Vermont, if a 30 cubic yard trailer can be filled with new wallboard scrap, it becomes cost effective to transport it for recycling rather than disposal. Generally, a 20,000 square foot project generates 30 cubic yards of new construction wallboard scrap.²⁰

New Wallboard Manufacturing

In the NEWMOA member-states, there are wallboard manufacturing facilities in New Hampshire, New Jersey, and New York. While some of the facilities have been idle or closed due to the recent economic downturn and corresponding decrease in construction activity, those facilities still manufacturing wallboard as of June 2010 are: Lafarge located in Buchanan, New York; National Gypsum in Burlington, New Jersey and Portsmouth, New Hampshire; and GP Gypsum in Camden, New Jersey and Newington, New Hampshire. Workgroup members visited the two facilities located in southern New Hampshire in June 2009. They were both operating at less than half their full capacity due to the state of the construction industry. Both manufacturers use natural rock imported from Nova Scotia as their gypsum source, and both incorporate recycled wallboard into their current process. At one facility, contractors and others drop off new wallboard scrap during specified hours. At the other one, recycled gypsum is obtained in powder form from an outside C&D wallboard processor, Gypsum Recycling America (GRA).

¹⁷ Old wallboard might be coated with lead-based paint or contain asbestos from joint compound - materials that could have been used on wallboard prior to the mid-1970s. Wallboard manufacturers in Canada and Europe do use gypsum recycled from renovation and demolition projects, but in the United States, manufacturers will not consider it due to their prior negative experience with numerous class action lawsuits on asbestos and subsequent concerns about potential liability.

¹⁸ NEWMOA estimated that waste wallboard from demolition and renovation projects in the Northeast was over 480,000 tons in 2006. Lafarge in Ravena, NY, one of two cement manufacturers in the Northeast, and one of the largest facilities in the country, has a capacity to utilize less than a tenth of that amount.

¹⁹ Based on conversations with the companies with which NEWMOA's Workgroup met.

²⁰ According to the National Association of Home Builders Research Center Report, "Residential Construction Waste Management Demonstration and Evaluation," May 2, 1995, (www.toolbase.org/PDF/CaseStudies/resi_constr_waste_manage_demo_eval.pdf) there is 1 pound of scrap wallboard generated per square foot of new construction floor space; and according to Gypsum Recycling America, 1 ton of scrap wallboard equals 3 cubic yards.

Both manufacturers reported during the sites visits that they could double the recycled content of the wallboard they produce if they made infrastructure investments. However, in order to make the needed capital investments, they would need assurances of a reliable supply of recycled gypsum. If both New Hampshire manufacturers were operating at full production, and both made the investments to increase recycled content, combined they would represent a potential market for approximately 180,000 tons per year of recycled gypsum powder from new construction scrap wallboard.

Land Application

Gypsum is calcium sulfate and has been used as a natural soil conditioning additive for more than a century. It provides calcium, which helps bind clay particles to allow better air and water infiltration, or it can be used to reclaim sodic (salty) soils, replacing the sodium with calcium. Generally, soils in the Northeast do not have high clay mineral content and do drain well, and therefore, do not need gypsum as a soil conditioning additive. However, there are several potential land application uses of gypsum in the region:

- To help reclaim roadside soils damaged from winter salt use
- To help support post-construction landscaping
- To apply on farms and other agricultural operations where beneficial

There are no businesses that recycle gypsum for these applications in the NEWMOA-member states. However, there are two facilities in Pennsylvania that process new construction waste wallboard for agricultural use. The larger facility, USA Gypsum noted that New Jersey and significant portions of Connecticut and New York are within a transport distance that is feasible for servicing. Between them, the two Pennsylvania facilities currently process approximately 35,000 tons per year of new construction scrap wallboard. The NEWMOA-member states could explore expanding each of the three potential land uses of waste gypsum.

Cement Manufacturing

Gypsum is a key additive to the cement finishing process and makes up over five percent of the finished product. In the NEWMOA member-states, there are four cement manufacturers - three in New York: Lafarge in Ravena, Holcim in Catskill, and LeHigh Northeast in Glens Falls; and one in Maine: Dragon Cement in Rockland. NEWMOA's Workgroup members visited the Lafarge plant and held a conference call with Dragon in May 2009. Both Lafarge and Dragon are operating at less than half capacity due to the downturn in construction activity. Both manufacturers currently use natural gypsum that is imported from Nova Scotia and estimate that approximately 20 percent could be replaced with recycled gypsum. Combined, those two facilities, if operating at normal capacity, represent a potential market for 30,000 tons or more of recycled gypsum powder per year. Neither of these manufacturers currently incorporates recycled gypsum, but both reported to the Workgroup that they had a high interest in purchasing processed recycled gypsum powder. Neither manufacturer is interested in processing waste wallboard. Both facilities would need to make capital investments to modify their equipment and are not inclined to make those improvements without a reliable supply of recycled gypsum powder.

Processing Waste Wallboard

Producing gypsum powder from wallboard waste requires special equipment that removes the paper and grinds the gypsum to a uniform size that wallboard and cement manufacturers and farmers and landscapers can use. The paper produced from recycling waste wallboard is typically used for energy recovery, animal bedding, or as a compost additive. Two facilities in the NEWMOA member-states

process waste wallboard to produce gypsum powder: Taylor Recycling in New York and GRA in Massachusetts.

NEWMOA's Workgroup found that recycling waste wallboard for the production of new wallboard and for cement has the greatest potential to use significant quantities of this waste. However, the existing and potential users of the recycled gypsum reported that they need to know that there is an adequate and reliable supply before making capital investments in the required equipment to expand their operations.

Overall, a main objective of this project was for states to identify viable government policy options that, if implemented, could create an adequate and reliable supply of waste gypsum for recycling. Following its investigation of potential markets, the Workgroup focused on developing these policy options and recommendations for next steps. The results of this effort are presented below.

Strategies to Increase Recycling of Waste Gypsum Wallboard in the Northeast

The NEWMOA C&D Materials Workgroup developed an initial list of potential policy and regulatory options that state agencies could implement to overcome the various barriers to increasing gypsum wallboard recycling. The group held a series of discussions to evaluate the options and decided to focus on those that are the most practical and feasible and could result in significant improvements in gypsum waste recycling in the foreseeable future:

- Ban the disposal of gypsum wallboard waste in landfills
- Require recycling of wallboard wastes produced by state-financed projects
- Require waste management planning
- Develop common terminology and reporting requirements
- Develop and implement extended producer responsibility approaches

These five policy options are recommended by the NEWMOA C&D Materials Workgroup for implementation or further study. Each one is described below, including a general overview, a summary of some challenges associated with it, and ideas for next steps. The Workgroup members believe all of the options have the potential to significantly advance greater recycling of gypsum wallboard waste, and there is no implied preference for any of the options based on the order in which they are presented. The proposed policies are not dependent on each other, so an individual state could implement one or more.

Each state agency would need to consider the regulatory constraints associated with implementing any of the policies in their jurisdiction and whether regulatory or legislative action could be required. They would also need to consider the staffing and other resources needed. Multi-state coordination and information sharing would enhance implementation of all of the options. Effective facilitation of any follow-up efforts would help ensure that the participating state interests are addressed and a useful set of support tools are developed.

The state agencies that are considering the various options would benefit from establishing a mechanism to engage the various stakeholders in the industry and communities to understand their insights and experience. Such stakeholder involvement could be coordinated either at the individual state level or regionally. Bringing appropriate stakeholders together can have market development benefits. For example, The Massachusetts Department of Environmental Protection (MassDEP) held quarterly stakeholder meetings over several years to discuss its proposed ban on disposal of new construction gypsum wallboard wastes. The Agency reached out to a C&D gypsum wallboard processor to ensure this key stakeholder perspective was represented. Over time, the various business stakeholders made

connections, which helped to develop the infrastructure for recycling new construction wallboard scrap in the state.

The state agencies would need to determine whether each of these policies options would apply to all waste wallboard or new wallboard scrap only as they consider implementing them.²¹ If a policy option applies only to new wallboard scrap, then the states would need to address the management of gypsum from renovation and demolition projects that end up in the residuals and fines at C&D materials processing facilities and contribute to hydrogen sulfide gas generation. An option for addressing this challenge that could enhance the policies outlined below would be to require generators to remove large pieces of the old wallboard waste prior to processing and disposal at landfills.²²

Ban the Disposal of Gypsum Wallboard Waste

A ban on disposal of wallboard would require generators and /or processors of C&D materials to segregate this material and find an outlet for it other than disposal. Under such a policy, a large supply of waste wallboard would be created, and business could develop to take advantage of the opportunity to process the material. A state gypsum wallboard disposal ban could require state legislation and/or regulatory rule-making. MassDEP published a proposed disposal ban on clean gypsum wallboard in May 2010²³ and held public hearings in June. The disposal ban is expected to be effective in approximately March 2011.

The experience of MassDEP has shown that there are some key questions that policy makers need to address when developing a disposal ban, including:

- How should stakeholders be engaged in the development of the ban?
- Would the ban address where materials separation occurs?
- Should the policy incorporate an exemption for generators of small quantities (for example, Massachusetts exempts less than five cubic yards) and a provision for a temporary exemption if market conditions severely limit options for processing or use of the material?
- Should the policy incorporate an exemption for specialty wallboard? Specialty wallboard contains additives that give it a specific property for a special application, such as mold resistance for bathrooms.
- How would the agency implement the ban and conduct compliance and enforcement activities?

Challenges

The main challenges that must be overcome in order to effectively implement a disposal ban include:

- providing adequate collection and processing infrastructure
- having available markets for the materials produced
- shipping the materials across state lines for disposal

As noted above, adequate collection and processing capacity is lacking in significant portions of the Northeast. This is particularly true in areas where large quantities of waste wallboard are inconsistently generated and/or generators are a long distance from recycling facilities. In these areas of the region,

²¹ Would not apply to the option focused on developing common terminology and facility reporting requirements.

²² Gypsum fines have a high surface area that is available to react and generate hydrogen sulfide gas. Larger chunks of gypsum have significantly less surface area available to react.

²³ The proposed regulation, background document, and public hearing notification are available at:

www.mass.gov/dep/service/regulations/newregs.htm#gypsum.

processors and recyclers would need to invest in the collection and aggregation infrastructure, particularly to capture waste wallboard from projects expected to generate less than 30 cubic yards. Recyclers may also need state assistance with addressing facility siting and permitting requirements and/or obtaining grants, or loans.

Markets for recycled gypsum are developing in the region. The information gathered from potential recycled gypsum users revealed that a ban that applies to new wallboard scrap in multiple states could generate more recycled gypsum than existing wallboard manufacturers, cement manufacturers, and agricultural users have the capacity to utilize in the region. State agencies and stakeholders would have to address the possible shortfalls in capacity. The wallboard processor, Gypsum Recycling America has indicated that it would be feasible to send recycled gypsum to wallboard and cement manufacturers located outside the NEWMOA-member states.

If a disposal ban is adopted in an individual state, there is potential for wallboard waste to be shipped across state lines for disposal. To address this, MassDEP has proposed that “No person shall dispose, transfer for disposal, or contract for disposal of the restricted material...” as part of its disposal ban.²⁴ An alternative approach would be for all of the states that import C&D materials from the Northeast to implement disposal bans.

Moving Forward

To address the challenges described above, state agencies could implement programs to help lower recycling infrastructure costs by promoting the development of more end use markets closer to where the material is produced. According to USA Gypsum, there is the potential to increase landscaping applications in the Northeast, particularly along roadsides and on seaside golf courses. State agencies would have to explore these and other possible uses to address infrastructure costs and challenges.

Many state agencies may be hesitant to consider developing a disposal ban without the existence of the necessary recycling infrastructure and end use markets, but the infrastructure and markets might not develop without the ban. This presents a “Catch-22” situation. State agencies interested in implementing disposal bans could convene stakeholder meetings to identify options, discuss barriers, and develop strategies. MassDEP began exploring its wallboard disposal ban in 2004, and they have worked since then with stakeholders on developing markets and infrastructure and to initiate a formal rulemaking. The Agency supported the stakeholder discussions to facilitate agreement on implementation of the ban. A key lesson from their experience is to plan for adequate time to discuss the issues with stakeholders and to present a consistent message that the state is seriously considering a disposal ban.

Require Recycling of Wallboard Wastes Produced by State-financed Projects

State governments could require recycling of waste wallboard generated during construction of government owned or leased properties. This lead-by-example approach could require that wallboard waste generated during construction projects is recycled. The resulting increased supply could help stimulate and sustain processing capacity and end-use markets.

There are two examples of state contracting programs in the Northeast that require C&D materials recycling in state construction projects and include new construction wallboard scrap. The

²⁴ The proposed regulation is available at: www.mass.gov/dep/service/regulations/newregs.htm#gypsum.

Massachusetts Department of Capital Asset Management (DCAM) has recently revised their specifications for construction waste management and disposal to include a requirement to divert all clean gypsum wallboard waste from disposal to recycling and/or reuse outlets. A copy of the revised specification is available in Appendix A.²⁵ The Maine Department of Environmental Protection (DEP) is working on a memorandum of agreement with Maine's Bureau of General Services that would result in recycling of waste wallboard from construction projects at state buildings.²⁶ Other states could adopt similar policies and programs.

The experience in Maine and Massachusetts has shown that there are key questions that policy makers' need to address in order to develop and implement this requirement:

- Should the recycling requirement be limited to wallboard only, or should projects be required to also recycle other specific C&D materials, such as wood, metal, ABC, and asphalt shingles?
- Is the specification only for projects at buildings the state owns or leases, or should it be extended into requirements for all projects that receive state funding?
- Would the requirement apply to all projects or only those above a certain size? What size would be appropriate? For example, Massachusetts DCAM exempts projects smaller than 20,000 square feet.
- How would the state monitor and enforce the requirement? Would the contractors need to submit a plan in advance of their projects and/or a report after the construction is completed? Which agency would receive and review the information?

Challenges

Key challenges in implementing this strategy include:

- the perception by builders and contractors that source separation would increase costs and that cost-effective wallboard processing and recycling facilities are not available
- the state building management agency would need to participate and coordinate with the environmental agency on development and coordination

State agencies could educate the construction industry to address their concerns about cost and markets. State building projects can provide useful information on the costs of source separation and recycling for state environmental agencies to use in such education efforts.

Moving Forward

To implement this policy, the state agencies that manage state buildings need to be engaged in discussions and planning. This process could be assisted by a strong executive branch commitment to overall "greening" of state agencies and leading-by-example. Once the capital asset management agency is engaged with the environmental agency on developing a policy, the agencies could work through the questions outlined above and develop a specification to add to contracts as has been done in Massachusetts and is underway in Maine.

Agencies would also need to identify reuse and recycling outlets for the materials and conduct outreach to contractors so they can identify them and include the associated costs in their project bids. If a state agency is hesitant to move forward with a specification change, implementing a pilot project or two

²⁵ The specification is not currently available on the internet.

²⁶ For more information, contact Randy McMullin at ME DEP: Randy.L.McMullin@maine.gov.

might be an appropriate first step. The state agencies could document the results and use these projects to highlight cost savings, other benefits, and lessons learned.

Require Waste Management Planning

State and local authorities can require building projects to develop waste management plans. The purpose of these plans is to focus attention on the types and quantities of wastes expected to be produced and how they would be managed *prior* to starting the construction project. This information can raise generator awareness and stimulate interest in options to reduce costs and/or increase recycling.

The requirements for the content of waste management plans vary, ranging from requiring an estimate of the quantity of waste that may be generated and the location for disposal;²⁷ to requiring the builder to recycle a minimum percentage of the wastes.²⁸ Some states and local governments have begun to require building contractors to submit a waste management plan in order to get a building permit.²⁹ Some local governments include provisions for a monetary fine if the plan is not developed and/or followed. Local authorities in San Jose, California have gone a step further and instituted a deposit-return system. Contractors are required to submit a waste management plan and pay a deposit before receiving a building permit. After the project, the contractor must submit evidence that the waste management plan was followed and then the deposit is returned.

Two NEWMOA-member states have laws that require large development projects to obtain a comprehensive permit from the state. In Vermont, projects over 10,000 square feet must undergo a state permit process known as Act 250. In Maine, projects that will affect greater than three acres must be approved by the State. In both Maine and Vermont, part of the process includes development of a waste management plan.³⁰ Vermont developed a template for a waste management plan submitted under Act 250, which is included in Appendix B.³¹ The waste management agencies in Maine and Vermont review the waste management plans. Neither state requires that wastes are recycled; however, most projects strive to minimize disposal. When a contractor decides to separate C&D materials on site and manage them for recycling, the opportunities to utilize the recovered materials for higher uses are increased and the costs of recycling reduced.

Based on the experience in Maine and Vermont, a state or local government would need to address the following questions to design an effective planning requirement:

- Would planning requirements apply to all project sizes or above certain minimum sizes?
- What would be required in terms of documentation from contractors?
- Should there be minimum recycling goals? If yes, would there be one for the overall project, or different goals for each material type?
- How would the program be implemented? Which government entity would review plans and enforce the requirements?

²⁷ For example, in Maine, www.maine.gov/sos/cec/rules/06/096/096c373.doc, Section 3: Adequate Provision for Solid Waste Disposal.

²⁸ For example, numerous locations in California: www.calrecycle.ca.gov/ConDemo/SampleDocs.

²⁹ For example, Lee County, Florida; Orange County, North Carolina; Chicago and Northbrook, Illinois; and Oakland, San Francisco, Santa Monica, Santa Rosa, and Ventura County, California.

³⁰ In Maine: www.maine.gov/sos/cec/rules/06/096/096c373.doc, Section 3: Adequate Provision for Solid Waste Disposal. In Vermont: www.nrb.state.vt.us/lup/publications/applong.doc, Schedule B, Criteria 1B (p).

³¹ The example document is not currently available on the internet.

If the specifications for waste management plans include a requirement for overall waste recycling, generators can typically meet such a specification by focusing their efforts on converting asphalt, brick, and concrete (ABC) into aggregate and not recycling other materials, such as gypsum wallboard. To address this, the planning requirements may need to target gypsum wallboard and other priority materials to promote their recycling.

The initial development of this policy option could start with construction and renovation projects at government-owned or leased properties, thus creating a lead-by-example approach. Maine, Massachusetts, and Vermont have implemented waste planning requirements for C&D wastes generated from state projects. State building projects are a good forum for state environmental agencies to obtain quantitative information that can provide examples of the benefits of and potential challenges with source separation and recycling.

Challenges

Key challenges associated with implementing this strategy in the Northeast include:

- local governments issue most building permits
- for state projects, the state building management agency would need to participate and coordinate with the environmental agency on development and implementation

To tie waste management planning with permitting, local governments would have to adopt and implement the requirements. C&D materials management planning requirements at the state-level in Maine and Vermont are part of an overall state permit approval process for large-scale development. Adoption of a similar statewide permitting process in other states might require legislation.

Moving Forward

To implement this policy option, there are several efforts states can undertake, including:

- developing a model C&D materials management plan for contractors to use
- identifying reuse and recycling outlets
- conducting outreach to raise awareness among contractors
- conducting education activities with local governments, focusing on sharing the experience of other localities that have implemented C&D materials management planning and/or recycling requirements
- assisting local governments with reviewing waste management plan submittals and/or developing and implementing compliance assurance and enforcement

If the policy focuses first on construction and renovation projects at government-owned or leased properties, the agencies that manage state buildings need to be engaged in discussions and planning.

Develop Common Terminology & Reporting Requirements

The state environmental agencies require C&D materials processing and disposal facilities to record and report on a wide variety of information; however, these requirements are not consistent across the states in the Northeast.³² In addition, state definitions of and methods for calculating C&D recycling, diversion, and disposal vary. Addressing differences in state reporting requirements is important

³² NEWMOA, *Construction and Demolition Waste Management in the Northeast in 2006*, June 30, 2009, www.newmoa.org/solidwaste/CDReport2006DataFinalJune302009.pdf.

because C&D materials routinely travel across state lines for processing and/or disposal.³³ Generators and waste haulers and processors in one state compete with the similar businesses in neighboring states, yet are subject to different regulations and reporting requirements.

C&D materials processing facilities in the NEWMOA-states vary considerably in their operations and end products. Some have invested large sums to enclose their operations and use a combination of equipment and labor to recover a significant percentage of the incoming mixed C&D materials for use outside the landfill. However, other facilities dump the materials on bare ground outdoors, grind them up to reduce the volume, and ship them for disposal or use as ADC at landfills. Generally, the only significant recovery and recycling occurring at these facilities is removal of some metal.

Increased public pressure and awareness of the importance of recycling in general, combined with the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program, has led building construction, renovation, and demolition contractors on many projects to require C&D materials recycling. However, because some state agencies have not adequately defined the methods for calculating recycling, some C&D processors claim that any material that is not disposed is recycled. Generator's lack of understanding of ADC can disadvantage state-of-the-art processors that recover materials for recycling. Low cost outdoor processing facilities that do not recover much material for uses outside of a landfill have a competitive cost advantage.

ADC provides a needed market outlet for C&D materials processors and state agencies might not want to consider this use as disposal. However, in order to promote resource conservation, use as ADC should not be considered recycling. Currently, most state agencies in the region do not use the term recycling, or calculate a recycling rate specific to C&D materials. Instead they focus on diversion from disposal, which in most states includes use as ADC. As a result, the terms recycling and diversion from disposal are often used interchangeably, which creates confusion. Implementing a clearer definition of what constitutes recycling and the acceptable method for calculating recycling rates would prevent this misconception. In addition, using two categories for diversion – one for use outside of the landfill and one for landfill uses – would show which facilities primarily produce materials for recycling and which ones are generating ADC.

Identifying the source of C&D materials is not included in most state reporting requirements. In some states, materials from building projects and road and bridge projects are handled at the same facilities, and there is no way to separate data by the type of project that generated the C&D materials. The quantity of C&D materials generated by road and bridge projects is much higher than C&D materials from building projects and tends to be mostly asphalt and concrete that is virtually all recycled as aggregate. As a result, recycling data related to building projects is dwarfed when ABC from road and bridge projects is included in the estimates for C&D materials recovery. To obtain a true picture of C&D materials recycling for buildings, data for C&D materials generated from road and bridge projects needs to be separate.

Common recordkeeping and reporting requirements for facilities across the Northeast states should require sufficient detail to enable a more complete understanding of the management of specific components of C&D materials. For example, recordkeeping and reporting requirements for C&D materials processors could include gypsum wallboard as a material to be tracked – new scrap and old

³³ Ibid.

wallboard separately – the quantity received, the quantity removed for disposal, and the quantity removed for recycling, including the business and locations for each.

If the suggested data improvements outlined above were implemented and all facilities in the region followed the same waste and recycling definitions and had the same recordkeeping and reporting requirements, the quantity and quality of available data from facilities in most states would significantly improve. This could facilitate more informed policymaking and more accurate monitoring of progress in C&D materials recycling. The increased transparency would benefit C&D materials processors that have invested in the needed equipment and staff to recover materials for use outside of landfills.

Challenges

There are challenges associated with implementing C&D reporting changes, including:

- Obtaining support within each state environmental agency, particularly as resources for solid waste programs are constrained³⁴
- Achieving agreement among states on terminology, calculation methods, and facility reporting requirements³⁵

A regional multi-state effort would benefit from funding of a facilitator or coordinator to help states work together to develop, agree upon, and implement this strategy. This facilitator could help ensure that participating state interests were addressed.

Moving Forward

There are some key steps that states could take to implement this strategy. State agencies could designate staff to participate in a regional workgroup that develops a model set of reporting requirements. These agencies could also engage stakeholders to provide input on terminology and facility reporting changes that they recommend. Once the model was developed, each state would need to assess its ability to implement it considering their regulatory and resource constraints. A final step would be developing a data system to manage and analyze the information. Such a system could be developed at the state or regional level, depending on the level of cooperation among the states on implementation.

Extended Producer Responsibility

An extended producer responsibility (EPR) strategy would involve all wallboard stakeholders, including manufacturers, builders, government agencies, waste processors, and recyclers, in assuming some responsibility for the management of the waste. An EPR approach could provide manufacturers and users of new wallboard with a financial incentive to minimize waste generation. There are a variety of models for implementing EPR:

- manufacturers set up their own infrastructure to take-back and recycle the wastes themselves
- manufacturers provide financial support for a third party to develop and manage a separate system
- manufacturers to work with existing haulers and recyclers to help finance their efforts to recycle the materials

³⁴ In some states, the type and quantity of data that they receive from facilities would be significantly altered under this policy option; necessitating changes in how information is stored and managed within the agency.

³⁵ For example, ADC is currently considered recycling in Maine and disposal in Connecticut.

In each of these models, at least a portion of the financial burden for end-of-life management would be placed on manufacturers and purchasers of the product; and therefore costs lowered for waste generators, C&D materials collection and processing facilities, and wallboard recycling facilities. EPR for wallboard waste would shift at least a portion of the costs of collection and recycling from generators, which would help recycling to compete more favorably with disposal. Support from manufacturers would ensure that wallboard recycling is accessible for all C&D projects, including those in areas that are a long distance from processing and recovery facilities.

The experience of states that have implemented EPR for other materials and projects has shown that there are some key questions that policy makers need to address, including:

- How would stakeholders be engaged in the development of the EPR approach?
- What would be the roles of the various stakeholders in implementation of EPR for wallboard?
- What would be the financing mechanisms that would support EPR?
- Should there be recycling goals?
- How would the state enforce the EPR approach and conduct compliance assurance activities?

Challenges

Every NEWMOA-member state has enacted EPR legislation for electronics, and/or one or more products that contain mercury, such as thermostats, automobile switches, fluorescent lamps, and/or batteries.³⁶ Implementing EPR for gypsum wallboard waste may require similar action. In March 2010, the legislature in Maine adopted EPR framework legislation, which gives authority to DEP to designate a waste material for development of an EPR approach without further legislative action. Such a framework could be used to designate C&D materials, such as wallboard as a priority for EPR action in the state. Other northeast states are examining this framework approach.

Moving Forward

There are several steps state agencies could undertake to move toward EPR for wallboard waste. State environmental programs could convene EPR stakeholder discussions to share ideas, questions, and concerns. If multiple states decided to implement EPR for wallboard wastes, multi-state coordination to develop similar requirements could be beneficial. Such an effort could result in model EPR legislation or regulations for wallboard waste, similar to the effort undertaken by NEWMOA to address mercury-added products³⁷ and those by the Product Stewardship Initiative (PSI) to address waste carpet, paints, and other products.³⁸

Summary

There are significant opportunities to increase the recycling of gypsum wallboard wastes in the Northeast. Existing manufacturers of new wallboard and cement can use recycled gypsum. In addition, state programs should evaluate use in landscaping applications in the Northeast as a potential new market. In order for the recycling infrastructure to expand, potential users need to know that there is an adequate and reliable supply of waste wallboard. The NEWMOA C&D Materials Workgroup has identified at least five options that have potential to be successful in increasing supply in the region. The feasibility of implementing each of the five options outlined in this Paper varies among the states.

³⁶ Product Stewardship Institute website: www.productstewardship.us, September 9, 2010.

³⁷ See <http://www.newmoa.org/prevention/mercury/modelleg.cfm> for example of model legislation.

³⁸ See the PSI website for examples of their approaches and agreements: www.productstewardship.us.

Massachusetts is banning the disposal of new construction wallboard wastes. The lengthy stakeholder discussions that preceded the regulatory changes have led to private sector investment in recycling infrastructure. Other states can follow this model.

All states can lead-by-example by requiring projects at state properties to develop C&D waste management plans, meet numerical recycling goals, and/or recycle new construction gypsum wallboard. State construction projects can serve as case studies to highlight cost savings, other benefits, or challenges that need to be addressed. States agencies can help local governments develop and implement requirements to develop C&D waste management plans as part of the construction permitting process.

States could stimulate greater recovery and recycling of C&D materials, including gypsum wallboard by developing common terminology and facility reporting requirements across the region and making the information available to the public.

Extended producer responsibility for gypsum wallboard is a potentially effective new approach that state agencies could explore further.

Acknowledgements

NEWMOA thanks the US EPA Resource Conservation Challenge (RCC) for support of this project. NEWMOA appreciates the contributions of the following members of the NEWMOA C&D Materials Workgroup:

Connecticut Department of Environmental Protection: Carey Hurlburt and Sherill Baldwin
Maine Department of Environmental Protection: Randy McMullin
Massachusetts Department of Environmental Protection: Jim McQuade
New Hampshire Department of Environmental Services: Mike Guilfooy, Don Maurer and Mike Wimsatt
New Jersey Department of Environmental Protection: Steve Rinaldi and Bob Confer
New York Department of Environmental Conservation: Rick Clarkson, Tom Lynch and Scott Menrath
New York Empire State Development: Linda Jacobs
Rhode Island Department of Environmental Management: Walid Ali
Vermont Department of Environmental Conservation: James Surwillo
US EPA Region 1: Christine Beling
US EPA Region 2: Dale Carpenter and Robert Jean

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Appendix A

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for recycling and disposing of construction waste.

1.3 RELATED SECTIONS

- A. Section 013543 - ENVIRONMENTAL PROTECTION PROCEDURES:
 - 1. Environmental-protection measures during construction.
- B. Section 017418 - DEMOLITION WASTE MANAGEMENT AND DISPOSAL
 - 1. Additional requirements for addressing existing materials in renovation and/or remodeling projects; not applicable to new construction.
- C. Section 018113 - SUSTAINABLE DESIGN REQUIREMENTS:
 - 1. Additional LEED requirements
- D. Section 311000 - SITE CLEARING:
 - 1. Site clearing, grubbing, and chipping activities

1.4 DEFINITIONS

- A. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, and/or installation of new materials as part of remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations prior to renovations or remodeling.
- D. Disposal: Removal off-site of construction and/or demolition waste for landfilling or incinerating at a permitted solid waste facility.

- E. Recycle: Recovery of construction or demolition waste for reuse or as an ingredient or as a feedstock in an industrial or manufacturing process to make a marketable product or commodity.
- F. Salvage: Recovery of construction or demolition waste and subsequent sale or reuse in another facility.
- G. Salvage and Reuse: Recovery of construction or demolition waste and subsequent incorporation into the Work.

1.5 PERFORMANCE REQUIREMENTS

- A. General: Develop a Waste Management Plan that states as its objective to attain at project completion a recycling rate of 75 percent or more by weight of the total waste generated by the Work.
- B. Recycle Requirements:
 - 1. **Clean Gypsum Wallboard Waste** (virgin material without any existing attached material, ie, paint, mastic, etc.) For all new construction and or renovation projects involving 20,000 square feet or greater, all clean (virgin material) gypsum wallboard waste **must** be diverted from disposal to recycling and/or reuse outlets.
 - a. For new construction and/or renovation projects involving less than 20,000 square feet, contractors are encouraged to divert clean gypsum wallboard waste from disposal to recycling and/or reuse outlets in accordance with Part (1.5) (2)a below.
 - b. Clean gypsum waste recycling outlets are included in Part (3)(2)b1 below.
 - 2. Maximize recycling of non-hazardous construction waste including the following materials:
 - a. Site-clearing waste.
 - b. Masonry and CMU.
 - c. Lumber, wood sheet materials, and wood trim.
 - d. Metals.
 - e. Roofing.
 - f. Insulation.
 - g. Glass.
 - h. Plastics.
 - i. Gypsum wallboard.
 - j. Acoustical ceiling panels.
 - k. Carpet and pad.
 - l. Piping.
 - m. Wire and cable.
 - n. Electrical conduit.
 - o. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.

1.6 SUBMITTALS

- A. Waste Management Plan (WMP): Submit 3 copies of Plan within 30 days of date established for the Notice to Proceed, in a format acceptable to the DCAM Project Manager.
- B. Waste Management Progress Reports: Concurrent with each Application for Payment, submit three copies of report. The following information shall be included:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste recycled, both estimated and actual in tons.
 - 5. Total quantity, of waste recovered (recycled) as a percentage of total waste.
- C. Waste Management Calculations: Before submitting a request for Substantial Completion, submit three copies of calculated final rates for recycling and disposal as a percentage of total waste generated by the Work.
- D. Facility Permitting Information: For landfill and/or incinerator facilities, provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.
- E. Record Keeping for Recycling and Landfill and/or Incinerator Disposal: Documentation to be submitted by the Construction Manager shall include the following:
 - 1. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
 - 2. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
- F. Facility Permitting Information: For ABC rubble crushing and/or recycling facilities, provide a statement from the facility that references its specific exemption from the solid waste regulations (per 310 CMR 16.05 (3) (e)) or provide a copy of the facility's current solid waste management facility permit in accordance with 310 CMR 19.000.
- G. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- H. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- I. LEED Submittals: The Designer shall prepare a Letter in accordance with LEED guidelines, which shall be signed by the Construction Manager. The Construction Manager shall provide all information required which includes a tabulation of total waste material, quantities diverted, and means by which it is diverted.

1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

1.8 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, and waste reduction, handling, transportation, and recycling/disposal procedures. Include separate sections in plan for recycling and disposal of construction waste. Indicate quantities by weight throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Program: List each type of waste and whether it will be recycled or disposed in a landfill or incinerator. Include points of waste generation, total quantity by weight of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 3. Donated Materials: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
 - 4. Sold Materials: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Include names, addresses, and telephone numbers.
- D. Handling and Transportation Procedures: Include methods that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location(s) on Project site where separated materials will be stockpiled.
- E. Waste Management Coordinator: Identify Construction Manager employee who will be the Waste Management Coordinator for the project. The Waste Management Coordinator will be responsible for implementing, monitoring, and reporting status of waste management activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement Waste Management Plan as approved by the Designer. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

- B. The Construction Manager shall conduct a Waste Management Meeting at the Site. The Construction Manager shall review methods and procedures related to waste management including, but not limited to, the following:
1. Distribute approved WMP to everyone concerned within three days of approved submittal return.
 2. Clearly identify the Waste Management Coordinator and explain the Coordinator's responsibilities.
 3. Review WMP with each trade when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.
 4. Review and finalize procedures for material separation and verify availability of containers and bins needed to maintain production.
 5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 6. Provide recycling educational literature for all workers, Subcontractors and suppliers engaged in on-site activities.
 7. Provide appropriate recycling signage for containers and workspaces.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walkways, and other adjacent occupied facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled, reused, donated, sold, and disposed.
 2. Comply with project requirements for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: Available recycling receivers and processors include, but are not limited to, those listed on Massachusetts Department of Environmental Protection's website:

<http://www.mass.gov/dep/recycle/reduce/managing.htm>

1. Clean gypsum wallboard recycling outlets include, but are not limited to:

Gypsum Recycling America
135 Fawcett Street
Cambridge, MA 02138
Tel: 617-596-4297

GP-Gypsum Corporation
170 Shattuck Way
Newington, N.H. 03801
Tel: 603-501-3618

- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical. For waste, which cannot be separated at Project site, co-mingle only with waste, which is to be separated later at a recycling facility. The Construction Manager will address contamination of recycling containers with trash or other contaminants and who will be solely responsible for payment of all fines and penalties.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable

- materials at each container and bin. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste off User Agency's property and transport to recycling receiver or processor.
- D. On-site crushing of asphalt pavement, brick, and concrete (ABC) rubble as described in 310 CMR 16.05, is not allowed. All ABC waste must be transported off-site to an asphalt batching plant or to an ABC crushing or recycling operation facility that is either conditionally exempt from 310 CMR 16.00 or has been sited and permitted in accordance with 310 CMR 16.00 and 310 CMR 19.000, respectively.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: To the extent feasible, require shippers using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Concrete: Deposit all debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for fill or sub-base.

D. Masonry: Deposit all masonry debris in designated containers to be transported to approved aggregate recycling facility to be crushed and screened for use as satisfactory soil for general fill or satisfactory soil for fill or sub-base. Clean and stack undamaged whole masonry units on wood pallets.

E. Wood Materials:

1. Clean Cut-Offs of Lumber: Deposit into designated clean wood container to be transported to designated recycling facility for use as mulch or bio-fuel.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

F. Metals: Separate metals by material type if practical. Stack salvageable structural steel members according to size, type of member, and length.

G. Asphalt Shingle Roofing: Deposit asphalt shingles in designated containers for off-site reuse. Nails, staples acceptable, flashing trim and accessories shall be recycled as metals.

- H. Glass: Deposit glass debris into designated containers to be transported to approved glass-recycling facility.
- I. Plastics: Deposit plastic containers and debris into designated containers to be transported to approved plastic recycling facility.
- J. Clean Gypsum Wallboard: Deposit scraps of clean gypsum wallboard into designated container protected from weather and transport to an appropriate gypsum wallboard recycling outlet or permitted construction and demolition debris processing facility that will divert clean gypsum wallboard to an appropriate gypsum wallboard recycling outlet.
- K. Acoustic Ceiling Panels: Deposit pulp able mineral fiber panels into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new acoustic ceiling panels. Separate suspension system, trim, and other metals from panels and sort with other metals.
- L. Carpet: Deposit carpet into designated container protected from weather and prepare for transport, as directed by manufacturer, to appropriate recycling facility to be processed into new products.

3.4 DISPOSAL OF WASTE

- A. Except for items or materials to be recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. For solid waste disposal facilities located in the Commonwealth of Massachusetts, dispose of materials only in facilities which currently comply with applicable state regulations, including requirements of 310 CMR 16.00 {Site Assignment for Solid Waste Facilities} and 310 CMR 19.000 {Solid Waste Management}, and local bylaws.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

STANDARD SPECIFICATIONS

DCAM Standard Specifications are intended for use only on projects of the Division of Capital Asset Management in the Commonwealth of Massachusetts. The specifications are intended to assist the Designer with incorporating DCAM and MGL Chapter 149 filed sub-bid requirements in documents used for bidding and construction. Each section will require editing by a registered architect or engineer before issue.

NOTES TO THE DESIGNER

This section is applicable to all new construction including installation of new materials in renovation and remodeling projects. If the project is for only new construction, delete the references to renovations and remodeling. If the project is a renovation project, then Specification Section 017418 should be added.

RESOURCES

Managing Construction and Demolition Waste including recycling and reuse options, sample waste management plans, and reports, data and case studies:

<http://www.mass.gov/dep/recycle/reduce/managing.htm>

For a full explanation of the construction waste ban, refer to the following links:

310 CMR 19.017: Massachusetts Waste Disposal Ban Regulation

<http://www.mass.gov/dep/recycle/laws/bansreg.htm>

Recycling Construction & Demolition Waste Guide for Architects and Contractors (Sponsored by the BSA, Associated General Contractors of MA, and MA DEP - April 2005): Note: this is a lengthy (57 page) document.

<http://www.mass.gov/dep/recycle/reduce/cdrguide.pdf>

Brief explanation of waste bans from WasteCap Massachusetts:

<http://www.wastecap.org/wastecap/resources/faq/wastebans.htm>

END

Appendix B

**Vermont Agency of Natural Resources, Waste Management Division
Construction Site Waste Reduction Plan**

Company Name: _____

Contact Person: _____

Address: _____

Telephone #: _____

Project Location:

Project Description:

(Demolition/renovation/new construction, square footage, commercial/residential/industrial, timeframe, etc.)

Job-site Planning Worksheet
Attach any extra sheets as needed

Waste Prevention Planning - What steps have been taken to prevent waste from being generated during the project? This could include using designs that favor standard sizes or specifying building techniques that incorporate fewer materials. On job sites, it could include a central location for all wood cutting to facilitate use of the cut-off pieces. It could also include asking suppliers to take back excess materials, removing salvageable materials before construction/renovation/demolition or including specifications requiring subcontractors to prevent waste.

Education Plan - Describe how the Waste Management Program will be communicated to construction crews and subcontractors and how contractors will insure that subcontractors abide by the Plan.

Contract specifications - Include any subcontractor waste reduction specifications you incorporated into your contract such as requirements for reusing or recycling certain materials. The web site at: <http://www.tjcog.dst.nc.us/cdwaste.htm> has sample language for all stages of construction/demolition/renovation. Describe how these contract specifications have been enforced.

It is important for large projects to specify its waste management goals in subcontractor agreements. This assures that the expectations and procedures are communicated clearly to everyone. The following is a sample specification in a subcontractor agreement:

"The subcontractor will make a good faith effort to reduce the amount of waste generated on the job-site and recycle material as per the contractor's Waste Reduction Plan. The subcontractor will follow the designated handling procedures for each type of waste generated on-site and provide documentation to verify material reuse, recycling, and disposal as indicated in the waste Reduction Plan."

Reprinted from the King County Washington, Construction Recycling Program

Reuse & Recycling Worksheet – page 2 of 3

Material	Estimated Quantity	End Markets - For a listing of Vermont salvage and recycling markets check out the web site at: www.anr.state.vt.us/dec/wastediv/recycling/c&d.htm or call 802-241-3477 or 241-3481. When researching recycling options - ask the recyclers what they are doing with the wastes.	Handling/Site Management - how materials are to be removed, separated, stored and hauled for reuse or recycling.
<i>Sample listing: Cardboard</i>	<i>one 3 cy dumpster</i>	<i>Recycled thru ABC Hauling.</i>	<i>A covered cardboard dumpster will be placed next to the trash dumpster. Will call hauler when full.</i>
Salvageable Items or used building materials such as windows, doors, moldings, fixtures, bathroom fixtures, etc. (Please list items separately)			
Asphalt roofing shingles			
Asphalt			
Brick			
Cardboard			

Reuse & Recycling Worksheet page 3 of 3

Material	Estimated Quantity	End Markets - For a listing of Vermont salvage and recycling markets check out the web site at: www.anr.state.vt.us/dec/wastediv/recycling/c&d.htm or call 802-241-3477 or 241-3481. When researching recycling options - ask the recyclers what they are doing with the wastes.	Handling/Site Management - how materials are to be removed, separated, stored and hauled for reuse or recycling.
"Clean" Wood			
Concrete			
Metal			
Plaster/Drywall			
"Treated/Painted" Wood			
Other			