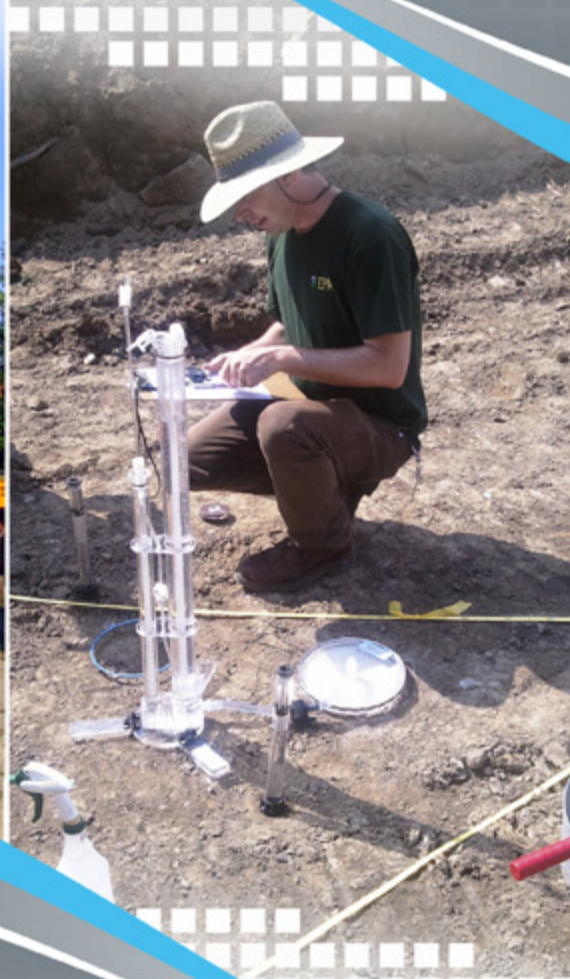


On the Road to Reuse:

Residential Demolition Bid Specification Development Tool



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1. Introduction

A. Background on Residential Demolitions

The United States Environmental Protection Agency (U.S. EPA) Region 5 has recognized the challenge that vacant residential properties pose to communities throughout U.S. EPA Region 5 office, which includes the states of Indiana, Illinois, Michigan, Minnesota, Ohio, and Wisconsin.

Residential demolitions are taking place at a record pace as cities attempt to reduce the existing backlog of vacant buildings, and improve neighborhood conditions affected by population loss and the foreclosure crisis.



Region 5 has developed this report and the bid specification development tools based on the experience and knowledge of Region 5 staff and representatives of communities in Region 5. In recent years, the number of vacant, dilapidated, and abandoned residences has increased dramatically. As cities have responded to stabilize the decline in cities, demolitions of residences have become a common practice to remove the hazard that vacant properties pose to surrounding communities.

B. Current State of Residential Demolitions

Current residential demolition programs vary greatly across the region. Cities, counties, sewer districts, land banks, and other entities may all have demolition programs operating jointly or separately within their respective jurisdictions. A high degree of variability exists in the demolition practices on sites, which contributes to uncertainty in future reuse of vacant parcels. There may also be communities currently without land banks or other entities that operate demolition programs. New entities will emerge to meet the demand for residential demolition and neighborhood stabilization.



Current demolition practices may leave an unfortunate legacy of land contamination when house debris is used as fill material as part of the current demolition process. There are significant environmental, liability, and redevelopment issues with this demolition practice.



As a response to the current state of demolition practices, this document provides organizations conducting demolitions with bid specification development tools that could be used during the local procurement process. These tools (Appendix) will allow cities, counties, land banks and other organizations to develop higher quality contract language that can be inserted into their own existing bid specification documents. The overall goal is a demolition process that is better for the environment.

C. Overview of U.S. EPA Bid Specification Development Tool Project and Project Goals

Region 5 developed this user report, which includes a menu of bid specification development tools, for use by cities, counties, land banks, and other entities engaged in residential demolition operations to yield an improved environment result. The bid specification development tools found in the appendices of this document have been designed to serve more than one purpose. They can serve as a tool to help the reader anticipate the environmental issues and concerns that may arise in connection with a demolition project so that those issues and concerns can be factored into the planning process. They can help the reader develop and organize information concerning a demolition project. They can also be used to modify existing bid specification language used by a community or to assist in creating language for new bid specifications. This specification language could then be utilized to develop procurement language, contract language, and associated documents, as appropriate, for use in a specific bid package that would instruct contractors on the contract and on the general and the technical requirements for the demolition project.

Some of the provisions included in the bid specification tools are based on regulatory requirements. Regulatory requirements exist irrespective of whether they are included in a bid specification, and the potential specifications included in the bid specification tools do not include an exhaustive list of applicable regulatory requirements. Such an exhaustive list cannot be provided because regulatory requirements may vary depending on the particular facts of the demolition project being planned and performed. The municipality or other entity planning and bidding the demolition project, and the contractors involved in the process, are responsible for determining and consulting the relevant regulatory requirements; including those cited in the reference section of the individual bid specification development tools found in the appendices of this report.

Also included in the bid specification development tools are some potential provisions that are not required by regulation, but rather, are suggestions for municipalities and other entities to consider when developing bid specifications and contracts for residential demolitions. These recommended provisions are written as they might appear in a municipality's bid specification documents and thus are framed in mandatory language. This mandatory language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. This bid specification development tool is not creating any new regulatory requirements or changing any existing regulatory requirements. The provisions that are not based on regulatory requirements represent best practices and are tools available to the municipality to consider while developing bid specifications and contracts.

By providing cities, counties, land banks, and other entities with these bid specification development tools, it is anticipated that demolition site conditions at the conclusion of the demolition process will be better than they would have been without the implementation of these tools. Looking ahead, cities, counties, land banks, and other entities that have increased certainty of the site conditions may be able to more effectively reuse or market sites that will consistently meet the needs of end users.

The goal of the residential demolition bid specification development tools (see Appendix) is to assist cities, counties, land banks and other organizations to improve residential demolitions. Benefits that communities may achieve include:

- Improved stormwater infiltration.
- Reduced stormwater runoff.
- Greater adherence to environmental regulations.
- Improved worker safety.
- Maximized diversion of waste from landfills by increasing salvage and recycling.
- Proper handling of hazardous waste streams.
- Improved end-use aesthetics.
- Stabilized and revitalized neighborhoods.

The areas with the potential to provide increased environmental benefits were identified through environmental interviews with stakeholders located throughout Region 5 (see Section 5). Results of the interviews helped clarify the most achievable areas of improved environmental performance through the demolition process. Given the wide range of entities, employed methods, levels of experience, funding, demand, and geographic spacing, these specifications are intentionally broad and generic in nature, so as to be useful to as many entities as possible, while still accomplishing the goal of improving the environmental performance of demolition practices.



Included in the Appendix are bid specification development tools for demolition projects, which reflect goals of preventing adverse environmental and health impacts. The desired environmental outcomes include improving stormwater infiltration, reducing the potential for adverse environmental impacts, ensuring compliance with asbestos requirements, and leaving the sites in a condition suitable for redevelopment, including green infrastructure and community agriculture uses. This report is designed to provide an explanation of the goals, intents, and process of development of the bid specification development tools in the Appendix. Also included in the demolition bid specification development tools is a list of existing regulations and best management practices that relate to building demolition procedures.

Green infrastructure is an approach that communities can choose to maintain healthy waters, provide multiple environmental benefits and support sustainable communities. Unlike single-purpose gray stormwater infrastructure, which uses pipes to dispose of rainwater, green infrastructure uses vegetation and soil to manage rainwater where it falls. By weaving natural processes into the built environment, green infrastructure provides not only stormwater management, but also flood mitigation, air quality management, and much more.

D. Evaluating Value - Short and Long Term Implications

Direct project costs (materials, labor, equipment, etc.) are commonly the primary factor considered when designing a residential demolition project. Managing a project's direct cost and developing a direct cost baseline or budget for a project and/or a demolition operation is critical to successful project management. However success can often be impacted by other factors beyond the cost of the immediate investment to demolish a residential structure. Successful demolition projects and/or demolition operations require the ability to consider other key factors in order to ensure that a project provides value to the community by positively impacting a wide range of economic, social, and environmental benefits. Within Section 3 of this report, (Highlighted Demolition Modifications to Improve Environmental Results), the reader will find the following subtopics: Environmental Impacts, Operational Impacts, Liability and Risk Reduction Impacts, and Cost Impacts. The subsections do not represent an exhaustive list of factors beyond direct costs that should be considered nor do the narrative sections represent a conclusive discussion of the individual impacts. These subsections have been designed to encourage critical thinking on other factors that may be overlooked when making decisions based solely on the direct costs of demolishing residential structures.

Many cities are exploring urban farming, creating stormwater retention infrastructure, waterfront parks, open space, habitat creation, urban forests, and other environmentally beneficial ways to use vacant land. However, current demolition practices that allow substantial impervious surfaces to remain (driveways, foundations, parking areas, etc.) do not adequately prepare vacant parcels for these reuses. Left in place, these impervious surfaces inhibit stormwater infiltration and become obstacles to the reuse of the property through imposed costs on the next developer.



E. Stabilizing Communities through Improved Demolition Practices

Many communities are contemplating large-scale demolition of abandoned residential structures in an effort to stabilize the housing market in affected neighborhoods. Unfortunately, the destabilizing impact of abandoned residential structures may continue even after the residential building structure is demolished. For example, poorly maintained vacant lots may become targets for illegal dumping of construction waste, hazardous materials, and garbage.

To address this continuing nuisance, communities are repurposing and redeveloping vacant lots. This report highlights technical features in the demolition process that can expedite local stabilization strategies through better site preparation for eventual reuse. If current demolition practices were improved and coordinated with other community strategies and initiatives, the demolition activity could potentially assist communities in the transformation of vacant properties into amenities and opportunities. These activities could add value to a neighborhood and improve the quality of life of the local residents.

Enhanced demolition practices can achieve multiple environmental goals and set the stage for vacant lot revitalization. The use of these bid specification development tools may lead to improved revitalization outcomes for local communities as demolition practices better prepare sites for greener reuse, such as the community garden pictured on right.



Improved demolition practices will help cities, counties, land banks and other entities stabilize property values by leaving vacant lots in a more aesthetically pleasing condition and provide developers with a standardized vacant property ready for reuse. In the image on left, a recent demolition (Lot A) will need additional soil and stabilization measures to avoid becoming another empty lot that is devoid of all vegetation (Lot B).

F. Health and Safety Disclaimer

Although this document addresses briefly the topic of worker health and safety and public safety and security at residential demolition sites, it is not the focus of this document. The user should ensure that any residential demolition is conducted in accordance with all applicable health and safety provisions of Title 29 and Title 40 of the Code of Federal Regulations, as well as all applicable federal, state and local requirements. One best practice would be to develop a health and safety plan for the project which establishes personnel protection standards and mandatory safety practices and procedures that protect both workers and the general public. Additionally, the health and safety plan assigns responsibilities, establishes standard operating procedures, and describes how unplanned events and incidents will be handled. Additional information on this topic is widely available and the reader should research available information and contact local resources to ensure compliance with applicable regulations to provide a safe and secure work site.

2. Environmental Concerns about Common Demolition Practices



There are several areas in which improvements can be made to existing demolition practices in order to increase the environmental quality of the end result. The sheer scope of this issue is staggering: 250,000 housing units and 45,000 non-residential structures are thought to be demolished in the United States each year – as measured before the arrival of the foreclosure crisis (Franklin-Associates, 1998). Considering the effects of the foreclosure crisis and loss of manufacturing jobs in traditionally industrial cities, this figure is anticipated to be much higher because the demand for demolitions rises as the number of vacant housing units grows.

The most recent Census found that the vacant housing units grew by 44% from 2000 to 2010. Calculations of demolition demand in the eight largest cities in Ohio conservatively estimate over 40,000 potential demolitions over the next five years in those cities alone (Mallach 2012). Estimates for demolitions (US EPA, 2009) debris generation include 19 million tons generated from residential demolitions and 65 million tons from non-residential demolitions. This is a little more than 50 percent of all of the building-related construction and demolition (C&D) materials generated (total of 170 million tons). Enhanced demolition practices can help achieve multiple environmental goals and may set the stage for vacant lot revitalization. The use of these bid specifications may lead to improved revitalization outcomes for a city, county, land bank, or other entity as demolition practices better prepare sites for reuse.

The environmental concerns and practices discussed in this section are not applicable to all demolitions at all locations. However, improvements in the way these concerns are addressed were identified by the various stakeholders as having the greatest environmental benefit at residential demolition projects. As such, the

Appendix contains a menu of environmentally sensitive practices that can easily be achievable and incorporated into a city, county, land bank or other entity's demolition bid specification.

A. Backfill Quality

When a home is demolished there is often a depression or hole left behind that must be filled. The backfill soils that have been used have been inconsistent in nature.

An outdated and inadequate demolition practice involves filling the site with the demolition debris itself and/or using low quality soil. Sources of backfill soil may not be free of contaminants or may have high clay contents that inhibit the infiltration of stormwater. Some backfills may contain rocks, broken concrete, or other deleterious material that leaves sites in a poor condition for future reuse.

Land reuse issues emerge when cities choose to fill the basement excavation with the demolition debris itself. This common demolition practice leaves sites in poor condition for future reuse. While this practice may save operational costs, it has cost impacts to future users and the existing neighborhood. These indirect costs far outweigh the operational savings from dropping the house into the basement and it is recommended that cities instead use proper backfill soils. Working with our stakeholders, we identified these issues to be pressing concerns in current demolition practices.



B. Grading

Post-demolition site finishing practices will involve grading the soil to ensure a level base for the entire site. Typical grading requirements focus on preventing settlement and ponding water. A grading plan may also identify a specified slope for drainage purposes. While these are essential and worthy goals, simply matching existing grades at a site may not reduce the risk for erosion, sedimentation, and runoff into streets and storm sewers.

Improved demolition bid specifications may help cities, counties, land banks and other organizations to leave the property in a condition that would enhance water infiltration and provide soil as a growing media. The demonstration site above is a field test of native plantings in a vacant lot in Cleveland.



C. Over-Compaction

Urban sites often have soils that are greatly compacted and do not allow for stormwater infiltration. Compacted soil is a limiting factor in plant establishment and growth. This can be exacerbated by demolition and backfill methods that further compact existing onsite soils and backfill. For example, the use of heavy machinery in the final stages of demolition will pack down the soil, which results in a compacted site.

Demolition activities often leave soils in a compacted state by the use of heavy machinery that packs down the soil. This compacted condition is exacerbated by poor quality fill material, which is often unsuitable for getting the lot ready for more productive uses.



D. Vegetation

Some residential demolition programs do not require the establishment of vegetation as a site finish. This can lead to increased erosion and sediment transport to the sewer system. Bare properties are also susceptible to illegal dumping of wastes, vandalism, and errant parking, in addition to being a neighborhood eyesore. Poor demolition practices result in blighted vacant lots that also impact market value similar to the deleterious impact of a vacant building. These negative lasting impacts continue to burden the environment as well as social and economic conditions in neighborhoods.

While the vacant house may be removed from the site, an empty lot that is devoid of vegetation will be subject to increased stormwater runoff and erosion. This issue is not only aesthetic, but can also result in depressed property values of occupied homes that surround the empty lot. Even a small property value impact can be magnified when cities are dotted with vacant lots that continue to malign neighborhoods even after the removal of the building.



E. Site Finishes Maintenance

Vegetation establishment may not always be successful if contractors are not required to protect the seed and, if resources are not available, to maintain the greenspace. In addition to controlling dust, sites with grass can serve as a barrier to soil containing lead and other contaminants on sites. Cost avoidance can be achieved by preventing the need for sites to be refinished a second time or requiring additional greening by third party agencies.

Improved demolition practices will assist in reducing in an environmentally sound manner the number of vacant residential structure in a community. Proper site finishes can reduce the potential for exposure to contamination found in urban communities. Proper seeding of a vacant lot allows grass to act as a barrier to exposure to lead found in the soil.



F. Complying with Asbestos Regulations

Insufficient knowledge of the asbestos regulations, a lack of adequate project oversight by the owner and operator, and poor performance by contractors can result in violations of applicable asbestos regulations. Some bid solicitors do not have bid specifications and contract language which define a project's asbestos requirements and needs in sufficient detail to ensure compliance with asbestos regulations. This presents the contractors, owners, and operators with potential legal liabilities, extra project costs, remediation costs and other potential liabilities associated with violations of federal, state, and local asbestos regulations. The failure to comply with applicable asbestos regulations could result in fines, penalties, imprisonment, and lawsuits.

Cities, counties, land banks, and other entities should write demolition bid specification with sufficient detail to procure the services of contractors who will safely manage asbestos and other contaminants.

G. Worker and Public Health Protection

Improper handling or disposal of asbestos and other hazardous substances presents a health and safety hazard not only to the site workers, but also to neighboring residents. This applies to potential hazardous dust generated during the demolition process. Even after the demolition process is complete, inadequate demolition may lead to site contamination from lead, PCBs, mercury, or asbestos. This issue is a common concern in commercial and industrial demolitions, but similar contamination concerns arise at residential sites, and can also lead to public health concerns, future uncertainty in redevelopment and legal liability.

H. Waste Management

Inadequate inspections and assessments of properties can lead to the mishandling of various waste streams. Contractor and worker training may not be sufficient to identify unknown materials for safe and legal disposal. There needs to be greater awareness of environmental regulations associated with different waste streams (e.g. mercury thermostats).

I. Diversion of Waste from Landfills

Typical bid specifications do not address opportunities for recycling, salvage, and building disassembly and materials reuse. Working with recycling facilities and deconstruction operations can lead to improved environmental outcomes and material sales may offset some project costs.

3. Highlighted Demolition Modifications to Improve Environmental Results



One of the goals of developing the residential demolition bid specification development tools is to assist cities, counties, land banks and other organizations/entities in developing high quality, detailed contract language. The sample bid specification language is provided as a tool to help those conducting demolition activities anticipate the scope of environmental issues relevant to demolitions, resulting in a more environmentally-friendly demolition process. The following sections outline the recommendations, and best management practices that are included in the specification sections in the Appendix. It is recommended that each city, county, land bank, or other entity assess its current practices, markets, and resources in order to determine which, if any, modifications will have the greatest impact and are most feasible. When the specifications reference demolition requirements, waste handling and disposal regulations, or worker protection measures U.S. EPA or the Occupational Safety and Health Administration (OSHA), those regulations must be met whenever they apply. All applicable statutory and regulatory requirements including environmental, workers protection, and historical preservation requirements must be met.

A. Conduct Pre-Demolition Inspections to Identify Waste Streams

One of the first steps for the demolition of a vacant home is to identify, characterize, and quantify the potential waste streams at the site. This may help ensure accurate bidding and the handling of the different waste streams. The **Pre-Demolition Survey** bid specification development tool provides a list of the potential waste streams that should be considered for the survey,



See Appendix:
[Pre-demolition Survey Waste Management Plan](#)

including asbestos-containing materials (ACM), lead-based paint (LBP), polychlorinated biphenyls (PCBs), mercury containing wastes (Hg), general household wastes, and other potential hazardous wastes. Another useful set of data to be compiled during the survey is an inventory of the items and materials that would be suitable for salvage and recycling. The Waste Management Plan specification tool provides information on developing a plan for procedures and methods to be used in the handling and disposal of the waste



Typical household wastes found in homes can be anything but typical at times. This image of pesticide bottles removed from an older home features two banned

substances: Chlordane (banned in 1988) and Deenate (DDT was banned in 1972). [Photo credit- Dave Graham, City of Chicago].

streams identified during the pre-demolition survey. This plan might be too extensive to develop for each individual residential structure, but could also be applicable and more effective for either a group of homes contracted together, or a general program overview that could be updated annually and provided to contractors. Such a plan may also be applicable to disaster recovery situations when many residential homes are damaged by disasters.

i. Environmental Impacts

Only by identifying various waste streams can the plans be established for the appropriate handling and disposal methods, which in turn protect human health and the environment to the greatest extent possible. Identification, separation, and removal of wastes with hazardous components like lead or mercury will allow more of the remaining materials (i.e., wood, bricks, flooring, etc) to be considered for reuse or recycling.

ii. Operational Impacts

The pre-demolition survey and development of the inventory should not interfere with the actual demolition which occurs later. All of the work described in these sections should take place prior to bidding and would therefore be conducted by an entity such as an environmental contractor, consultant or trained government employee separate from the demolition contractor.

iii. Liability and Risk Reduction Impacts

By putting forth the effort to identify waste streams and also the plans and procedures for the safe and legal disposal of the waste, project owners may avoid violations of applicable environmental and health and safety regulations. Ensuring that contractors understand and abide by the waste management plan is essential to achieving the goals of these sections.

iv. Cost Impacts

Accurate and complete waste identification is an essential component of conducting quality residential demolitions and should be built into the cost structure. While it will not likely lead to short term operational cost savings, the reduction in long term liabilities, potential fines and future development costs may prevent costly change orders and avoid miscommunication about known hazardous materials and poor public relations with local neighborhoods and officials.

B. Remove Asbestos-Containing Materials



See Appendix:
Asbestos NESHAP
Compliance

One of the most important requirements for all demolitions subject to asbestos regulations, and a best practice for all demolitions in general, is to ensure that asbestos-containing material (ACM) is handled appropriately. The Asbestos Compliance bid specification development tool provides a brief description of key provisions of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for asbestos. The section discusses requirements for the handling and disposal of ACM along with best management practices for all demolitions.

i. Environmental Impacts

Asbestos is a known human carcinogen and the proper handling of ACM is essential to protect workers and the neighboring residents from releases of asbestos fibers.

ii. Operational Impacts

Generally, asbestos abatement of regulated ACM (RACM) is required prior to proceeding with demolition. However, under some circumstances, such as when a building is structurally unsound and in danger of imminent collapse, it may not be safe to remove asbestos prior to demolition. In these instances, work must comply with all applicable asbestos regulations. It is important for all site workers to be aware of the hazards of asbestos and to respond appropriately if unknown or suspect materials are discovered. Coordination between the abatement contractor and the demolition contractor is essential for effective project execution.

iii. Liability and Risk Reduction Impacts

Failure to comply with the Clean Air Act's asbestos NESHAP requirements could lead to civil or criminal enforcement actions which may lead to fines, penalties, and imprisonment. Actions can be brought against building owners and operators, demolition contractors, as well as other parties involved in the project, depending on the particular circumstances.

iv. Cost Impacts

Determining if asbestos is present and how it needs to be addressed is a component of conducting residential demolitions. Such work should be built into the cost structure for projects. It is critical that owners and operators have a clear understanding of the asbestos regulations and use that knowledge to issue good bid specifications and clear contract provisions that will limit and control costs. Costly change-work orders and costly solutions for mistakes involving asbestos can be avoided to some degree by good project bid specifications and good contract language. Abatement and demolition practices which minimize the generation of regulated asbestos-containing debris and waste can result in cost savings. Sometimes, removing asbestos-containing facility components in sections and disposing of them in sections can save money when compared to other acceptable asbestos abatement practices. Packaging multiple asbestos inspections and abatement projects in a single bid and contract can also result in cost savings. These cost-saving efforts may also provide environmental benefits by reducing the amount of waste going to landfills.

C. Prevent Fugitive Dust



See Appendix:
Managing Fugitive
Dust

The Managing Fugitive Dust bid specification development tool discusses the need to limit fugitive dusts generated during demolition. Also discussed in the section is the handling of other hazardous dusts that may require special protections for workers, i.e., lead, asbestos, PCBs, mercury. According to a recent Chicago-based housing demolition study, lead dust presents a hazard in the form of lead poisoning in children that may be reduced with proper dust control strategies (Mucha, Stites, Evens, MacRoy, Persky, Jacobs, 2009). Fugitive dust generally refers to particles lifted into the air by man-made and natural activities such as the movement of soil, vehicles, equipment, demolition, and wind. Consult your local environmental agency for the definition of fugitive dust in state and local regulations.

i. Environmental Impacts

Fugitive dust can have a negative impact on the health of residents, especially those with respiratory illnesses.

Lead dustfall from demolition of scattered site family housing: *Developing a sampling methodology*

“The City of Chicago provides over 3000 demolition permits each year; this is likely an underestimate of actual demolitions because not all demolition activities have permits. The city requires that demolition sites be fenced and that water be used to wet the debris to minimize dust emissions, although we observed a wide range of compliance with these requirements. A recent survey of the US housing stock by Housing and Urban Development (HUD) shows that there are approximately 7.4 billion ft² of interior surfaces and 29.2 billion ft² of exterior surfaces coated with lead paint 1 mg/cm² (Vojta et al., 2002). The potential impact of disturbing this large surface area of lead-based paint is substantial. If a painted surface area of one square foot at 1 mg/cm² is disturbed and turned into dust, and if that dust is evenly distributed over an average 10 ft×10 ft room floor, the resulting lead loading will be 9300 µg/ft², well above the existing EPA limit of 40 µg/ft².”

<http://www.sciencedirect.com/science/article/pii/S0013935108002399>

Lead dustfall from demolition of scattered site family housing: developing a sampling methodology. Mucha AP, Stites N, Evens A, MacRoy PM, Persky VW, Jacobs DE. Environ Res. 2009 Feb;109(2):143-8. doi: 10.1016/j.envres.2008.10.010. Epub 2008 Dec 21

ii. Operational Impacts

Control of fugitive dust is largely achieved by spraying water during demolition, a practice which is simple to execute in an urban setting with fire hydrants in the vicinity. Multiple hoses may be necessary for larger houses if one is not sufficient and water trucks may be required in rural areas. Generally, water is used to control fugitive dust during the portion of the demolition that occurs after hazardous substances such as asbestos have been removed. However, under some circumstances, such as when a building is structurally unsound and in danger of imminent collapse, it may not be safe to remove hazardous materials prior to demolition. In such instances, wetting the facility, or a portion of the facility, during demolition may be required by regulations to control the emission of the hazardous material from the building.



CAUTION

In many cases, cities, counties, land banks and other entities are required to accept the low bidder, who may have little or no experience in complying with asbestos regulations and control of fugitive dust. Cities, counties, land banks and other entities should make certain that bid specification documents are sufficiently detailed so that comparable contractor services are being evaluated.



iii. Liability and Risk Reduction Impacts

Local regulations may have restrictions on fugitive dust emissions. Hydrant permits are often required for water use. Also important is limiting the impact on neighboring residents and minimizing the likelihood of complaints and health liabilities. Citizens calling about dust emissions is one of the top complaints received by local, state, and federal enforcement offices.

iv. Cost Impacts

Fugitive dust control is a standard procedure that should have minimal impact on the overall project cost, but the project owner should provide field oversight to ensure adherence to the bid specifications.

D. Salvage and Recycle More Materials; Proper Waste Disposal



See Appendix:
Salvage and Recycling
Waste Handling and Disposal
Waste Management Plan



Demolition debris recycling and salvage strategies are gaining popularity. Some cities, counties, land banks and other organizations are evaluating deconstruction strategies to reuse materials and provide local job training opportunities. A robust Waste Management Plan is a cornerstone to any demolition project, but especially important if pursuing salvage, recycling, or deconstruction activities. If there is a focus on material recovery then a more specific plan, such as a Deconstruction Plan, may also be needed before demolition begins.

There are two sections in the Appendix that discuss the treatment of waste streams identified during the pre-demolition survey. The Recycling and Salvage bid specification development tool relates to those items intended for reuse, resale, or recycling, and the Waste Handling and Disposal bid specification development tool pertains to all other waste streams, including hazardous wastes, special wastes, and non-hazardous wastes. Both of the sections are closely interrelated to the 'Waste Management Plan's bid specification development tool, in that the plans and procedures established in the waste management plan need to be followed during the execution of the work.

i. Environmental Impacts

Recycling and reusing materials from residential buildings saves energy and reduces the production of greenhouse gas emissions and other pollutants by reducing the need to extract raw materials and ship new materials long distances. Many urban areas also address environmental issues in minimizing the amount of waste sent to landfills, known as the diversion rate. Depending on local regulations, required diversion rates may be 80 percent or higher. Alternatively, goal diversion rates can be established during the bidding phase, which may provide an incentive to the contractor to work with local recycling and salvage operations.

ii. Operational Impacts

An increase in the segregation of materials in preparation for salvage or recycling generally will result in increased effort by the demolition contractor and more time required per site. However, waste segregation does not require advanced techniques or specialized equipment. Some administrative effort may be required prior to commencing work in order to identify potential reuse or resale markets.

iii. Liability and Risk Reduction Impacts

It is best to require documentation of all materials that are taken off-site for salvage, recycling, or disposal. These may already be required if local regulations establish a required diversion rate. Another legal consideration is to ensure that any hazardous materials or asbestos are appropriately addressed prior to taking them off-site. This should be addressed in the contract language and the waste management plan.

iv. Cost Impacts

The cost impacts associated with increasing recycling and salvage may be mixed. An increase in the amount of materials recycled and salvaged may reduce the volume and therefore the cost of disposing of wastes, but additional time spent segregating and processing different materials on-site may lead to increased labor costs. Depending on local market availability, all-inclusive recycling facilities may sort and segregate a single stream of materials for recycling and thereby reduce the added labor costs. Ultimately, the cost balance will depend on the quantity, type, and condition of the materials present at a given site. Project owners may wish to establish progressive revenue sharing agreements that encourage salvage and recycling by the contractor to the greatest extent possible, the markets for the materials, and the cost of waste disposal.

E. Incorporate Deconstruction Practices



See Appendix:
Deconstruction

Deconstruction involves disassembling an entire building, or portions of a building, in order to harvest materials for direct reuse or recycling. The Deconstruction bid specification development tool incorporates many of the elements discussed in other sections and also offers best management practices for implementing deconstruction features into existing demolition practices.



The Milwaukee Metropolitan Sewer District (MMSD) is demolishing 83 homes along the Kinnickinnic River as part of a \$50 million infrastructure project on floodplain and stormwater management. MMSD demolition contractors use improved fill materials to allow stormwater infiltration and are actually deconstructing the buildings in the floodplain. The demolition bid specifications identify the allowable soil materials as well as the percent, by weight, of the houses that should be kept out of landfills. Improved demolition practices will avoid costs later in the project to widen the stream channel and eliminate flooding of adjacent neighborhoods.

i. Environmental Impacts

An important environmental benefit from recycling and reuse is the energy and natural resource savings from reducing the need to extract virgin resources. As discussed with recycling and salvage, another impact of deconstruction is the reduction of waste entering landfills, known as the diversion rate, which may be established by local regulations or within the contract. According to a Riverdale case study compiled for EPA by the National Association of Home Builders Research Center, if 25 percent of homes demolished were deconstructed it could save 20 million tons of land fill space yearly. (Center, 1997). There are positive societal impacts associated with the operation of deconstruction material outlets, such as the ReBuilding Exchange or Habitat for Humanity ReStores.

ii. Operational Impacts

Deconstruction is often conducted by specialized deconstruction firms and is most successful with experienced workers skilled in the disassembly and handling of materials. Depending on local markets, materials may need to be packaged or prepared in specific ways in order to receive the highest value. Vandalism and scavenging of an unsecured residence may greatly limit the quantity of materials available for salvage or resale.

iii. Liability and Risk Reduction Impacts

Some markets and reuse stores are unable to accept items or materials that contain lead-based paint. It becomes essential to identify these possible items during the pre-demolition survey in order to plan accordingly. Local government may also require special deconstruction permits.

iv. Cost Impacts

Deconstruction methods, practices, and markets continue to grow and improve. Full building deconstruction will require more time and labor than standard demolition, but if the local market has adequate resale and reuse markets, and if experienced and qualified deconstruction firms are available, excess costs can be minimized. Oftentimes, a blend of deconstruction and standard demolition can be accomplished to determine the cost implications of deconstruction.



A hybrid approach to demolition/deconstruction may include “light deconstruction”, after hazardous materials have been addressed, by a local non-profit before demolition takes place. In many cases, the residential homes are stripped of metals and items of value, which means that full-scale deconstruction will have limited resale value. The Cincinnati Metropolitan Sewer District plans to employ this hybrid approach (light deconstruction/demolition) as preparation for a large-scale green stormwater infrastructure project in the Lick Run watershed. Entities using this approach should consider including language in their bid specifications that would ensure that all applicable environmental, health, and safety regulations are followed during light deconstruction.

F. Use Better Backfill and Remove Basements



See Appendix:
Soils for Earthwork
Placement of Fill
Impervious Surface Removal

The ‘Soils for Earthwork’ bid specification development tool outlines the use of three distinct materials for backfill. The first is a sandy subsoil to fill the voids created from basements or other excavations. The second is a thin layer of compost used to amend the site soils in preparation for vegetation. The final layer is a sandy loam to be used as topsoil. It is recommended that all materials be sourced from approved suppliers and be free of contaminants. The ‘Placement of Fill’ bid specification development tool offers suggestions for adequate compaction of the subsoil to prevent settling, recommendations for layer thicknesses for the compost and topsoil, and best management practices for placement methods and procedures. Finally, the ‘Impervious Surface Removal’ bid specification development tool lists recommendations for the excavation and removal of basement foundations, slabs, driveways, and other impervious surfaces prior to beginning backfill.



Sewer districts are seeking new methods of providing green infrastructure services to improve stormwater management. As part of a new trend, sewer districts are

partnering with municipal public works departments to convert vacant lots from acres of impervious surface into decentralized stormwater infiltration systems.

i. Environmental Impacts

The use of sandy soils for backfill is expected to increase the volume of stormwater that is able to infiltrate on-site, especially with the removal of the basement. This in turn reduces the chance of erosion and sedimentation, and can lower the volume of runoff entering storm sewers. Applying compost and topsoil will also aid in the establishment of vegetation, which further slows stormwater runoff, prevents erosion and sedimentation, and lowers runoff volumes.

Cities, counties, land banks or other entities may stabilize property values by using proper fill and leaving vacant lots in a more



aesthetically pleasing condition. This practice provides developers with a standardized vacant property ready for reuse.



Cities and sewer districts may partner together in order to utilize the residential demolition bid specifications to facilitate stormwater management practices. Using sandy soils as backfill is one strategy to increase stormwater infiltration while creating certainty of the quality of the fill material in the event of subsequent reuse.

ii. Operational Impacts

The modification of backfill materials is likely to have minimal operational impacts to residential demolition. Potential impacts may include initial time spent to identify qualified material suppliers and longer delivery routes. Availability may also be limited depending on the resources available and the number of sites being demolished. For basement removal, all the necessary equipment should be on-site, but additional trucks to haul the concrete may be required, plus additional time to conduct the excavation.

iii. Liability and Risk Reduction Impacts

By pre-screening sources of backfill and potential material suppliers, the project owner can require that all necessary material testing and analyses are conducted to ensure that the materials are clean and free of contaminants. This becomes increasingly important as the number of demolitions increases. By minimizing the potential for unclean material being placed on site and by using contaminant free material, the project owner minimizes future site liabilities. Contaminant free fill material has obvious environmental and public health benefits.

The avoidance of poor or contaminated soil as backfill material can help cities, counties, land banks or other entities better manage the costs of demolishing residential structures. It can help reduce the costs of penalties and fines from enforcement actions and reduce exposure to liabilities from poorly designed and managed projects.



iv. Cost Impacts

Depending on market availability and demand, increases in material costs for backfill may be minimal. The routine removal of basements and foundations not only reduces the future cost to developers but creates a level of certainty that underground site issues have been addressed. Many cities and developers have encountered demolition legacy issues when digging into the subsurface in the course of site reuse. Also, incomplete impervious surface site work can increase costs for other governmental units, such as a sewer district that will be forced to address sediment and stormwater runoff from the site.

G. Install Green Infrastructure and Use Native or Adapted Seed Mixes and Plants



See Appendix:
Grading Soil Stabilization
and Seeding



A typical demolition of a residence leaves the property in a condition not conducive to planting trees or grass, or establishing vegetative cover. This decreases the menu of options that cities have to reuse vacant lots for stormwater infrastructure or native plantings.

The ‘Grading’ bid specification development tool is designed to provide best management practices for general grading of sites in a manner to prevent ponding of stormwater. Also included in the section is information on the installation of rain gardens and bioswales. These options are best applied to specific sites that can accommodate these types of green infrastructure. For example, a bioswale would be most appropriate if there are multiple adjacent vacant sites. The ‘Soil Stabilization and Seeding’ bid specification development tool makes recommendations for the use of native or adapted seeds mixes and plants when establishing greenspace on a vacant parcel.

i. Environmental Impacts

The installation of vegetation at a site has multiple environmental benefits. First, plants help prevent erosion and sediment transport of topsoil by binding the soil together. The roots

also help infiltration of stormwater by providing routes of transport. If properly designed, rain gardens and bioswales can further reduce offsite stormwater runoff by detaining most of the water at a site. Finally, the presence of greenspace over a bare site adds significant aesthetic value to the neighborhood and plants may even help prevent access to the site and prevent illegal dumping of trash.



Many cities are installing rain garden projects to control stormwater in a manner similar to the Cleveland example above. Improved demolition practices can achieve multiple environmental goals and set the stage for vacant lot revitalization - as rain gardens or other types of stormwater management.

ii. Operational Impacts

Most contractors should have the means to apply seed and install erosion control straw. The selection of an appropriate seed mixture may require some advance effort to determine the best mix for the region and climate. The installation of green infrastructure, however, will likely require a significant amount of advance planning and may require the use of a specialized contractor with unique experience in the installation of these features. Furthermore, the project



It is always a good practice to prepare sites for vegetation, but is absolutely critical when the end use will be a landscaped site. In some cases, cities like Cleveland and Buffalo are planning ahead by identifying potential end uses, which may include housing, community gardens, or green stormwater infrastructure. If the end use will be a vegetated site then the demolition process can better prepare the site and reduce future costs for site finishing. Planning ahead can reduce the need to perform rework.

owners will likely need to identify the specific sites that are suitable for green infrastructure well in advance of soliciting bids and conducting the work.

iii. Liability and Risk Reduction Impacts

Stormwater benefits may accrue over time that can balance out the initial construction cost. Depending on the systems established in the communities, adjacent parcels, even if all vacant or slated for demolition, may be owned by different entities. The need for access agreements and multiple stakeholders will require extra administrative work, but given the multiple co-benefits of green infrastructure and vacant lot repurposing, the benefits likely outweigh the costs of pursuing multi-lot projects.

iv. Cost Impacts

There will certainly be an additional cost for requiring seeding after demolition and backfill if it is not currently a standard practice. On the other hand, the incorporation of appropriate seed mixtures should present a minimal cost variation. However, if the selection of seeds and plants is carefully planned, the required maintenance can be minimized.

Installation of green infrastructure will present additional costs to the overall project. However, there are stormwater benefits that may accrue over time that can balance out the initial construction cost. If green infrastructure is incorporated into several different parcels, those additional costs could be spread to multiple sites, thereby reducing the per-site increase while still reaping the environmental benefits of the installation. There may be opportunities to include a cost share of the incremental costs associated with green infrastructure projects. For example, this cost share may be between a local stormwater management agency and a municipality or land bank.

4. Earthworks Field Trial with CCLRC

In July 2012, U.S. EPA worked with the Cuyahoga County Land Reutilization Corporation (CCLRC, also known as the Cuyahoga Land Bank) to field test four bid specification development tools related to earthwork:

- Soils for Earthwork.
- Placement of Fill.
- Grading.
- Soil Stabilization and Seeding.

U.S. EPA provided technical assistance to CCLRC to incorporate recommended language and other changes into CCLRC's earthworks bid specification language. This was an iterative process between CCLRC and U.S. EPA. Experienced demolition contractors were then selected by CCLRC to conduct demolitions at five vacant homes using the amended bid specifications. The primary changes to the demolition process included using a specified sandy soil for backfill, applying compost and/or topsoil, and working with the Cleveland Botanical Garden to develop a native seed mixture. The field trial yielded many lessons learned for both CCLRC and U.S. EPA, including the following:

- The enhanced residential demolition bid specification development tools may not be understood adequately without additional guidance. Users of this report will have to review their own bid specifications to identify opportunities to incorporate the ideas and concepts offered in this report and its Appendix.
- Not all components of the menu of demolition specifications will be practical or applicable for a given region, market, or regulatory environment.
- Contractor education of the specification changes is necessary to ensure compliance with contract language. Contractor education needs to emphasize both specification content and intent.



U.S. EPA Region 5 staff (Chicago and Cleveland) and a field research team from the U.S. EPA Office of Research and Development (Cincinnati) observed five residential demolitions in Cleveland's Slavic Village neighborhood. This demolition was completed by the Cuyahoga County Land Revitalization Corporation (CCLRC). The land bank acquired the buildings involuntarily through the tax foreclosure process in Cuyahoga County. Since the bid specification language needs to be tailored to local conditions, U.S. EPA worked with CCLRC on the implementation of residential demolition bid specifications that included alternative soil and fill techniques.

- Field oversight of contractors is an essential component of producing the desired results listed in the contract specifications.
- With enough advance notification, contractors have the ability to be flexible and accommodate changes.
- Backfill materials of a higher environmental quality are not necessarily more expensive.
- A single hose is not always sufficient for dust control on larger buildings, and fire hydrants are not always conveniently located.
- Project information should be available on-site is helpful when assisting concerned neighboring residents. This may include results of the pre-demolition survey, completion dates of asbestos abatement, abatement and demolition contractor information, market analyses behind the decision to demolish a structure, and contact information for the project owner.



As an outcome of the field testing, the CCLRC staff was able to illustrate the need for additional field oversight. Two additional staff members joined the CCLRC team to focus on contractor performance in the field.

In addition to the aforementioned lessons learned, U.S. EPA Office of Research and Development (ORD) was on-site during the field trial to conduct soils research as part of the Urban Soils Assessment project. Data was collected from the basement excavations following removal of all impervious surfaces. Testing included water infiltration, ground-penetrating radar, soils classification, and compaction testing of existing soils. ORD will return to the sites in 2013 to reassess soil characteristic and to determine the effectiveness of the field trial.

5. Overview of Bid Specification Development Tool Use

As discussed in Section 4, one of the lessons learned from the field trial with CCLRC was the need to take into account local conditions when presenting the residential demolition bid specification tools for use. Local procurement laws and practices, weather conditions, climate and even local vegetation needs can impact how a specification can be adapted for local use. This report identifies the activities associated with demolishing residences, from pre-planning to demolition to site rehabilitation. For each of the activities, the report provides bid specification development tools to assist bid solicitors in developing better bid specifications to ensure a more environmentally responsible demolition and site rehabilitation. One approach for incorporating the improved demolition specifications into existing demolition procedures is to first assess the current state of the demolition bid program. This could include market analyses to determine what aspects of the specifications would have the greatest economic and environmental impact on the project. If a new residential demolition program is being created, local land banks, counties, cities, or other entities are encouraged to apply the appropriate demolition bid specification tools to all bids and contracts that are utilized in the new program. Ultimately, the residential demolition specifications should raise awareness of the multiple opportunities and methods available to improve the environmental quality of residential demolition.

The information in each bid specification development tools section is intended to be considered alongside local conditions (e.g. climate, neighborhood context, or appropriate vegetation) be considered in order to achieve the best result. The language in the bid specification development tools is not intended to be used as a standalone document, but rather the concepts and recommendations can be selected and adapted as appropriate for the specific demolition activity and individual organization's needs. Cost implications, regulatory requirements, and goals of the organization will all play a significant role in selecting the most effective and implementable concepts presented in each bid specification development tools section. Individual bid specification development tools section and instructions for their use can be found in the Appendix section of this document.

The concepts and language in this document are intended to allow a user to selectively insert the appropriate sections into a set of existing bid specifications.



As more cities, counties, land banks and other entities re-evaluate their demolition practices, it is possible to modify their contractor requirements. Applied locally, these environmentally improved strategies may result in demolition site conditions that are better for future development.

 See Appendix

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Health and Safety Disclaimer: Although this document addresses briefly the topic of worker health and safety and public safety and security at residential demolition sites, it is not the focus of this document. The user should ensure that any residential demolition is conducted in accordance with all applicable health and safety provisions of Title 29 and Title 40 of the Code of Federal Regulations, as well as all applicable federal, state and local requirements. One best practice would be to develop a health and safety plan for the project which establishes personnel protection standards and mandatory safety practices and procedures that protect both workers and the general public. Additionally, the health and safety plan assigns responsibilities, establishes standard operating procedures, and describes how unplanned events and incidents will be handled. Additional information on this topic is widely available and the reader should research available information and contact local resources to ensure compliance with applicable regulations to provide a safe and secure work site.

Residential Demolition Bid Specification Development Tool

The appendices to this document are known as “bid specification development tools”. They have been designed to serve more than one purpose. They can serve as a tool to help the reader develop and organize information concerning a demolition project, especially information about environmental concerns and issues. They can also be used to modify existing bid specification language used by a community or to create language for new bid specifications. This specification language could then be utilized to develop procurement language, contract language, and associated documents as appropriate for use in a specific bid package that would instruct contractors on the contract and on the general and the technical requirements for the demolition project.

The “bid specification development tools” found in these appendices have been organized by topic and each follow a similar general format. The general format provides the reader with information in the following broad categories: Purpose, References, Contractor Required Submittals, Quality Assurance, Required Materials, and Execution. Each of these categories is designed to provide information and resources to the reader so that the reader can develop or modify their own written requirements concerning the individual topics for their demolition project.

Note that the appendices and topics are designed to be a tool to formulate specification language, but should not be interpreted or utilized as specification or contract language itself. They are not intended to cover all components of a demolition project nor can they be expected to cover all the local conditions in your community. They are not intended to reflect all applicable local, state, nor federal laws and requirements. The reader will have to work within their organization and their local jurisdiction to make sure that the language they use in their documents is appropriate and addresses the needs of their community.

Bid Specification Development Tool Elements

PURPOSE – This section provides a brief overview of the specific topic’s goals and intended results.

REFERENCES – This section includes a list of additional sources of information, especially environmental regulations, that may be pertinent to the specific topic.

CONTRACTOR REQUIRED SUBMITTALS – This section lists suggested documentation that the bid solicitor may require the contractor to submit in order to fulfill the requirements of the section. Documentation may include specific work plans (e.g. Waste Management Plan or Deconstruction Work Plan), written notices of environmental compliance, or receipts related to materials management.

QUALITY ASSURANCE – This section includes management of the quality of products and process as they relate to contractor performance. Quality assurance is intended to avoid mistakes through systematic measurement, comparison of a standard, or monitoring of a process.

REQUIRED MATERIALS - This section describes the materials, products, or equipment that a bid solicitor may require a contractor to provide to be incorporated in the project as part of the final work product.

EXECUTION - This section describes in detail any preparatory actions, use of specific products, and contractor actions to complete the work in the section.

General Requirements

PRE-DEMOLITION SURVEY

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. Requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts. The goal of the Pre-Demolition Survey bid specification development tool is to provide information to the contractor to conduct a complete and thorough inspection and survey of the salvageable materials, non-hazardous wastes (including recyclable waste materials), and potential hazardous waste streams within residences prior to beginning demolition. The results of the pre-demolition survey would be presented in an inspection report and incorporated into the demolition bid package, which would in turn be used to develop the Waste Management Plan.

Potential wastes stream covered by this section include:

- Asbestos-containing materials (ACM).
- Lead-based paint (LBP).
- Polychlorinated biphenyls (PCBs).
- Mercury.
- Refrigerants.
- Electronic waste.
- Salvageable materials (e.g. bricks, furniture, flooring, doors).
- Recyclable demolition materials (e.g. wood, concrete, metal, shingles).
- Other household waste.

Personnel responsible for and/or conducting inspections should be aware that some building materials may fall into more than one waste stream category and the inspection report should document materials accordingly.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. State Specific Licensure Requirements for Asbestos

- C. State Specific Licensure Requirements for Lead
- D. State Specific Regulated Wastes
- E. 15 CFR Part 285 – National Volunteer Laboratory Accreditation Program (NVLAP) Procedures and General Requirements
- F. 40 CFR Part 61, Subpart M – National Emissions Standards for Asbestos
- G. 40 CFR Part 82, Subpart F - Recycling and Emissions Reduction
- H. 40 CFR Part 257 and 40 CFR Part 258 - Non-Hazardous Wastes
- I. 40 CFR Part 261, Subpart C – RCRA Characteristic Hazardous Wastes
- J. 40 CFR Part 261, Subpart D - RCRA Listed Hazardous Wastes
- K. 40 CFR Part 273 – Standards for Universal Waste Management
- L. 40 CFR Part 745 - Lead-Based Paint Poisoning Prevention in Certain Residential Structures
- M. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs)
- N. 40 CFR Part 763, Subpart E – Asbestos-Containing Materials in Schools
- O. GO Guide: “Deconstruction and Reuse”, published by the Delta Institute, October 2012.

CONTRACTOR REQUIRED SUBMITTALS

- A. The contractor responsible for conducting the pre-demolition survey agrees to submit the results of the pre-demolition survey in an inspection report for inclusion in the demolition bid package. This information will be used by the demolition contractor to develop the Waste Management Plan, as described in the Waste Management Plan bid specification development tool. The inspection report should also include visual photographic documentation to identify materials, existing conditions, and sample locations corresponding with analytical reports.

QUALITY ASSURANCE

- A. All surveying must be performed by personnel with experience conducting pre-demolition surveys in residences. When required by state and/or local regulations, all asbestos inspection activities must be completed by a licensed asbestos inspector and all lead inspection activities must be completed by a licensed lead inspector.
- B. Laboratories used to analyze samples of building materials collected during the pre-demolition survey must be accredited by the National Environmental Laboratory Accreditation Program (NELAP), the National Volunteer Laboratory Accreditation Program (NVLAP), or the National Lead Laboratory Accreditation Program (NLLAP) or certified by the American Industrial Hygiene Association (AIHA), according to the required analyses of the sample.
- C. Throughout the course of the demolition, the contractor shall maintain and provide copies of all waste-related paperwork, including the pre-demolition survey inspection report, asbestos inventory, analytical reports, salvage and recycling receipts, waste tickets, waste manifests, and others as applicable.
- D. Removal requirements for ACM are covered in the Asbestos Compliance bid specification development tool. The handling and disposal of all waste streams is covered in the Waste Management Plan and Waste Handling and Disposal bid specification development tools.

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

EXECUTION

ASBESTOS-CONTAINING MATERIALS (ACM)

- A. All residential demolitions subject to the NESHAP must adhere to the requirements in 40 CFR Part 61 Subpart M for a thorough inspection of the facility for the presence of ACM, including all exterior areas. Additional NESHAP information is provided in the Asbestos Compliance bid specification development tool.
- B. Local ordinance or state law may be more strict in the interpretation of NESHAP requirements, and contractors must check state and local requirements before beginning any demolition, deconstruction, or renovation activity.
- C. ACM inspections must be conducted by trained, qualified, and, if required, state-licensed asbestos inspectors.
- D. All samples collected during the ACM inspection shall be analyzed by an NVLAP certified laboratory.
- E. Materials that contain greater than 1 percent asbestos will be considered to be ACM and shall be quantified by the inspector.
- F. The inspection report must identify all sampled materials as well as all confirmed and suspect ACM, quantities, locations, and friability. Additionally, the report should identify any areas of the site that the inspector was unable to access at the time of the survey.

The asbestos inspector may elect to develop a representative sampling scheme for the project. Any exemptions or limitations contained in 40 Part CFR 763 do not limit or replace the NESHAP requirement, when applicable, for a thorough inspection of the entire site.

EPA explained at 55 FR 48412 that it “does not consider residential structures demolished or renovated as part of a commercial or public project to be exempt from [the asbestos NESHAP].”

LEAD BASED PAINT (LBP)

- A. Any pre-demolition LBP inspection to determine the presence or absence of LBP in a pre-1978 house must be conducted by a trained, certified, and, if required, state-licensed lead inspector or risk assessor.
- B. The inspection report must identify all confirmed and suspect LBP, estimated quantities, and locations of peeling, flaking, or other damage.
- C. All painted surfaces and components within the interior or exterior portions of any structures at a site shall be inspected. At a minimum, samples must be collected using appropriate methodologies from any paints that are loose or flaking from the substrate. This includes any painted surfaces that may peel or be damaged as a result of the demolition process.
- D. Analysis of LBP samples must be completed by a lab accredited by NLLAP for LBP sample analysis.
- E. The inspection report must identify all confirmed and suspect LBP, estimated quantities, and locations of peeling, flaking, or other damage.

Although this specification divides the various waste streams, the pre-demolition survey may often be conducted by a single qualified individual or small team.

POLYCHLORINATED BIPHENYLS (PCBs)

- A. PCB inspections must be conducted by personnel experienced with hazardous and universal waste stream inspections.
- B. Suspect items shall be identified and quantified during the inspection. For large quantities of PCB-suspect oils, a sample shall be collected and analyzed by a NELAP-accredited lab. Depending on the impacted surface, wipe and/or bulk samples may also be required if there is evidence of spills or staining associated with PCB-suspect oil.
- C. For example, items that are suspect to contain PCBs in older buildings (e.g. pre-1980) include, but are not limited to oil associated with old electrical transformers, fluorescent bulb lighting, ballasts, caulks, paints, wood floor finishes, adhesives, elastic sealants, heat insulation, and capacitors in appliances.
- D. The inspection report must identify all confirmed and suspect PCBs, estimated quantities, and locations.

UNIVERSAL WASTES, HOUSEHOLD HAZARDOUS WASTES, AND GENERAL WASTES

- A. This section applies to all remaining items not covered in the ACM, LBP, or PCB inspection requirements described in the preceding sections. The inspection of universal wastes, household hazardous wastes, and general wastes must be conducted by personnel experienced with hazardous and universal waste stream inspections.
- B. Examples of items to inspect and quantify under this section include, but are not limited to:
 - 1. Mercury light switches.
 - 2. Mercury-containing thermostats.
 - 3. Mercury-containing gas pressure regulators.
 - 4. Batteries.
 - 5. Fluorescent, high-intensity discharge (HID), and low pressure sodium lamp bulbs.
 - 6. Refrigerant (found in air conditioners, refrigerators, freezers and dehumidifiers).
 - 7. Smoke detectors.
 - 8. Fire extinguishers.
 - 9. Compressed gas cylinders.
 - 10. Electronics.
 - 11. Chemicals.
 - 12. Pesticides.
 - 13. Paints.
 - 14. Solvents.
 - 15. Used oil.
 - 16. Fuels and fuel oil tanks.
 - 17. Biological waste (vermin, pigeon excrement).
 - 18. Medical waste (syringes).
 - 19. Mechanical equipment (lawn mowers, etc.).
 - 20. Scrap tires.
 - 21. Major appliances.
 - 22. Furniture.
 - 23. Mattresses.
 - 24. Controlled substances (pharmaceuticals or illegal substances).
 - 25. Household garbage.
- C. The inspection report must identify and quantify all waste streams identified during the pre-demolition survey.

This list is not intended to be exhaustive of all potential waste streams identified at a site. When in doubt, quantify materials and include in the inspection report for further consideration when developing the Waste Management Plan.

SALVAGEABLE AND RECYCLABLE ITEMS

- A. While conducting the pre-demolition survey, the inspection personnel shall also identify and quantify any items that may be salvaged or recycled prior to demolition. Table 1 in the Deconstruction specification may be useful in creating the inventory of salvageable and recyclable items.
- B. To be eligible for salvage or recycling, items must be free of hazardous or special waste streams as identified in the preceding sections. Items must also be able to be removed without disturbing or releasing any adjacent hazardous materials; otherwise, adjacent hazardous materials must be removed properly and in accordance with federal, state, and local regulations prior to removal of the salvageable or recyclable items.
- C. The contractor should contact the local building material reuse store to determine the local reuse store's policies on painted items (e.g. no flaking paint accepted). There may be state and local laws or regulations that address the management, handling, or sale of materials containing LBP.
- D. Salvageable materials may include:
1. Doors.
 2. Door frames.
 3. Millwork.
 4. Windows.
 5. Window frames.
 6. Porcelain fixtures.
 7. Brick.
 8. Wood flooring.
 9. Cabinets.
 10. Furniture.
 11. Major appliances.
 12. Hot water radiators.
 13. Hardware.
- E. Recyclable materials may include:
1. Metals from steel frames.
 2. Plumbing.
 3. Wiring.
 4. Wallboard.
 5. Carpeting.
 6. Roofing materials.
 7. Wood.
 8. Asphalt.
 9. Concrete.
 10. Appliances.
 11. Certain special wastes, such as electronics or scrap tires.
- F. The pre-demolition survey report should also identify what items are required to be removed for salvage or recycling prior to the demolition of the structure. This information will assist the contractor in developing the sequence of removal in the Waste Management Plan.

Older appliances are often energy inefficient and may not be good candidates for reuse. For information on responsible appliance disposal go to <http://www.epa.gov/rad/>

General Requirements

WASTE MANAGEMENT PLAN

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The city, county, land banks and other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for city, county, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in a city, county, or land bank's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the cities, counties, land banks and other entities to consider while developing bid specifications and contracts.

By including provisions concerning a Waste Management Plan in a bid specification for residential demolitions, a city, county, land banks and other entities would provide information to the Contractor to assist in the development of a Waste Management Plan for use in managing non-hazardous, hazardous, and special waste streams during demolition.

This section includes potential provisions for bid specifications on:

- Waste stream identification and disposition of wastes and materials, with an emphasis on material recovery.
- Coordination and sequencing of waste removal.
- Transportation, management, and disposal requirements for waste streams.
- Salvage, recycling, and disposal facility requirements.

REFERENCES

- A. State Specific Residential Cleanup Criteria.
- B. State Specific Disposal Requirements
- C. 40 CFR Part 61, Subpart M – National Emission Standard for Asbestos
- D. 40 CFR Part 82, Subpart F - Recycling and Emissions Reduction

- E. 40 CFR Part 257 and 40 CFR Part 258 - Non-Hazardous Waste
- F. 40 CFR Part 261 – Identification and Listing of Hazardous Waste
- I. 40 CFR Part 263 – Standards Applicable to Transporters of Hazardous Waste
- J. 40 CFR Part 264 – Standards for Hazardous Waste Treatment, Storage, and Disposal Facilities.
- K. 40 CFR Part 273 –Universal Waste Management
- L. 40 CFR Part 279 – Standards for the Management of Used Oil
- M. 40 CFR Part 745 - Lead-Based Paint Poisoning Prevention in Certain Residential Structures
- N. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions.
- O. 49 CFR Part 171 – Department of Transportation (DOT) General Information, Regulations, and Definitions.
- P. 49 CFR Part 172 – DOT Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.

CONTRACTOR REQUIRED SUBMITTALS

WASTE MANAGEMENT PLAN

- A. Develop a written Waste Management Plan prior to commencing any work on site and continue to implement, maintain, and enforce the plan until final demobilization from the site. Materials should be salvaged for subsequent sale or reuse and wastes should be recycled to the greatest extent possible. The development, implementation, and maintenance of the Waste Management Plan is solely the contractor’s responsibility and shall be submitted to the city, county, land bank, other entity or project owner for approval. Approval must be obtained prior to commencing any mobilization activities. The contractor’s Waste Management Plan, at a minimum, shall address the requirements in the following paragraphs.

Calculation Method
A waste diversion rate is calculated by dividing the weight of all materials salvaged or recycled with the total weight of all waste generated. Generally, materials removed as hazardous waste streams are exempt from the diversion rate calculation.
- B. The Waste Management Plan must demonstrate the contractor’s methods and procedures of meeting or exceeding the city, county, or land bank’s required waste diversion rate of __ percent. It shall be the goal of the contractor to minimize waste disposal in landfills to the greatest extent possible.
- C. Results of the pre-demolition survey will be provided to the contractor to assist in preparing the Waste Management Plan.
- D. Waste Stream Identification: The contractor shall utilize the inspection report from the Pre-Demolition Survey to identify the anticipated waste streams at each Site. These may include, at a minimum, the following:
 1. Items for salvage and resale (e.g. old-growth wood).
 2. Items for salvage and donation (e.g. doors).
 3. Items reused onsite (e.g. fencing).
 4. Materials for recycling off-site (e.g. metals).
 5. Materials recycled on-site (e.g. trees for chips).
 6. Worker-generated recyclable waste and general refuse.

A Waste Management Plan includes provisions for the inspection, sampling, removal, transportation, and disposal of previously identified materials of unknown composition that may be encountered during the demolition.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the “Purpose” portion of this section for an explanation of why the language appears as it does and how it might be useful.

7. Wastes for disposal.
8. Hazardous and special wastes:
 - a. Asbestos-containing material (ACM).
 - b. Lead-based paint (LBP).
 - c. Polychlorinated biphenyls (PCBs).
 - d. Mercury-containing equipment.
 - e. Major appliances.
 - f. Universal wastes.

Waste Management Plan 101

For residential demolition, it is essential for the contractor to identify the planned methods for abating, removing, staging, transporting, and disposing of various waste streams. The following list of questions may help clarify the basis of the Waste Management Plan:

- What are the identified waste streams?
- How will each waste stream be removed safely and legally?
- Can materials be salvaged or recycled?
- Where will waste streams be disposed?
- How will the material be transported?
- Who will transport the wastes?
- What special requirements should be considered in the plan?

E. For items identified for salvage, resale or donation, the contractor should contact the local building material reuse store to determine whether the reuse store is able to accept older materials that have been coated with LBP. There may be state and local laws or regulations that address the management, handling, or sale of materials containing LBP.

F. The Waste Management Plan shall identify each party responsible for implementation of specific requirements (e.g. asbestos abatement contractor, site superintendent, salvage firms) to ensure accountability.

G. Provide in the Waste Management Plan a figure or map which presents the delineation of all temporary staging areas for segregated waste streams.

In addition to training related to the Waste Management Plan, it is typical for a project to have a separate Health and Safety Plan that identifies health and safety training requirements.

H. Provide in the Waste Management Plan a discussion on containment procedures for removal and decontamination procedures for both equipment and personnel when handling various waste streams to prevent cross-contamination. Comply with the prohibition on intentional venting of refrigerants during the disposal of refrigeration and air conditioning equipment.

I. Coordination: The contractor shall establish lines of communication between the stakeholders, including the owner or city, county, land bank or other entity, abatement subcontractors, disposal facilities, site inspectors, and others as necessary. The contractor will be responsible for disseminating contact information, notifications, notification revisions, inspection reports, and all other pertinent information to all parties throughout the duration of the project. Alternatively, the contractor must ensure that another designated party conducts the duties of this paragraph.

J. Sequence: Upon identification of the anticipated waste streams at the site, the contractor shall present in the Waste Management Plan the intended sequence of removal operations. This sequence must identify any subcontractors that will be performing specific tasks, such as removal of items for salvage, and must identify potential conflicts of materials and tasks (e.g. ACM that needs to be abated and is located under a salvageable item).

K. Transportation and Disposal: Include in the Waste Management Plan identification of transporters; proposed salvage centers, recycling centers, and disposal facilities;

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methods of transportation and disposal; contingency plans for spills during transportation; and schedule for transportation and disposal. Identify requirements for waste profiling, sampling, and analyses that may be required by salvage, recycling, or disposal operations prior to acceptance of materials or waste.

- L. Transportation Routes: Include in the Waste Management Plan proposed transportation routes or alternate routes which will be used to transport materials to each disposal facility. Comply with applicable federal, state, and local regulations.
- M. Disposal Facility Requirements: Outline in the Waste Management Plan any of the following as applicable:
 - 1. Packaging requirements for shipments.
 - 2. Restrictions by waste stream which may cause rejection of transported materials.
 - 3. Restrictions on delivery schedules.
 - 4. Type and frequency of routine additional sampling and analysis of materials by waste stream, as required by each disposal facility.
 - 5. Additional sampling and analysis of materials that will be conducted by the disposal facilities during receipt of shipments to verify waste profiles.
- N. Salvage or Donation Center Requirements: Outline in the Waste Management Plan any of the following as applicable:
 - 1. Acceptance policy for materials.
 - 2. Restrictions and test requirements.
 - 3. Disposition of rejected materials.
- O. Recycling Operation Requirements: Outline in the Waste Management Plan any of the following as applicable:
 - 1. Packaging or processing requirements for incoming materials.
 - 2. Restrictions and testing requirements.
 - 3. Disposition of rejected loads.
 - 4. End use of materials.
- P. Newly Discovered Waste Streams: The Waste Management Plan should include procedures for handling newly discovered but unidentified or suspicious materials that is encountered during performance of work at the site. At a minimum, the requirements for sampling and laboratory analysis must be followed, as discussed in the “Pre-Demolition Survey” bid specification development. This requirement applies to ACM, LBP, polychlorinated biphenyls (PCBs), mercury-containing wastes, universal wastes, household wastes, non-hazardous wastes, or hazardous wastes.
- Q. Agency Approvals: Identify waste streams that will require pre-approval by a governing agency. Provide agency approvals to all stakeholders as they are received.
- R. Operating Licenses and Permits:
 - 1. All on-site refrigerant removal shall be conducted by an EPA certified technician using EPA certified refrigerant recovery equipment.
 - 2. Include letter from each proposed salvage, recycling, or disposal facility stating that it is in compliance with its federal, state, and local permits and that permits will remain current for the duration of the demolition and waste disposal activities and that the facility can accept the specified wastes under its operating permit.
 - 3. Include copies of valid operating licenses and permits from each transporter for each proposed transport vehicle or container.

- S. Security: Include in the Waste Management Plan a description of the security requirements that will be followed for waste streams on the site until the waste has left the site for salvage, recycling, or disposal.
- T. Records Management: Include in the Waste Management Plan provisions to create a list of all records that will be generated under the plan and identify the party responsible for maintaining the records.

QUALITY ASSURANCE

- A. Coordinate with the salvage, recycling, or disposal facilities to complete waste or material profiling prior to transport from the site.
- B. The Contractor shall provide waste characterization analytical results of materials scheduled for off-site disposal prior to transport from the site.
- C. As required by the selected salvage, recycling, or disposal facility for a given waste or material stream, continue to sample and analyze the materials to verify that the type and concentration level of contaminants remains within acceptable ranges.

REQUIRED MATERIALS

Requirements for the implementation of the Waste Management Plan are covered in the ‘Salvage and Recycling’ and ‘Waste Handling and Disposal’ bid specification development tools.

EXECUTION

Requirements for the implementation of the Waste Management Plan are covered in the ‘Salvage and Recycling’ and ‘Waste Handling and Disposal’ bid specification development tools.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the “Purpose” portion of this section for an explanation of why the language appears as it does and how it might be useful.

Waste Disposal

SALVAGE AND RECYCLING

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements that apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts. The goal of the Salvage and Recycling bid specification development tool is to provide information to the contractor to assist in the salvage and recycling of materials during the demolition process. The section includes:

- Salvage, which is the recovery of building materials for subsequent sale or reuse.
- Recycling, which is the collection, sorting, processing, and converting of solid wastes in preparation for reuse.

Information for Cities, Counties, Land Banks and Other Entities

The organization should consider evaluating and developing an incentive program for the allocation of revenues, savings, rebates, tax credits, and other incentives received in return for salvaging and recycling materials at the site. Examples of contractual benefits include increasing the contractor's share of the profits as the recovery rate increases or awarding additional future demolitions based on performance.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. State Specific Regulated Wastes
- C. State Specific Disposal Requirements
- D. 40 CFR Part 61, Subpart M – National Emission Standard for Asbestos
- E. 40 CFR Part 82, Subpart F - Recycling and Emissions Reduction
- F. 40 CFR Part 257 and 40 CFR Part 258 - Non-Hazardous Waste
- G. 40 CFR Part 261 – Identification and Listing of Hazardous Waste
- H. 40 CFR Part 261, Subpart C – RCRA Characteristic Hazardous Wastes
- I. 40 CFR Part 261, Subpart D - RCRA Listed Hazardous Wastes
- J. 40 CFR Part 263 – Standards Applicable to Transporters of Hazardous Waste
- K. 40 CFR Part 264 – Standards for Hazardous Waste Treatment, Storage, and Disposal Facilities

- L. 40 CFR Part 273 – Universal Waste Management
- M. 40 CFR Part 279 – Standards for the Management of Used Oil
- N. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
- O. 49 CFR Part 171 – Department of Transportation (DOT) General Information, Regulations, and Definitions
- P. 49 CFR Part 172 – DOT Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
- I. 40 CFR Part 264 – Standards for Hazardous Waste Treatment, Storage, and Disposal Facilities
- J. 40 CFR Part 273 – Standards for Universal Waste Management
- K. 40 CFR Part 279 – Standards for the Management of Used Oil
- L. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
- M. 49 CFR Part 171 – Department of Transportation (DOT) General Information, Regulations, and Definitions
- N. 49 CFR Part 172 – DOT Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
- O. 40 CFR 82, Subpart F-Recycling and Emissions Reduction
- P. 49 CFR Part 172 – DOT Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

Calculation Method

A waste diversion rate is calculated by dividing the weight of all materials salvaged or recycled with the total weight of all waste generated. Generally, materials removed as hazardous waste streams are exempt from the diversion rate calculation.

CONTRACTOR REQUIRED SUBMITTALS

- A. At the conclusion of the project, the contractor shall submit documentation for all materials that were salvaged or recycled according to the Waste Management Plan and this section. Documentation must demonstrate compliance with the required waste diversion rate as a percentage by weight, as defined in the ‘Waste Management Plan’ bid specification development tool. Methods for removal of salvageable and recyclable materials are included in the ‘Deconstruction’ bid specification development tool.

QUALITY ASSURANCE

- A. The contractor shall comply with the Waste Management Plan developed under the ‘Waste Management Plan’s bid specification development tool for all salvage and recycling activities.
- B. The contractor shall be aware of and confirm the operating hours of the salvage and recycling sites that will be utilized during the project. To the extent such operations must possess permits or licenses, the contractor will only use those facilities that possess the required permits or licenses.
- C. The contractor shall confirm that all hazardous materials have been removed prior to removing items for salvage or recycling. Any materials that are comingled with hazardous materials, such as asbestos or lead-based paint, must be handled and disposed as contaminated materials. As a result, contaminated materials are not allowed to be salvaged or recycled unless the hazardous contaminant can be removed in compliance with applicable regulations.
- D. The contractor shall ensure that all on-site air conditioning units, and any other refrigerant containing equipment such as appliances, are drained of refrigerant by a certified technician.

Generally, reselling of salvaged items and materials should not be conducted within or adjacent to the site, and materials should be transported off-site to the appropriate facility for resale or reuse.

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

Alternative to disposal of cleared woody debris from plants and trees, an on-site chipper may be used to generate wood chips for reuse on-site as landscaping or for resale to a local landscaper.

EXECUTION

- A. The contractor shall conduct all salvage and recycling activities in accordance with the Waste Management Plan developed under the 'Waste Management Plan' bid specification development tool.
- B. Prior to beginning demolition, train all site workers in the proper waste management procedures as detailed in the Waste Management Plan. The contractor will be responsible for disseminating revisions, addenda, notifications, or other information concerning changes to the Waste Management Plan to all site workers.
- C. Prior to beginning demolition, establish designated areas for segregated waste streams to be collected for salvage, recycling, or disposal.
- D. Materials shall be salvaged for subsequent sale or reuse to the greatest extent possible. Return reusable products to suppliers, such as pallets or unused products.
- E. Recycle as many of the demolition waste materials as possible that are not able to be salvaged or reused.
- F. The contractor shall provide appropriately sized and labeled containers for all items to be recycled. Items to be recycled shall include at a minimum the following:
 1. Packaging materials such as cardboard boxes and crates.
 2. Site-clearing wastes such as woody debris or chipped branches.
 3. Wood building materials such as lumber that is free of wood rot.
 4. Masonry and rock materials, including concrete.
 5. Major appliances.
 6. Aluminium cans, plastic bottles, and other recyclable wastes generated by site workers.
- G. Stockpile and store segregated wastes without comingling and secure materials to prevent generation of dust.
 1. Any material stockpiled must be handled in compliance with applicable local, state, and federal requirements.
- H. The contractor is responsible for the security of all wastes or salvaged items staged on site and should assess the need for additional security measures needed throughout the project.
- I. Remove and transport all salvaged and recycled materials to the appropriate resale, recycling, or disposal facility in accordance with the Waste Management Plan.
- J. Newly Discovered Waste Streams: Should any newly discovered unidentified or suspicious materials be encountered during the performance of work at the site, the requirements for sampling and laboratory analysis must be followed, as discussed in the 'Pre-Demolition Survey' bid specification development tool. This requirement applies to ACM, LBP, polychlorinated biphenyls (PCBs), mercury-containing wastes, universal wastes, household wastes, non-hazardous wastes, or hazardous wastes.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

Waste Disposal

WASTE HANDLING AND DISPOSAL

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition. Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Waste Handling and Disposal specification tool is to assist the contractor in executing the Waste Management Plan for all hazardous, special, and non-hazardous waste streams generated during demolition. This section does not include materials that are to be salvaged or recycled. The section includes: Execution requirements for the handling and disposal of hazardous, special, and non-hazardous waste streams

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. State Specific Regulated Wastes
- C. State Specific Disposal Requirements
- D. 40 CFR Part 61, Subpart M – National Emission Standard for Asbestos
- E. 40 CFR Part 82, Subpart F - Recycling and Emissions Reduction
- F. 40 CFR Part 257 and 40 CFR Part 258 - Non-Hazardous Waste
- G. 40 CFR Part 261 – Identification and Listing of Hazardous Waste
- H. 40 CFR Part 261, Subpart C – RCRA Characteristic Hazardous Wastes
- I. 40 CFR Part 261, Subpart D - RCRA Listed Hazardous Wastes
- J. 40 CFR Part 263 – Standards Applicable to Transporters of Hazardous Waste
- K. 40 CFR Part 264 – Standards for Hazardous Waste Treatment, Storage, and Disposal Facilities
- L. 40 CFR Part 273 – Universal Waste Management

- M. 40 CFR Part 279 – Standards for the Management of Used Oil
- N. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
- O. 49 CFR Part 171 – Department of Transportation (DOT) General Information, Regulations, and Definitions
- P. 49 CFR Part 172 – DOT Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

CONTRACTOR REQUIRED SUBMITTALS

- A. At the conclusion of the project, the contractor shall submit documentation for all waste that was not salvaged or recycled and was disposed at a landfill, incinerator (Waste-to-Energy or Energy-from-Waste facility), or treatment facility in accordance with the Waste Management Plan and this section, including all load tickets and waste manifests for hazardous, special, and non-hazardous wastes. Documentation must also prove compliance with the required waste diversion rate as a percentage by weight, as defined in the ‘Waste Management Plan’ bid specification development tool.

QUALITY ASSURANCE

- A. The contractor shall comply with the Waste Management Plan developed under the ‘Waste Management Plan’ bid specification development tool for all waste handling and disposal activities.
- B. The contractor shall confirm that disposal facilities receive wastes and maintain permits and compliance with all appropriate federal, state, and local requirements throughout the duration of the project.
- C. The contractor shall confirm that all hazardous materials have been removed prior to removing items for salvage or recycling, unless items or materials can be removed for salvage or recycling without disturbing hazardous materials. Any materials that are comingled with hazardous materials, such as asbestos or lead-based paint, must be handled and disposed as contaminated materials in accordance with the Waste Management Plan and this section.

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

EXECUTION

- A. The contractor shall conduct all waste handling and disposal activities in accordance with the Waste Management Plan developed under the ‘Waste Management Plan’ bid specification development tool.
- B. Prior to beginning demolition, train all site workers in the proper waste management procedures as detailed in the Waste Management Plan.
- C. Prior to beginning demolition, establish designated areas for waste streams to be collected that will not be salvaged or recycled for reuse. Isolate hazardous, special,

Additional provisions for the handling and disposal of asbestos-containing materials (ACM) waste are provided in the ‘Asbestos Compliance’ bid specification development tool.

Contractors should consider sizing and segregating non-hazardous materials prior to disposal in order to achieve the greatest savings in disposal fees, in accordance with the guidelines for each disposal facility or landfill.

and non-hazardous wastes from each other in an effort to prevent comingling.

- D. The Contractor shall salvage and recycle for resale and reuse to the greatest extent possible building materials that do not contain hazardous or special wastes, in accordance with the 'Salvage and Recycling' bid specification development tool.
- E. The Contractor shall supply labeled containers for each appropriate hazardous, special, and non-hazardous waste for proper disposal.
- F. As required by applicable regulations, stockpile and store segregated wastes without comingling.
- G. Hazardous and special wastes must be removed from the site in a timely manner and may not be stockpiled in quantities that exceed the size of the disposal container. Any material stockpiled must be handled in compliance with applicable local, state, and federal requirements. Containers with hazardous or special wastes must be labeled appropriately and those that remain onsite overnight must be locked and secured at all times. Hazardous and special wastes shall be characterized, manifested, and transported to the appropriate offsite disposal facility in accordance with the Waste Management Plan.
- H. The contractor must maintain a secure, clean, and orderly site and non-hazardous wastes that are not able to be salvaged or recycled shall not be allowed to accumulate on-site. Non-hazardous materials shall be transported to the appropriate off-site disposal facility in accordance with the Waste Management Plan.
- I. Newly Discovered Waste Streams: Should any undiscovered, unidentified, or suspicious building material become evident during the performance of the work at the site, the requirements for sampling and laboratory analysis must be followed, as discussed in the 'Pre-Demolition Survey' bid specification development tool. This requirement applies to ACM, LBP, polychlorinated biphenyls (PCBs), mercury-containing wastes, universal wastes, household wastes, non-hazardous wastes, or hazardous wastes.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

Waste Disposal

DECONSTRUCTION

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Deconstruction bid specification development tool is to provide information to municipalities and contractors for incorporating deconstruction practices into the residential demolition program and to encourage building material salvage, reuse, and recycling to the greatest extent possible. This section is for incorporating deconstruction into building demolition by disassembly of portions of a building and includes:

- Work Plan requirements for deconstruction.
- Deconstruction methods and requirements.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. 40 CFR Part 61, Subpart M – National Emissions Standards for Asbestos
- C. 29 CFR 1926 – OSHA Safety and Health Regulations for Construction
- D. GO Guide: “Deconstruction and Reuse”, published by the Delta Institute, October 2012.

CONTRACTOR REQUIRED SUBMITTALS

A. The contractor shall develop a deconstruction Work Plan which includes a section detailing planned procedures and methods for deconstruction. The Work Plan shall be submitted to the owner for review and approval prior to commencing work, and shall include the following deconstruction topics:

Order of Operations: Reminder to Contractors

The contractor should confirm that environmental hazards have been properly mitigated or abated prior to performing deconstruction or removal of items.

1. **Sequence of Deconstruction:** The schedule and order of significant deconstruction and removal activities shall be documented, including estimated dates. This list shall indicate any activities that will be conducted by subcontractors in order to highlight any activities that may overlap. The schedule should attempt to minimize any conflicts or overlaps in working areas in order to maximize efficiency. The Contractor must also maintain site security throughout the deconstruction process.
 2. **Inventory of Items to be Salvaged:** The inventory shall be based upon the results of the Pre-Demolition Survey and shall be provided to all site personnel, including subcontractors, to ensure that materials are not inadvertently damaged during adjacent work. The contractor shall provide photographic documentation of the condition of all items, material, or equipment that is to be salvaged for resale or donation and include photos and descriptions.
 3. **Qualifications and Experience:** The contractor shall provide documentation of previous residential deconstruction projects including the proposed site workers and their experience with deconstruction projects. This review and verification of qualifications will be part of the deconstruction Work Plan approval process. The owner will review and verify the qualifications and experience as part of the Work Plan approval process.
 4. **Salvage Markets:** The contractor shall identify proposed buyers, resellers, or other end-use facilities for items intended to be salvaged. A tracking system for all items should be established and outlined in the Waste Management Plan.
 5. **Waste Management Plan:** Ensure that elements of the deconstruction plans adhere to and incorporate the Waste Management Plan. Affirm adherence to meet the reuse and recycling diversion goals.
- B. Deconstruction permits must be obtained by the contractor with copies provided to the owner in areas where local or state regulations require such permits. The deconstruction permit may be in addition to a local or state demolition permit.
- C. Prior to contract closure, the contractor must submit documentation of the final disposal of all materials removed from the site, including landfill receipt tickets for demolition debris; hazardous waste manifests and landfill receipt tickets for hazardous wastes, ACM, or other wastes; and inventories and receipts for materials salvaged or recycled.

QUALITY ASSURANCE

- A. The contractor must ensure that all site personnel are trained and aware of deconstruction plans, procedures, and methods and will be responsible for disseminating revisions, addenda, notifications, or other information to all stakeholders, including municipalities, owners, abatement firms, removal technicians, oversight personnel, workers, or other subcontractors.
- B. At a minimum, training requirements for site personnel must include asbestos recognition and LBP awareness training.
- C. Utilize a professional engineer, architect, or other competent building professional to confirm that planned deconstruction methods and procedures will not compromise the structural integrity of the building during deconstruction.
- D. Conduct all asbestos-related work in accordance with 40 CFR Part 61 Subpart M and the 'Asbestos Compliance' bid specification development tool.
- E. Conduct all waste handling in accordance with all federal, state, and local laws, and the 'Salvage and Recycling' and 'Waste Handling and Disposal' bid specification development tools.

The municipality should determine prior to soliciting bids which party will be responsible for development of the communication plan and, if necessary, include it as a required submittal of the winning bidder.

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

EXECUTION

PREPARATION

- A. Review the Pre-Demolition Survey to ensure that any and all hazardous materials identified in the survey have been properly removed and recycled or disposed.
- B. Notify all appropriate utility agencies of planned deconstruction and confirm the service disconnection of all utilities present.
- C. Coordinate with the resellers, buyers, or other end-use facilities to determine the required or preferred condition, sizing, and packaging of materials. Ensure that all site workers are made aware of requirements.
- D. Install appropriate structural shoring as dictated by the professional engineer, architect, or other competent building professional during the structural inspection. Maintain, adjust, and remove shoring as needed throughout the deconstruction.

Deconstruction Sequencing Reminder

Prior to commencing deconstruction, ensure that appropriate waste inspections have been conducted for asbestos, lead-based paint, universal wastes, and/or other household waste streams. Hazardous wastes shall be addressed in accordance with applicable regulations.

- E. Install all temporary safety controls required prior to beginning deconstruction or removal activities.
- F. Confirm the existing condition of all items, materials, or equipment that is to be salvaged for resale or donation.
- G. Prepare printed material and a project sign to provide project information to neighboring residents and the local community, including contact information for the deconstruction project manager.

DECONSTRUCTION

- A. Conduct all deconstruction and removal actions in accordance with the provisions documented in the Work Plan and accounting for all items, materials, and equipment identified for removal.
- B. All removal methods and procedures must adhere to the OSHA Construction Industry Regulations in 29 CFR Part 1926, in addition to any other applicable federal, state, or local requirements. This includes utilizing methods to protect workers from exposure to animal wastes or biohazards that may be present at sites.
- C. Deconstruction shall proceed from upper levels to lower levels. Deconstruction must be complete on each level before any structural members may be removed from lower levels. Alternatively, if the contractor wishes to tip a building as a primary deconstruction technique, the Work Plan shall outline the procedures and any potential structural hazards must be identified prior to executing the work.
- D. In all cases stairways shall be removed last from each level. The contractor must maintain routes of egress for all site workers in the event of an emergency.
- E. Prior to disturbance, verify contents of any sealed or hidden spaces that were not accessible during the pre-demolition survey.
- F. Remove deconstructed materials from the structure in a timely manner. Do not allow excessive quantities to stockpile within the structure, thereby compromising the strength of the building components.
- G. Recovery of Materials:
 - 1. Remove and dispose of unsuitable materials in accordance with the Waste Management Plan. Unsuitable conditions include the presence of decay, infestation of termites or other vermin, or contamination with hazardous materials.
 - 2. Cut openings and holes plumb, square, and true to the required finished dimensions.
 - 3. Conduct all cutting and drilling from the exposed finished surface of the material to avoid damage to the existing finished surface.
 - 4. Remove and appropriately size structural members using methods to maintain the highest value.
- H. Newly Discovered Waste Streams: Should any newly discovered unidentified or suspicious material be encountered during the performance of work at the site, the requirements for sampling and laboratory analysis must be followed, as discussed in the

‘Pre-Demolition Survey’ bid specification development tool. This requirement applies to ACM, LBP, polychlorinated biphenyls (PCBs), mercury-containing wastes, universal wastes, household wastes, non-hazardous wastes, or hazardous wastes.

- I. Remove and transport all items, materials, and equipment in accordance with the Waste Management Plan and the ‘Salvage and Recycling’ and ‘Waste Handling and Disposal’ bid specification development tool.
- J. Obtain documentation confirming the final deposition of all items, materials, equipment, and waste that leaves the site.

TABLE 2: REUSABLE MATERIALS CHART

Item	What to Reuse	What to Recycle	What to Dispose	Potential Environmental & Health Concerns
Wood (lumber, flooring, and siding etc.)	Timbers, large dimension lumber, plywood, flooring, molding, lumber longer than 6 feet	Unpainted and untreated wood unfit for reuse	Painted, pressure-treated and rotting wood	Lead paint, structural integrity, asbestos, asbestos transite siding, vermiculite insulation and other
Windows	Windows in good condition (for single panes, consider adding storm windows)	Metal frames and screens, unpainted and untreated wood	Glass, painted items, wood in disrepair	Lead paint, asbestos in older window glazing compound, energy inefficiency
Cabinets	Cabinets, hardware (hinges and knobs)	Hardware, unpainted and unfinished wood	Unusable painted or finished wood	Lead paint, formaldehyde in particleboard or interior-grade plywood
Plumbing products	Sinks; tubs; faucets	Metal pipe, toilets, inefficient plumbing fixtures, faucets with lead content	PVC and other plastic pipe, toilet seats (not accepted at recycling stations)	Drinking water: lead content and asbestos wrap on pipes, in faucets, solder, and old galvanized pipe
Plaster and gypsum wallboard	Wallboard in good condition (to repair cracks or “skim coat”)	Clean wood lath, unpainted wallboard	Painted plaster or wallboard	Nuisance dust, lead paint or walls, possible asbestos in older wallboard, plaster and popcorn ceilings
Electrical products	Electrical products in good working order	Metals (fixtures, conduit)	Ceramic and plastic parts	Frayed wires, possible asbestos insulation
Landscape materials	Timbers, stone, concrete	Untreated, unpainted wood	Rotting, treated, and painted wood	Treated wood may contain arsenic, etc.
Non-wood flooring (tile, carpet, etc.)	Clean carpet in good condition	Large quantities of ceramic tile	Vinyl, stained carpet, broken tile	Asbestos content in tiles (especially 9-inch tiles) or sheet vinyl flooring, lead particles in dust in old carpet
Roofing materials and attic insulation (see Building Envelope guide for more details)	Sheathing in good condition, terra cotta or slate tiles	Metal materials, asphalt roofing materials, untreated cedar shingles	Treated cedar shingles	Possible asbestos content in roofing and vermiculite insulation

Source: Adapted from Delta Institute Go-Guide to Deconstruction and Reuse (October 2012). Previously developed from Salvage & Reuse, green home remodeling series, Chicago Department of Environment (October 2007). Originally developed by Seattle Public Utilities.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the “Purpose” portion of this section for an explanation of why the language appears as it does and how it might be useful.

Hazardous Materials Handling

ASBESTOS COMPLIANCE

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Asbestos Compliance bid specification development tool is encourage cities, counties, land and other entities to help ensure that all residential demolitions follow general best practices and the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations for asbestos whether or not the asbestos NESHAP is applicable to the demolition. This section includes:

- Provisions for asbestos.
- Coordination among stakeholders.
- Additional management practices for asbestos.

Provisions concerning the handling and disposal of asbestos-containing waste materials can be found in the Waste Handling and Disposal and Waste Management Plan bid specification development tools.

EPA explained at 55FR 48412 that “the demolition of one or more houses as part of an urban renewal project, a highway construction project, or a project to develop a shopping mall, industrial facility, or other private development would be subject to the [asbestos] NESHAP.”

REFERENCES

- A. State Specific Residential Cleanup Criteria and applicable local requirements
- B. State Specific Training, Licensure, Notification, and Removal Requirements for Asbestos
- C. State Specific Disposal Requirements for Asbestos
- D. 40 CFR Part 61, Subpart M – National Emissions Standards for Asbestos

CONTRACTOR REQUIRED SUBMITTALS

- A. The contractor is required to ensure that the demolition notification form for asbestos abatement is submitted to the appropriate U.S. EPA, state or local agencies, including any applicable fees, a minimum of 10 working days prior to beginning any asbestos removal work, which includes any activity that would breakup, dislodge, or disturb asbestos-containing materials (ACM). All required information on the form must be completed, and the inspection report from the ‘Pre-Demolition Survey’ should be reviewed and consulted in preparing the notification. If information on the notification changes, it shall be the responsibility of the contractor and owner/operator to ensure that revisions to the notification are submitted to the appropriate U.S. EPA, state or local agencies in a timely manner.
- B. The requirements in the notification form also apply to the owner and the operator of the demolition operation.

QUALITY ASSURANCE

- A. The basis for this specification section is the NESHAP regulation for asbestos, located at 40 CFR Part 61, Subpart M supplemented by additional practices not required by the regulation. Specifically, 40 CFR §61.145(a) requires a thorough inspection, as discussed in the ‘Pre-Demolition Survey’ bid specification development. The asbestos NESHAP also covers the requirements for notification and asbestos emission controls also known as work practices to be used when removing regulated ACM (RACM). In 40 CFR §61.150, waste handling, transportation, and disposal requirements are outlined, including a prohibition on visible emissions and shipping and disposal documentation.
- B. The contractor shall be familiar with the NESHAP regulation as it applies to reporting, recordkeeping, and ACM handling requirements for demolitions. This includes requirements for buildings that are determined by a State or local government Agency to be structurally unsound and in danger of imminent collapse. The requirements of the asbestos NESHAP are applicable throughout the entire project, including all demolition that follows asbestos abatement because previously undiscovered ACM could be discovered within a structure or at a site as demolition proceeds.
- C. Local ordinances or state laws may establish additional requirements related to asbestos and contractors shall check with local and state authorities to ensure they are aware of applicable requirements before beginning any demolition, deconstruction, or renovation activity.
- D. As a best practice, all work conducted at the site related to asbestos must be performed by personnel with sufficient experience in conducting similar asbestos work in residences. When required by federal or state regulations, all asbestos-related activities must be completed by accredited contractors and personnel. In addition, state regulations may require the contractors and personnel to obtain a state license for asbestos abatement activities.

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

EXECUTION

NOTIFICATION

- A. In addition to the notification requirements of 40 CFR Part 61 Subpart M, the contractor shall:
1. Provide the city, county, land bank or other entity that owns or controls the property copies of the licenses and accreditations for all personnel involved in the abatement work.
 2. Confirm in writing to the demolition contractor the procedures to be followed in the event that unexpected RACM is discovered or if Category II nonfriable ACM becomes friable.

COORDINATION

- A. A communication plan shall be established among all stakeholders of the project, including at a minimum, the owner (city, county, land bank or other entity), building inspectors, asbestos abatement firm, demolition contractor, salvage or recycling firm, universal waste technicians, waste haulers, and oversight personnel.
- B. The contractor shall coordinate distribution of contact information such that all stakeholders will receive copies of the notification forms, demolition permits, or revisions to notification forms. All stakeholders work to ensure that the requirements established within the NESHAP regulation, the site-specific demolition permit, and the methods described on notification forms are adhered to according to plan.

The city, county, land bank or other entity that is conducting the project should determine prior to soliciting bids which party, or parties, will be responsible for development of the communication plan and, if necessary, include it as a required submittal of the winning bidder.

It is common industry practice for independent, third-party oversight contractors or consultants to monitor the work conducted by the asbestos abatement contractors. As a best practice, oversight personnel should be provided with all project information in a timely manner.

REMOVAL

- A. The removal of all RACM in accordance with 40 CFR Part 61, Subpart M, and Appendix A to Subpart M, must be completed prior to commencing any demolition activities, except at facilities being demolished under an order of a State or local government agency, issued because the facility is structurally unsound and in danger of imminent collapse.
- B. If a facility has been determined by a state or local government agency to be structurally unsound and in danger of imminent collapse, RACM may be left in place during demolition provided that all applicable requirements in 40 CFR Part 61, Subpart M are followed for such situations.
- C. The contractor may schedule the salvage firm or others to work prior to or in coordination with the abatement firm, provided that all NESHAP requirements and OSHA health and safety requirements are met.
- D. Newly Discovered ACM: Should any newly discovered potentially asbestos-containing materials be encountered at the site, the requirements for sampling and laboratory analysis must be followed, as discussed in the 'Pre-Demolition Survey' section. The presence of newly discovered ACM may require a revision to notifications submitted previously or may require a new notice.

BEST MANAGEMENT PRACTICES

- A. The abatement firm should collect and filter all wastewater generated during the abatement process, including decontamination of personnel. Prior to discharge to public sewers the water must be filtered using a high-efficiency particulate air (HEPA) filter. Alternatively, the contractor should consult with the local Publicly Owned Treatment Works (POTW) to determine the acceptable discharge limit for asbestos.
- B. The contractor should provide at least one inspection viewing port that allows a clear view of as much of the asbestos removal work area as is feasible without requiring entry to a contaminated zone. The viewing port should be located between 4 and 6 feet above the floor level. When possible, multiple inspection ports may be installed to further improve oversight of removal operations.
- C. Samples collected by personal air monitors shall be analyzed with a one-day turnaround time or faster and results of all air samples shall be immediately distributed to the project stakeholders, including at a minimum oversight personnel and the city, county, land bank or other entity that owns or controls the property. Results of the samples shall be used to determine if improper removal techniques are being used frequently or consistently and whether work practices need to be amended to mitigate risk and exposure to site workers.
- D. To assist inspectors in confirming adequate wetting of waste materials, clear plastic shall be used on all layers of bagging for wrap-and-cut removals of RACM, in addition to the standard labeling requirements. Opaque or black plastic sheeting should be avoided.
- E. All asbestos waste containers shall be closed and locked at the end of each work shift. Waste containers that have reached capacity shall be hauled from the site for proper disposal the following work day at the latest.
- F. Fully executed waste manifests with all necessary signatures must be obtained by the contractor with copies provided to the city, county, land bank or other entity that owns or controls the property. for all shipments of asbestos waste.

Asbestos waste bags that contain metals or other items with value are at risk of being opened, with a resulting hazard of airborne asbestos. This risk can be minimized through effective security measures.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

Hazardous Materials Handling

MANAGING FUGITIVE DUST

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts. The goal of the Managing Fugitive Dust bid specification development tool is to provide requirements for the contractor to prevent workers and members of the public from being exposed to fugitive dusts that may be generated during demolition activities. Specific hazards in this section include:

- Lead-based paint (LBP).
- Polychlorinated biphenyls (PCBs).
- Other sources of hazardous dusts.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. State Specific Licensure Requirements for Lead
- C. 29 CFR 1910 Subpart Z: OSHA General Industry Standards for Toxic and Hazardous Substances
- D. 29 CFR 1926.62 – OSHA Construction Safety and Health Regulations for Lead
- E. 40 CFR Part 745 - Lead-Based Paint Poisoning Prevention in Certain Residential Structures
- F. 40 CFR Part 761 – Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions

CONTRACTOR REQUIRED SUBMITTALS

- A. The contractor shall include in the Fugitive Dust Work Plan a section detailing the planned procedures, controls, and methods to handle potential fugitive dust. The inspection report, as discussed in the 'Pre-Demolition Survey' bid specification development tool, shall be used by the Contractor to develop procedures, controls, and methods for mitigating hazards associated with LBP and PCBs.

QUALITY ASSURANCE

- A. All lead-related work must be performed by personnel with sufficient experience in conducting lead-related work in residences. When required by federal or state regulations, all lead-related activities must be completed by appropriately licensed or certified lead professionals and/or firms.

For lead removals and abatement work not subject to 40 CFR 1926.62 (OSHA Lead Standard), in addition to any state-specific regulations, contractors should consider following those practices.
- B. The contractor shall confirm that all asbestos, LBP or PCB removal operations and abatements have been completed prior to proceeding with demolition activities. If LBP in good condition remains on structure substrates, the Contractor must ensure that the demolition methods do not create hazardous dust in violation of this specification.
- C. At no time may any workers be exposed to lead in excess of the permissible exposure limit (PEL) of 50 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$).
- D. At no time may any workers be exposed to PCBs in excess of the PEL of 0.5 milligrams per cubic meter of air (mg/m^3).

REQUIRED MATERIALS

There are no required materials to be provided for the completion of the work within this specification.

EXECUTION

GENERAL DUST CONTROL

- A. The contractor shall keep dust down at all times, including nonworking periods. Soil at the site and other areas disturbed by demolition activities should be sprinkled with water. Conduct demolition activities using methods that minimize the generation of dust.

The use of water to control fugitive dust is only appropriate after hazardous materials such as lead and asbestos have been removed from the building as required.
- B. The contractor must prevent airborne dust from dispersing into the atmosphere and impacting surrounding property.
- C. Maintain adequate water supply. This may require a water tank truck if insufficient water is available on site. Equipment used to apply water shall, at a minimum, consist of a tank, a spray bar, and a gauge-equipped pump.

The best method for meeting the requirements of the OSHA Lead Standard is to conduct no dust-generating activities on lead-containing surfaces. This also guarantees protection of workers.

LEAD BASED PAINT

- A. If the Pre-Demolition Survey identifies paints containing lead, such materials must be handled and disposed properly to protect health of workers and neighboring residents.
- B. The contractor shall not conduct grinding, sanding, abrasive blasting, welding, cutting, torch burning, or any other activity that may create dust from surfaces covered with known lead-based paint or with paints that have not been adequately characterized.
- C. To meet the requirements of the OSHA Lead Standard, the contractor must institute appropriate work practices, engineering controls, administrative controls, and mechanical ventilation to ensure that worker exposure to lead does not exceed the permissible exposure limit.
- D. If work practices are unavoidable on lead-containing surfaces, the contractor will be required to conduct an exposure assessment, as described in the OSHA Lead Standard, Paragraph (d), to determine appropriate personnel protective equipment (PPE), including respirators, for workers.
- E. When respirators and air monitoring are determined to be required according to the results of the exposure assessment, the contractor must provide a written plan for air monitoring and respiratory protection plan, and descriptions of the work practices, engineering controls, and administrative controls.

POLYCHLORINATED BIPHENYLS

- A. If the Pre-Demolition Survey identifies dusts or other PCB-containing materials with concentrations of PCBs that are PCB wastes under 40 CFR 761.50(b), such wastes must be disposed of according to the PCB regulations. For more information on PCB-contaminated building materials, see <http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/pdf/wste-memo 102412.pdf>.
- B. The contractor shall not conduct grinding, sanding, abrasive blasting, welding, cutting, torch burning, or any other activity that may create dust from surfaces that have been confirmed to be contaminated with PCBs or which have contain or be in contact with PCB-containing liquids, oil, waste, or debris.
- C. In addition to the removal requirements and activity restrictions, the contractor must provide for appropriate provisions for personal protective equipment (PPE) for site workers that may be in contact with PCB-impacted materials as well as any appropriate air monitoring to be used to indicate concentrations of airborne dust.

For residential demolitions with PCB-impacted materials, the city, county, land bank, other owner or contractor may wish to employ the services of a third-party consultant to ensure proper contaminant remediation. Additional EPA information on safe PCB removal activities is available at: www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/caulk/guide/guide-sect4.htm

Earthwork

IMPERVIOUS SURFACE REMOVAL

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Impervious Surface Removal bid specification development tool is to ensure that contractors use safe methods to remove asphalt and concrete slabs and basement foundations while eliminating impedances to stormwater infiltration at the site. The section includes details on:

- Excavation safety.
- Basement foundation removal.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. Local utility standards when working within 24 inches of utility lines
- C. 29 CFR Part 1926, Subpart P: OSHA Construction Industry Regulations for Excavations

Utility Clearance: Call Local Utility Line Information service at 811 not less than three working days before performing work.

CONTRACTOR REQUIRED SUBMITTALS

- A. There are no contractor required submittals for this specification.
 1. Excavation safety competent personnel.
 2. Methods for eliminating or minimizing the amount of time workers will be within the excavation.
 3. Sloping, sheeting, shoring, or bracing plan for excavation walls.

4. Equipment to be used within excavations for placement and compaction in accordance with the 'Placement of Fill' bid specification development.
5. Closest emergency medical facility, driving routes, and contact information.

QUALITY ASSURANCE

- A. The contractor will perform work in accordance with Federal, state, and local environmental regulations.
- B. Prior to performing work under this section, the Contractor will be responsible for verification that asbestos-containing materials (ACM) and other identified hazardous wastes or materials have been removed from the structure in accordance with the 'Waste Handling and Disposal' and 'Asbestos Compliance' bid specification development tools.
- C. Upon removal of subsurface impervious structures, the Contractor shall conduct compaction of the exposed subgrade soils in accordance with the 'Placement of Fill' bid specification development tool.

REQUIRED MATERIALS

The contractor is required to provide subsoil, compost, and topsoil fill as specified in the 'Soils for Earthwork' bid specification development tool.

EXECUTION

EXCAVATION PROTECTION

- A. For all excavations, utilize equipment and methods to eliminate or minimize the amount of manual labor to be conducted within the excavation.
- B. Slope, sheet, shore, or brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding soil.
- C. Design sheeting, shoring, or bracing to be removed at completion of excavation work.
- D. Repair damage caused by failure of the sheeting, shoring, or bracing and for the settlement of filled excavations or adjacent soil.
- E. Repair damage that results from settlement, water or earth pressure, or other causes resulting from inadequate sheeting, shoring, or bracing.
- F. If leaving open excavations at the end of the work day, protect the perimeter to prevent danger to others.

Note: Pursuant to OSHA, excavations deeper than 5 feet in all types of earth must be protected from cave-in and collapse. Excavations less than 5 feet deep are exempt, unless inspection by a competent person indicates that hazardous ground movement is possible. OSHA excavation information can be found at: <https://www.osha.gov/doc/outreachtraining/htmlfiles/excavate.html>

PREPARATION

- A. Notify utility company to remove and relocate utilities, as needed.
- B. Confirm that all identified hazardous wastes and substances, including ACM, have been removed from basement and other subgrade structures. Guidelines for ACM removal is included in the 'Asbestos Compliance' bid specification development tool.
- C. Protect any utilities that will remain from damage. The contractor will be responsible for repairing any damage.

Removal of basements and other impervious surfaces can disturb asbestos containing materials (ACM). Friable and non-friable ACM may need to be removed prior to any activity, including disposal, that would disturb the ACM.

- D. Protect plant life, lawns, and other features remaining as a portion of final landscaping, in accordance with the ‘Soil Stabilization and Seeding’ bid specification development tool. The contractor will be responsible for repairing any damage.
- E. The contractor shall provide effective dust control that does not interfere with the establishment of a vegetative cover by sprinkling water or using other approved methods. Dust control must be sufficient to prevent visible emissions.

REMOVAL

- A. Removal of subsurface impervious structures includes basement foundations and walls, foundation slabs, asphalt driveways or walkways, concrete driveways or walkways, garage slab foundations, underground pool linings, or any other structure located below grade that does not normally allow water to penetrate through the material and which may impede future development of the site.
- B. Removal of the subsurface impervious surface and structures identified in the previous paragraph shall be removed in their entirety. Alternatively, the city, county, land bank or other entity that owns or controls the property may elect to limit removal to extend only 4 feet below existing grades, in accordance with the state specific removal requirements for residential demolition work.
- C. Do not perform excavation, grading, or compaction when weather conditions or the condition of the materials are such that work cannot be performed satisfactorily.
- D. Where an excavation is deeper than specified, the area shall be backfilled to the proper grade with subsoil fill and compacted in accordance with the ‘Placement of Fill’ bid specification development tool.
- E. Protect excavations from freezing using tarps, straw, or heating devices when necessary. Material that becomes frozen shall be removed, reworked and recompacted.
- F. Concrete, asphalt, or other large pieces of subgrade structures to be removed under this section shall be appropriately sized for transport. For concrete, demolish in sections. Use power-driven saw to cut area perimeters and regular intervals prior to removal.
- G. The Contractor should minimize the quantity and duration of any stockpiled material prior to transport to the final disposal facility.
- H. Additional guidelines are included in the ‘Waste Handling and Disposal’ bid specification development tool.

The bid solicitor may want to require that the contractor immediately STOP WORK and notify the city, county, land bank or other entity that owns or controls the property. If unidentified features or materials are discovered during the removal work of this section. This may include underground storage tanks (USTs), underground utilities, old foundations, or suspect ACM.

SITE CLEANLINESS

- A. Clean adjacent structures and surfaces of dust, dirt, and debris caused by demolition operations and return adjacent areas to pre-demolition conditions.

Earthwork

SOILS FOR EARTHWORK

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts. One goal of the Soils for Earthwork specification tool is to ensure that contractors provide environmentally-clean material and appropriate types of fill that provide the greatest potential for plant growth and stormwater infiltration and percolation. Another goal is to ensure that new materials brought to the site help make the site usable for a wide variety of future uses. The section includes:

- Required subsoil materials (General Fill-Sand).
- Required compost materials.
- Required topsoil materials.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
- C. 40 CFR Part 503 - Standards for Use and Disposal of Sewage Sludge
- D. Integrated Management Practices Standards and Specifications – Soil Amendments, 2003; Low Impact Development Center
- E. Recommended Test Methods for the Examination of Composting and Compost, August 2001; US Composting Council
- F. Maine Department of Agriculture, Chapter 56 – Standards for Compost Products
- G. U.S. EPA Comprehensive Procurement Guidelines for Landscaping Products

CONTRACTOR REQUIRED SUBMITTALS

- A. Materials Source Report prepared by an Environmental Professional for imported general fill, compost, and topsoil materials: The report at a minimum must define the location, volume, and current and historic uses of the fill source material to determine if the potential for any soil contamination is present.
- B. A certified Environmental Testing Laboratory shall perform analysis of samples collected by an Environmental Professional and the data must be tabulated and compared to the applicable residential state cleanup standards. The results of this comparison shall be submitted in writing to ____.
 - 1. General Fill material based on the prior use of the general fill and at a frequency of one sample per ____ cubic yards.
 - 2. Compost at a frequency of one per ____ cubic yards.
 - 3. Topsoil at a frequency of one per ____ cubic yards.
- C. Manufacturer's Certificate: Certify soils/fill/compost meet or exceed specified requirements.

Alternate to Item B: contractor provides a generator's certification that materials are from a virgin source (example: quarry sand used for General Fill) or recent data/sampling results from the source owner.

QUALITY ASSURANCE

- A. Contractor will furnish subsoil, compost, and topsoil material from a single source per material throughout the work.
- B. Contractor will perform work in accordance with federal, state, and local environmental regulations.
- C. Laboratory analysis will be conducted on the general fill and topsoil to be used for the placement at residential sites. At a minimum, the source fill material should be sampled and analyzed for Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), RCRA metals, and pH. Additional analysis such as asbestos or radiological testing may be required based on the prior use of the fill source or state specific testing requirements. The number of samples will depend on the volume of fill being used from each source location. The source location will be surveyed and sampled at a frequency of one sample per ____ cubic yards. Laboratory analytical results and photographs of the sample locations will be included as an attachment to the source report discussed in Section A of Contractor Required Submittals.
- D. All imported soil and topsoil shall meet applicable state or local residential and ground water protection criteria.

REQUIRED MATERIALS

The contractor is required to provide the following types of materials as part of the project. See specification section 'Placement of Fill' for information on how each material is to be placed.

- A. SUBSOIL MATERIALS (General Fill Sand)
 - 1. Sand shall be sourced from a virgin quarry or from a borrow source.
 - 2. Graded.
 - 3. Conforming to ASTM D2487 Group Symbol SP.
 - 4. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris (including any construction or demolition rubble, or other man made items).
 - 5. Less than 5 percent silt, clay, or rock material by dry weight.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

B. COMPOST MATERIALS

1. Mature, stable, weed free, and produced by aerobic decomposition of organic matter.
2. Compost feedstock may include, but is not limited to:
 - a. Green material consisting of chipped, shredded, or ground vegetation.
 - b. Clean, processed, recycled wood products;
 - c. Exceptional Quality Class A Biosolids as defined in 40 CFR, Part 503.
 - d. Yard trimmings;
 - e. Source-separated municipal solid waste.
3. Must not contain any visible refuse or other physical contaminants, substances toxic to plants, or over 5 percent sand, silt, clay, or rock material by dry weight. Other deleterious material, plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.
4. Must possess no objectionable odors.
5. The compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life.
6. Good thermophilic composting practice. A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed.
7. Particle Size: Must pass through 1-inch screen or smaller.
8. Soil Reaction Range in pH of 5.5 to 7.5.
9. Moisture content of 35 percent to 55 percent. The moisture level shall be such that no visible water or dust is produced when handling the material and the material shall not be saturated. Moist samples of compost on an as-received basis shall be dried in an oven at a temperature between 105°C and 115°C until a constant dry weight of the sample is achieved. The percentage of moisture will be determined by dividing the dry weight of the sample by the moist weight of the sample and then multiplying by 100.
10. The compost shall measure a minimum of 6 on the maturity and stability scale. Material shall be stable to highly stable, thereby providing nutrients for plant growth. Screening of material must pass maturity tests or demonstrate its ability to enhance plant growth. In other words, nutrients shall not be of a form or concentration that would burn seeds or planting stock, or otherwise impede or prevent plant growth. For example, compost shall be tested for maturity and stability with a gaseous test that measures carbon-dioxide (CO₂) and ammonia (NH₃), which are the two most common gaseous emissions of composting materials. High rates of emission of either or both gases are indicative of an unstable, unfinished compost that is still actively degrading .
11. Soluble salt concentration may vary but must be reported, with a preferred salt content of 2.5 decisiemens per meter (dS/m) or millimhos per centimeter (mmhos/cm) for the soil/compost blend. The soluble salt concentration of the amended soil should not exceed approximately 1.25 dS/m where seeds, young seedlings, or salt-sensitive crops are to be planted.

C. TOPSOIL MATERIALS

1. Topsoil shall be sourced from a clean borrow source or supplier.
2. Friable Sandy Loam that can be pulverized under normal hand pressure.
3. Sandy Clay Loams with the lowest possible clay proportion may also be acceptable.
4. Conforming to ASTM D2487 Group Symbol SM.
5. Free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds and foreign matter (including any construction rubble, or other man-made items).
6. Screening: Single screened.
7. Acidity range (pH) of 5.5 to 7.5.
8. Containing minimum of 4 percent and maximum of 25 percent organic matter.

Sandy Loam: Soil having this texture consists of soil materials containing somewhat less sand, and more silt plus clay, than loamy sands. As such, they possess characteristics which fall between the finer-textured sandy clay loam and the coarser-textured loamy sands. Many of the individual sand grains can still be seen and felt, but there is sufficient silt and/or clay to give coherence to the soil so that casts can be formed that will bear careful handling without breaking.
(University of Florida, IFAS, <http://edis.ifas.ufl.edu/ss169>).

EXECUTION

EXCAVATION

- A. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.
- B. The contractor shall provide effective dust control by sprinkling water, using calcium chloride or other dust suppressants, or using another approved method. Employ dust control sufficient to prevent visible emissions, including from open excavations and from trucks hauling material to or from the site.

Earthwork

PLACEMENT OF FILL

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts. The goal of the Placement of Fill specification tool is to ensure that contractors install fill materials in a manner sufficient to provide the greatest potential for plant growth and stormwater infiltration and percolation while preventing settling and consolidation. This work will also consist of incorporating compost within the root zone in order to improve soil quality and plant growth. This specification applies to all types of plantings, including trees, shrubs, vines, ground covers, and herbaceous plants. The section includes:

- Backfilling building basements/voids to subgrade elevations with subsoil.
- Applying compost.
- Applying topsoil.

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. Local utility standards when working within 24 inches of utility lines.
- C. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.

Utility Clearance: Call Local Utility Line Information service at 811 not less than three working days before performing work.

- D. ASTM D2922 – Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- F. 29 CFR Part 1926.650 – OSHA Excavation and Trenching Standard
- G. Iowa Stormwater Management Manual 2E-5 Soil Quality Restoration, Version 3, October 2009; Iowa State University – Institute for Transportation.

CONTRACTOR REQUIRED SUBMITTALS

- A. Results of Compaction Testing for Density and Moisture.

QUALITY ASSURANCE

- A. Contractor will perform work in accordance with federal, state, and local environmental standards.
- B. Top Surface of General Backfilling: Plus or minus 1 inch from existing adjacent elevations.
- C. Contractor will perform laboratory material tests in accordance with the ‘Soils for Earthwork’ bid specification development tool.
- D. The contractor’s independent testing firm will perform in-place compaction tests in accordance with the following:
 1. Density Tests: ASTM D1556 or ASTM D2922.
 2. Moisture Tests: ASTM D3017.
- E. Frequency of Tests by contractor: At least 1 in-place density test and 1 in-place moisture content determination will be made for every 5,000 square feet of each lift of subsoil placed.
- F. When results of compaction tests indicate that the specified requirements are not met, contractor will remove the backfill, replace, and retest.
- G. Compaction Requirements: Subgrade and subsoil shall be compacted to 95 percent of the standard maximum dry density as determined in accordance with ASTM D698.

Alternate Compaction Requirements:
 With approval of the property owner, the contractor may elect not to complete specified compaction tests. As an alternative, the contractor will use on-site equipment to manually compress subgrade prior to backfill. Manual compaction will also be conducted for each 12-inch lift of subsoil placement. The use of alternate compaction methods shall yield a dense, stable, and unyielding compacted mass. The contractor shall document compaction and provide a summary to the owner in lieu of the testing results that proves the equipment and methods used.

REQUIRED MATERIALS

- A. Subsoil, compost, and topsoil fill: As specified in ‘Soils for Earthwork bid specification development tool’.

EXECUTION

PREPARATION

- A. Remove debris, snow, ice, water, soft soils, organic materials, or frozen ground from areas to be backfilled.
- B. The contractor shall provide effective dust control by sprinkling water, using calcium chloride or other dust suppressants, or using another approved method. Employ dust control sufficient to prevent visible emissions.
- C. Proof roll to identify soft spots in subgrade. Backfill with subsoil and compact to density equal to or greater than requirements for subsequent fill material.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the “Purpose” portion of this section for an explanation of why the language appears as it does and how it might be useful.

1. Cut out soft areas of subgrade not capable of compaction in place. Backfill with subsoil material and compact to density equal to or greater than requirements for subsequent fill material.
- D. Compact existing subgrade to 95 percent density to prevent subsequent backfill materials from settling.
- E. Scarify subgrade surface to a depth of 3 inches.
- F. Never compact, place fill, or perform deep tilling under the drip line of trees to be saved.
- G. Existing compacted urban fill areas shall be tilled to a minimum depth of 4 inches before the addition of compost and topsoil.
- H. Perform deep tillage (4 inches to 8 inches) when soil moisture is optimum (moisture content of approximately 40 percent by mass). Stop tillage if soil is clumping, slaking, or smearing. Allow soil to dry before continuing.
- I. Use ripping tillage tools when tilling. Do not use rotary tillage as this breaks down soil structure, kills worms, and creates small pore spaces that can reconsolidate.

Typical Methods for Basement Backfill

1. Excavate basement and other impervious surfaces.
 2. Compact existing subgrade.
 3. Backfill with subsoil to within 6 inches of existing top grades; compact each 12-inch lift.
 4. Apply 1 inch of compost.
 5. Conduct tilling using ripping tools to a depth of 4-6 inches.
 6. Place topsoil:
 - a. 6 inches over all backfilled areas.
 - b. As needed over all other areas to fill voids and to ensure plant growth.
 7. Immediately seed entire site.
- NOTE: Never compact, place fill, or perform deep tilling under the drip line of trees to be saved.

COMPACTION OF SUBSOIL

- A. Apply uncontaminated water as necessary during compaction to obtain specified density. If material to be compacted is excessively moist, aerate with suitable equipment and methods until the moisture content is corrected. In areas not accessible to rolling equipment, compact material to specified density with mechanical tampers.
- B. Do not direct jets of water at fill with such force that finer materials will be washed away or larger structures will be broken down.
- C. Compaction Equipment: The type, size, and efficiency of compaction equipment shall be capable of achieving specified degree of compaction. When operating equipment adjacent to structures, the contractor shall exercise care so as not to cause damage or displacement of the structure.
- D. Upon completion of backfilling, remove excess material and debris from work areas and travel routes.
- E. If subsoil lifts are subject to vehicular traffic, reshape and re-compact fills to ensure consistent compaction across the area.

SUBSOIL BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Place subsoil material in equal continuous layers not exceeding 6 inches of compacted depth.
- D. The surface of previously completed lifts shall be scarified and/or moistened by sprinkling, as required, to ensure that a proper bond is achieved with the subsequent lift of subsoil.
- E. Maintain optimum moisture content of subsoil materials in order to attain required compaction density and to ensure there is no visible dust and no visible water.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

- F. Make gradual grade changes. Blend slope into level areas.
- G. Employ placement method that does not disturb or damage other work.
- H. Slope grade away from nearby structures a minimum 2 inches per 10 feet, unless noted otherwise.
- I. Make gradual grade changes. Blend slope into level areas.
- J. Remove surplus subsoil materials from the site.

APPLYING COMPOST

- A. Use low ground-contact pressure equipment for spreading compost to ensure stormwater infiltration.

A method to meet this requirement may include using manual labor with wheelbarrows and shovels. In no case may the equipment used be larger than a skid steer.

- B. Compost shall be uniformly applied over the planting area at an average depth of 1 to 2 inches.
 1. The landscape architect or engineer shall specify the final compost inclusion rate depending upon soil conditions and quality, plant tolerances, and producer's recommendations. The use of stable, nutrient rich composts will reduce initial fertilizer requirements by the amount of available nutrients in the compost.
 2. The landscape architect or engineer shall limit the application of nitrogen and phosphorous in the compost recommendations.
- C. Incorporate uniformly to a depth of 4 to 6 inches using ripping tools or other appropriate equipment to help prevent re-consolidation of tilled soil. Do not use rotary tillers.
- D. Never compact, place fill, or perform deep tilling under the drip line of trees to be saved.
- E. Pre-plant fertilizer and pH adjusting agents (e.g., lime and sulfur) may be applied in conjunction with compost incorporation, as necessary.

Optional Soil Analysis: Before any soil preparation procedures ensue, a soil analysis may be completed by a reputable laboratory to determine any nutritional requirements, pH, and organic matter adjustments necessary. Once determined, the soil can then be appropriately amended to a range suitable for all plant species to be established.

PLACING TOPSOIL

- A. Use low ground-contact pressure equipment for spreading compost to ensure stormwater infiltration. A method to meet this requirement may include using manual labor with wheelbarrows and shovels. In no case may the equipment used be larger than a skid steer.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Apply topsoil at an average settled depth of 6 inches over excavated areas following application of compost.
- D. For areas outside of the extents of excavation, apply sufficient topsoil as needed to fill voids and depressions and to ensure successful plant growth.
- E. Remove vegetative material and foreign non-organic material from topsoil while spreading.
- F. Grade topsoil to eliminate rough, low, or soft areas, and to ensure positive drainage.
- G. Use a RockHound, Harley, or similar landscape rake to make final topsoil surface smooth. The soil surface shall also be reasonably free of large clods, roots, stones greater than 2 inches, and other material which will interfere with planting and subsequent site maintenance. Do not compact surface prior to seeding. Minor surface irregularities, divots, and dents may remain in order to capture rainfall.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

- H. During placement near plant material, buildings, and pavement, use manual methods to prevent damage.
- I. Immediately seed in accordance with the 'Soil Stabilization and Seeding' bid specification development tool.

PROTECTION OF FINISHED WORK

- A. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- B. Do not re-compact the site while top dressing or placing compost.
- C. Immediately seed and provide erosion control matting according to the 'Soil Stabilization and Seeding' bid specification development tool.
- D. Prohibit traffic from landscaped areas, using temporary fencing as needed.
- E. Reshape and re-compact fills subjected to vehicular traffic.

RESTRICTIONS

- A. Do not perform excavation, grading, or compaction when weather conditions or the condition of the materials are such that work cannot be performed satisfactorily.
- B. After occurrence of heavy rains, do not operate equipment in active earthwork areas until the material has dried sufficiently to prevent occurrence of excessive rutting.
- C. Keep excavations free of water and protect from freezing using tarpaulins, straw, or heating devices when necessary.
- D. Protect plant life, lawns, rock outcroppings and other features remaining as portion of final landscaping through the use of colored markings, temporary fencing, or other means as deemed appropriate by the contractor.
- E. Do not disturb soil within the branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.
- F. Compact each layer before placing succeeding layers to the density specified in the Quality Assurance section or the alternate density specified by the property owner.
- G. Employ placement method that does not disturb or damage other work. Do not dump directly against installations. The contractor shall be required to maintain site cleanliness during all backfill operations.

Earthwork

GRADING

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Grading bid specification development tool is to provide information to the contractor for finish grading on lots, and especially to establish grading practices appropriate for the installation of green infrastructure features in the final landscape plan for properties following residential demolition. The section includes

- General Grading Guidelines.
- Special grading requirements for stormwater management (e.g. rain gardens, bioswales).

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. Local utility standards when working within 24 inches of utility lines

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

Property Owners:

The application and use of this section will need to be determined on a site-by-site basis. Topography, location of adjacent structures, size of parcels, and existing landscaping to remain will all impact whether a site is suitable for green infrastructure features since there are special grading requirements for runoff management practices like rain gardens or bioswales. During the planning phases of residential demolition and prior to bidding, the city, county, land bank or other entity that owns or controls the property should define whether a combination of some, all, or none of these grading needs will be included in the scope of work. Other regional entities may also be consulted for contribution of resources to help install green infrastructure features.

- C. Rain Garden Manual for New Jersey, April 2005; The Native Plant Society of New Jersey
- D. RainGardens.org; West Michigan Environmental Action Council
- E. Vegetated Infiltration Swales Technical Standard 1005, May 2007; Wisconsin Department of Natural Resources
- F. Vegetated Swales, Storm Water Technology Fact Sheet, September 1999; United States Environmental Protection Agency.
- G. Storm Water Management Handbook for Construction Activities, 2006 Edition; City of Houston, Harris County, and Harris County Flood Control District

CONTRACTOR REQUIRED SUBMITTALS

- A. The contractor’s Work Plan shall include a section for green infrastructure features that may be installed at a site, which will likely correspond with the seeding and planting elements of the Work Plan, as included in the ‘Soil Stabilization and Seeding’ specification. The plan should highlight the following:
 1. Layout of all proposed green infrastructure features in plan view.
 2. Direction of stormwater flow.
 3. Backfilled excavation areas.
 4. Areas to remain undisturbed.
 5. Existing vegetation to remain.

QUALITY ASSURANCE

- A. Contractor will perform work in accordance with federal, state, and local environmental regulations.
- B. Top Surface of Topsoil Placement: Plus or minus 1 inch from existing adjacent elevations.
- C. Contractor will perform laboratory material tests in accordance with the ‘Soils for Earthwork’ bid specification development tool.
- D. Contractor’s independent testing firm will perform in-place compaction tests in accordance with the ‘Placement of Fill’ bid specification development tool.

REQUIRED MATERIALS

- A. The contractor is required to provide subsoil, compost, and topsoil fill as specified in the ‘Soils for Earthwork’ bid specification development tool.

EXECUTION

GENERAL GUIDELINES

- A. In areas where no backfill is conducted and no green infrastructure features are to be installed, final grades shall be in accordance with the following requirements:
 1. Contractor shall compact subgrade and subsoil in accordance with the ‘Placement of Fill’ bid specification development tool.

2. Contractor shall place subsoil, compost and topsoil in accordance with the 'Placement of Fill' bid specification development tool.
 3. Slope grade away from structures a minimum of 2 inches vertically per 10 feet horizontally.
 4. Make grade changes gradual. Blend slope into level areas. Grade to promote positive drainage.
 5. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
 6. Prevent ponding of water in all active work areas.
 7. Repair or replace items indicated to remain that are damaged by excavation or filling.
- B. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- C. Prohibit traffic over topsoil.
- D. The contractor shall provide effective dust control that does not interfere with the establishment of a vegetative cover by sprinkling water or using other approved methods. Employ dust control sufficient to prevent fugitive dust emissions.
- E. When it is necessary to haul soft or wet soil material over roadways, use vehicles that can contain these materials without spillage. Immediately clear away spillage or tracking of materials on roadways caused by hauling.

RAIN GARDENS

A. Placement

1. Utilize existing flow paths of stormwater runoff from adjacent properties, including downspouts from neighboring buildings.
2. Placement within excavation extents that have been backfilled according to the 'Placement of Fill' bid specification development will ensure sufficient infiltration.
3. If the rain garden is to be placed in existing soils along the perimeter of the property, check the infiltration capacity by digging a hole 8 inches deep and filling it with water. For adequate soil infiltration, the water level should drop at least 1 inch per hour.
4. Measures should be taken to prevent subsurface flow into the basements of adjacent residences. These measures would include:
 - a. Sub-soil, sub-grade grading (under a permeable fill soil) toward the middle or back of properties.
 - b. Ensuring that soils drain toward the backyard.
 - c. Providing a sufficient route for overflow, such as through a capped septic pipe.
 - d. Utilizing a technology-based approach that would place an impermeable membrane barrier spanning a sufficient range of depth and area to ensure that water does not move into residential property.

Rain Garden: This green infrastructure feature is set slightly below grade and captures stormwater runoff. It improves water quality by allowing water to be naturally filtered by soil, and it can reduce untreated water runoff from urban areas to large water bodies or sewers.

The condition of adjacent structures should be considered when implementing controls for subsurface flow, since it may not be worth expending resources for a building slated for future demolition.

Note that these materials are tools available to cities, counties, land banks and other entities to consider while developing bid specifications and contracts. Please refer to the "Purpose" portion of this section for an explanation of why the language appears as it does and how it might be useful.

5. If the aforementioned measures are not feasible, rain gardens, trenches, and other infiltration-based green infrastructure practices must be located at least 30 feet from foundations with a basement, or 10 feet from foundations without a basement.

B. Sizing

1. The size of the rain garden shall be 20 percent to 30 percent of the total drainage area.
2. Dimensions of the rain garden shall be approximately 2:1 (length x width), with the long edge perpendicular to the incoming flow path.
3. The approximate depth of the rain garden shall be 24 inches to help the rain garden redistribute soil water into surrounding site soils.

C. Additional Design Considerations

1. The subsurface bed of the rain garden shall be flat, or subsoils should be sloped toward the back and the interior of the lot.
2. Adapted plants shall be used in accordance with the 'Soil Stabilization and Seeding' bid specification development tool.
3. Overflow runoff from rain gardens shall be directed to existing drainage features.
4. No existing site soils will be allowed to be hauled offsite. The contractor shall adjust dimensions of the rain garden so as to prevent the generation of excess soil.

D. Execution

1. Following backfill of subsoil in excavations, establish grades of the rain garden to satisfy the rain garden design requirements.
2. Apply compost and place topsoil in accordance with the 'Placement of Fill' bid specification development tool.
3. Plant adapted plants and seed in accordance with the 'Soil Stabilization and Seeding' bid specification development tool. Follow up with required maintenance.

BIOSWALES

A. Placement

1. Swales shall follow existing topography and utilize stormwater runoff flow paths that are interconnected with surrounding areas.
2. Swales shall be placed so as not to direct any stormwater runoff toward structures or foundations.
3. Swale placement shall ensure that overflow of the swale does not impact surrounding structures or foundations.

Bioswale:

This green infrastructure feature is used to route runoff volume from place to place to another, increasing the number of infiltration opportunities, and can provide some water quality improvement. Bioswales are most appropriate in areas with existing slopes.

4. Swales shall be designed to maximize hydraulic path length and resistance, and thereby increase the likelihood of water infiltration. Sharp curves or turns should be avoided to prevent scour and erosion.

B. Sizing

1. Cross-section shape of the swale may be trapezoidal or triangular according to the site-specific requirements.
2. Side slopes shall be 1 horizontal to 1 vertical (1:1).
3. Maximum depth of the swale shall not exceed 3 inches.
4. Maximum width of the base of the swale shall not exceed 3 feet.
5. Longitudinal slope of the swale shall be from 1 percent to 4 percent.
6. Total surface area of the swale should be approximately 1 percent of the drainage area.

C. Additional Design Considerations

1. Bioswales may not be practical for use on flat properties.
2. Adapted plants and seed mix shall be used in accordance with the 'Soil for Stabilization and Seeding' bid specification development.
3. Overflow runoff from swales shall be directed to existing drainage features.
4. No existing site soils will be allowed to be hauled offsite. The contractor shall adjust dimensions of the swales so as to prevent the generation of excess soil.

D. Execution

1. Following backfill of subsoil in excavations, establish grades of the swale to satisfy the bioswale design requirements.
2. Apply compost and place topsoil in accordance with the 'Placement of Fill' bid specification development.
3. Plant adapted plants and seed in accordance with the 'Soil Stabilization and Seeding' bid specification development. Follow up with required maintenance.

Earthwork

SOIL STABILIZATION AND SEEDING

PURPOSE

This section recommends provisions that cities, counties, land banks and other entities may consider adapting for specifications soliciting contractors for demolition work. Some of the provisions provided below are based on regulatory requirements. The regulatory requirements apply irrespective of whether they are included in a bid specification, and the potential specifications included below do not include an exhaustive list of regulatory requirements. We cannot provide such an exhaustive list because requirements may vary depending on the particular facts of the demolitions at issue and any state or local requirements. The cities, counties, land banks, other entities and contractor should consult the relevant regulatory requirements, including those specified in the References section below, in preparing for the demolition.

Also included below are some potential specifications that are not required by regulation, but rather are suggestions for cities, counties, land banks and other entities to consider including when developing bid specifications and contracts for residential demolitions.

These recommended provisions are written as they might appear in an organization's bid specification and thus are framed in mandatory language. Such language is not meant to imply the existence, creation, or reinterpretation of any regulatory requirement. Such provisions represent best practices and are tools available to the city, county, land banks or other entity to consider while developing bid specifications and contracts.

The goal of the Soil Stabilization and Seeding specification tool is to ensure that contractors provide and install native vegetation that is well adapted to post-demolition fill conditions, will provide sufficient cover so as to prevent erosion and sedimentation, requires minimal maintenance, and improves the aesthetic qualities of the vacant property. The section includes details on:

- Adapted seed mixtures (e.g. native).
- Adapted plants (e.g. native).

REFERENCES

- A. State Specific Residential Cleanup Criteria
- B. State Departments of Agriculture
- C. Soil and Water Conservation Districts
- D. Land Grant Universities and Cooperative Extension Services
- E. Local utility standards when working within 24 inches of utility lines.
- F. Rain Garden Manual for New Jersey, April 2005; The Native Plant Society of New Jersey

Vegetation Preservation Strategy:

Prior to incorporating the contents of this section into the scope of work, city, county, land bank or other entity that owns or controls the property should identify areas of vegetation and specific trees or shrubs that are to be protected and remain on site throughout the demolition. Such features should be outlined in the plans and identified visually with tape, stakes, or other markings prior to commencing work.

CONTRACTOR REQUIRED SUBMITTALS

- A. Product Data including the seed mix, fertilizer, and other accessories.
- B. The Contractor shall develop a Work Plan for soil stabilization and seeding and it shall include a section for seeding and erosion control that works in conjunction with the 'Grading' and 'Placement of Fill' bid specification development tools. The plan should focus on strategies to minimize the amount of maintenance required after installation while achieving the desired cover of vegetation and preventing erosion and sedimentation. The plan should include, but not be limited to, the following:
 - 1. Seed mixtures and fertilizers for the site and adjacent areas and application rates.
 - 2. Planting plan.
 - 3. Specify the required time of year for planting such mixtures.
 - 4. Methods of preparing seedbed, seeding, and rolling seeded areas.
 - 5. Methods to provide erosion control until seed is placed and vegetation is established (i.e., use of any or a combination of straw matting, emulsifiers, tackifiers, adhesives, and nurse crop seed).
- C. Seed Certificates: Submit certificates from seed vendors for seed mixture required, stating botanical and common name, percentage by weight and percentages of purity, germination, and weed seed for each species.
- D. Plant Certificates: Submit certificates for planting containers for plants required, stating botanical names and common name, and planting instructions.
- E. Operation and Maintenance: Include maintenance instructions, seasonal pruning or cutting methods for grasses, maximum blade height; types, application frequency, and recommended coverage of fertilizer.

The bid solicitor may want to require that the seeding and planting submittals shall be submitted for approval at least 14 days prior to initiating seeding or planting. In addition to the seed and plant certificates, the plans should highlight the contractor's planned methods and chronology of installation, tools to be used, and post-seeding erosion control methods and materials. For rain gardens or bioswales, diagrams of approximate locations of plants should also be included.

QUALITY ASSURANCE

- A. Seed Supplier: Company with documented experience specializing in manufacturing local products specified in this section.
- B. Deliver grass seed mixture in original sealed containers bearing seed supplier's label and certificate indicating the content of species, grade, and mass. Seed in damaged packaging is not acceptable. Label containers showing:
 - 1. Analysis of seed mixture.
 - 2. Percentage of pure seed.
 - 3. Percentage of weeds.
 - 4. Year of production.
 - 5. Net weight.
 - 6. Date when tagged and location.
 - 7. Percentage germination.
 - 8. Name and address of distributor.
- C. Remove from the site seed that has become wet, moldy, or otherwise damaged in transit or storage.
- D. Store seed in weatherproof enclosures.

Invasive Species:

The contractor and the city, county, land bank or other entity that owns or controls the property should address the presence of invasive species at the site and establish a plan for removal prior to installation of new plants and vegetation.

- E. Deliver plants in flats showing suppliers label and certificate indicating content of species.
- F. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- G. Store materials in accordance with manufacturer’s instructions and in a manner to prevent damage or deterioration.

REQUIRED MATERIALS

The Contractor is required to provide the following types of materials as part of the project:

- A. Subsoil, compost, and topsoil fill as specified in the ‘Soils for Earthwork’ bid specification development tool.
- B. Native Seed: Fresh, clean, new-crop seed obtained from an approved seed house and harvested during the previous year with minimum germination of 70 percent and minimum purity of 85 percent.
- C. Preference should be given to drought-resistant and low-maintenance seed mixtures and plants.
- D. Weed Seed Content: Not more than 0.25 percent and free of noxious weeds.
- E. Seed Mixture: Native seed mixture shall be tailored to match the local region and climate, while achieving the goals of this specification to require minimal maintenance and help prevent erosion. Seed mixture shall be developed in consultation with one of the following resources:
 1. State Department of Agriculture.
 2. Soil and Water Conservation Districts.
 3. Land Grant Universities and Cooperative Extension Services.
 4. City Arborist.
 5. Reputable local greenhouse or nursery.
- F. Plant List: Native plants shall be selected to match the local region and climate, including the amount of daily sunlight and shade. The plant list shall indicate the plants that are designated for general landscaping, rain gardens, or bioswales, as included in the ‘Grading’ bid specification development. The plant list shall be developed in consultation with one of the following resources:
 1. State Department of Agriculture.
 2. Soil and Water Conservation Districts.
 3. Land Grant Universities and Cooperative Extension Services.
 4. City Arborist.
 5. Reputable local greenhouse or nursery.
- G. Erosion Control: Manufactured straw matting.
- H. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous plant growth.

Seeding vs. Planting:

The use of plants in this section corresponds to the requirements for rain gardens and bioswales described in the ‘Grading’ bid specification development tool, while seeding requirements are applicable for all portions of the site.

Alternate to Straw Matting:

The Contractor may elect to use loose straw as post-seeding erosion control. The straw shall be free of weeds or other deleterious material and must be secured to the ground with biodegradable staked netting. Placement shall not be excessive so as to cause transport of the straw beyond the site boundaries by wind.

EXECUTION

PREPARATION

- A. Confirm that the areas of vegetation that were identified to remain undamaged during the demolition are intact. Mark areas as such and seed only areas requiring the work under this specification, or those areas that were damaged during the demolition.
- B. Verify topsoil has been placed as specified in the 'Soils for Earthwork' and 'Placement of Fill' bid specification development tools and is ready to receive the work of this section.
- C. Eliminate uneven areas and low spots.
- D. Remove debris, roots, branches, and stones in excess of 3 inches in size.
- E. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil. Only low ground-contact pressure equipment or hand tools may be used for topsoil placement, as included in the 'Placement of Fill' bid specification development tool.

SEEDING

- A. Rake soil surface smooth prior to seeding. Follow immediately with erosion control over entire seeding area ensuring complete coverage.
- B. Native seed mix shall be applied across the entire property.
- C. Broadcast seed at rate in accordance with supplier's recommendation evenly in two intersecting directions.
- D. Rake or use roller to establish seed soil contact at approximately ½-inch depth
- E. Do not seed areas in excess of what can be stabilized with erosion control matting on the same day.
- F. Planting Season: In accordance with seed supplier's recommendation.
- G. Do not apply materials over snow, ice, frozen ground, or standing water.
- H. Do not apply seed when wind conditions are such that material would be carried beyond designated area or that materials would not be uniformly applied or when wind velocity exceeds 10 miles per hour. No seeding shall be performed when even distribution cannot be attained.

Alternate Seeding Method: Hydroseeding

- Seed and mulch shall be applied simultaneously in a water slurry via hydraulic seeder/mulcher.
- Hydraulic seeder/mulcher shall be capable of applying the homogeneous materials uniformly and the discharge pumps and gun nozzles shall be kept free of buildup.
- Hydraulic seeding/mulching equipment shall have the tank volume certified by a plate affixed by manufacturer.
- Application of Materials: Measure the quantity of each material to be charged into the hydraulic seeder/mulcher tank following manufacturer directions. For advanced users, the applicator system can be calibrated either by mass or by a system of mass calibrated volume measurements. Add the materials to the tank while it is being loaded with water. Thoroughly mix the materials into a homogeneous water slurry and distribute uniformly over the designated surface area. Apply seed and mulch within 2 hours of being charged into the hydraulic seeder/mulcher tank. During loading of the hydraulic seeder/mulcher tank, add materials in the following sequence: water, then seed, then mulch.
- Blend into existing adjacent grass areas to bond new growth to existing adjacent areas or to previous applications to form uniform surfaces.
- Seeding and mulch shall overlap adjoining vegetation by 12 inches but shall not pass the property boundary without the written permission of the adjacent property owner.
- Mulching material shall be free of weeds and other foreign materials; free of growth- or germination-inhibiting ingredients; manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material will become uniformly suspended to form a homogeneous slurry; dyed a suitable color to facilitate inspection of the placement of the material; when applied, capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

SEED AND PLANT PROTECTION

- A. Protect seeded and planted areas from damage by identifying areas with stakes and string around the area periphery.
- B. Cover all seeded areas with a straw blanket for erosion control.
- C. Install matting on dry ground and in accordance with manufacturer's recommendation.
- D. Roll matting without stretching or pulling.
- E. Lay smoothly on ground surface and bury the ends of each section in a 6-inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls a minimum of 12 inches. Backfill trench and rake until smooth and level with adjacent soil.
- F. Secure outside edges and overlaps at 36-inch intervals with stakes.
- G. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- H. Install matting in accordance with manufacturer's instructions.
- I. Suspend installation operations whenever climatic conditions, as determined by engineer or manufacturer's representative, are unsatisfactory for placing matting to the requirements of this section.

PLANTING

- A. Add sufficient water to prevent plugs and soil from drying out.
- B. Planting holes or slits shall be deep enough to allow the crown of the plant to be at grade level, while roots extend vertically into the substrate without kinking.
- C. Use sufficient water to prevent plugs and surrounding soil from drying out.
- D. Plants are to be planted in random clusters of 10 to 20 per species.

MAINTENANCE

- A. Commence maintenance immediately after area is seeded and planted. Maintain seeded areas for _____ year(s) from the date seeding and planting is completed or until native grass is well established and exhibits vigorous growing conditions, whichever is longer. The vegetative cover must also be free of eroded, bare, or dead spots and be at least 98 percent free of weeds. The contractor shall be responsible for repair or replacement of damaged vegetation.
- B. Prohibit all traffic over finished surfaces.
- C. Water deeply and often enough to prevent plants and soil from drying out. Using a low-volume output sprinkler over a period of a few hours will help move water more deeply into the soil where it will be retained for later use.
- D. Perform first mowing when seedlings are 40 percent higher than desired height, or about 5-6 inches maximum.
- E. Mow native grass to a height of 6 inches. If planted in spring, mow every 45 days with final mowing between October 15 and November 15. If planted in fall, mow once in May, June, and July.
- F. If a mulching mower is used, make sure that clumps of grass are not left behind. If

necessary, immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

G. At no point during the maintenance period shall weed growth exceed 2 percent of the area.

H. Immediately reseed areas showing bare spots.

I. Repair washouts or gullies.

J. Protect seeded areas and plants with warning signs during maintenance period

Landscaping installation and maintenance should be specific to the geographic and climatic regions.

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