# Inter-Agency Task Force Action Plan to Encourage the Use of Recycled-Content Building Materials

***Prepared by:***

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
221 Third Street
Newport, RI 02840

Spring 2000

---

***Prepared for:***

New York City Department of Sanitation
Bureau of Waste Prevention, Reuse and Recycling
44 Beaver Street
New York, New York 10004

## BWPRR Overview

This report is one of a number of waste prevention reports prepared under a long-term contract by consultant Science Applications International Corporation, and issued at contract conclusion. The reports are listed below. The New York City Department of Sanitation (DOS, or the Department), Bureau of Waste Prevention, Reuse and Recycling (BWPRR), the sponsor, has issued a Foreword to the studies; it acknowledges the many contributors and frames a position based on its considerable efforts to review, practice, and measure waste prevention. The Foreword appears at the beginning of the first report in the series, *Measuring Waste Prevention in New York City*. Interested readers are strongly encouraged to access the material through the Department's web site at: www.ci.nyc.ny.us/strongest Print or electronic versions are available through BWPRR.

---

**Waste Prevention Reports:**

- *Measuring Waste Prevention in New York City*
- *Survey of Waste Prevention Programs in Major Cities, States and Countries*
- *Procurement Strategies Pursued by Federal Agencies and Jurisdictions Beyond NYC for Waste Prevention and Recycled Products*
- *Inter-Agency Task Force Action Plan to Encourage the Use of Recycled-Content Building Materials*
- *Materials Exchange Research Report*
- *Characterization of NYC's Solid Waste Stream*
- *Life Span Costing Analysis Case Studies*
- *Packaging Restrictions Research: Targeting Packaging for Reduction, Reuse and Recycled Content*
- *NYCitySen$e Summary Report*
- *NYC WasteLe$$ Summary Report*

# Table of Contents

# Executive Summary

Science Applications International Corporation (SAIC), with Konheim & Ketcham Inc. (K&K), assisted by Robert Schwartz & Associates, was contracted by the New York City Department of Sanitation (DOS), Bureau of Waste Prevention, Reuse and Recycling (BWPRR) to examine opportunities to promote the use of recycled-content building materials in the construction industry in New York City. The construction industry, one of the City's largest consumers of materials, represents a major potential market for recyclable materials recovered from the New York City waste stream.

Pursuant to the contract with DOS, the consultant team identified opportunities to promote the use of recycled materials in construction, examined building codes, studied efforts in other jurisdictions to promote the use of recycled-content building materials and the applicability to New York City, and considered the economic implications of recommendations contained in this report.

## Background

The NYC Building Code does not contain restrictions that explicitly prohibit the use of recycled-content materials solely on the basis that they contain recycled material. However, certain materials, whether or not made with recycled-content, are prohibited for specific uses. The consultants concluded that building codes of jurisdictions considered leaders in recycling, which were reviewed for this study, do not contain provisions that are more innovative than NYC's Code in encouraging the use of recycled-content materials in construction.

Nearly all codes throughout the nation specify performance standards, known as reference standards, rather than identifying specific acceptable materials (material-based standards) for various uses. Most of the building codes from the other jurisdictions examined conform to two standard codes: the Uniform Building Code (UBC) and the Building Officials Code Administration (BOCA) code.

Other jurisdictions, unlike New York City, tend to simply adopt the UBC and BOCA codes. The New York City Building Code is more stringent than the UBC and BOCA codes, requiring specific approval of all materials that affect fire, toxicity or public safety. Other jurisdictions generally allow materials to be used as long as they are certified by the manufacturer as meeting nationally accepted standards.

The New York City approval process appropriately reflects the reality of New York City's building stock — a preponderance of high density, multi-story structures — and the concurrent need to ensure that these structures are designed to maximize the protection of the health and safety of New York City residents, fire fighters, tourists, and other individuals who could otherwise be placed at risk. Approval reviews are performed by the Division of Materials and Equipment Approval (MEA) of the New York City Department of Buildings (NYCDOB).

Reference standards, the basis of MEA review, are defined and can be revised by Reference Standard Committees. These committees, comprised of experts in construction-related fields, are established by the NYCDOB. Some standards also are codified in Local Law by the City Council.

**Report Format**

**Section I** of this report discusses specific recycled-content building materials, and the approval process for using recycled-content building materials in New York City.

**Section II** of the report presents an overview of building codes in other jurisdictions, and efforts in these jurisdictions to promote the use of recycled-content building materials.

**Section III** highlights the consultants' recommendations and the Action Plan developed by the New York City Inter-Agency Task Force on Recycled-Content Building Materials.

**Inter-Agency Task Force and Action Plan**

On October 17, 1997, the Department of Sanitation convened an Inter-Agency Task Force on Recycled-Content Building Materials (the Task Force) to discuss strategies for promoting use of recycled-content building materials in New York City. Representatives from the following agencies participated in the Task Force meeting: Department of Sanitation; Department of Buildings; Department of Design and Construction; Mayor's Office of Construction, Office of the Director of Construction; Fire Department; Corporation Counsel; and the Mayor's Office of Operations. The session was led by representatives of SAIC and K&K, who worked with the Task Force to develop the Action Plan.

The following Action Plan items, presented in greater detail within the body of the report, are based on interactive discussion among the Task Force participants as well as information and recommendations provided by the consultant team.

1. Issue Policy Statement.

At the October Task Force meeting, responding to the consultant's recommendation, the New York City Department of Buildings indicated the intent to issue a formal policy statement to raise awareness within the building and construction industry that recycled content building materials can be allowed for use in New York City. On November 26, 1997, Gaston Silva, Commissioner of the Department of Buildings (DOB), issued Executive Order 3/97 to clarify that the New York City Building Code permits the use of recycled content plastic, glass, asphalt and concrete construction materials that meet nationally accepted performance standards and specifications and code criteria.

2. Sponsor a Seminar.

The Task Force will pursue planning of a seminar for the building industry to discuss and promote opportunities for increased use of recycled-content building materials in New York City.

3. Establish a dedicated phone line and provide information via the Internet.

DOB anticipates establishing a dedicated telephone line, staffed during designated hours, to answer questions about recycled-content building materials. Information on recycled-content building materials also is to be included on DOB's Web Site, linked to DOS's Web Site.

4. Examine the Merits of Developing a Recycled-Content Building Materials Directory.

The Task Force plans to sponsor a focus group for representatives of the targeted audience for a directory and potential directory co-sponsors to explore the merits and feasibility of developing a New York City-specific directory to promote increased use of recycled-content building materials. Alternatively, or in addition to the focus group, the Task Force may conduct a survey. Depending upon the outcome of the focus group and/or survey, the Task Force may take steps to develop, produce, print, and distribute a Recycled-Content Building Materials Directory. If deemed appropriate and feasible, the directory also could appear on DOB's Web Site, linked to DOS's Web Site.

5. Amend NYC Building Code to allow plastic as a building material.

Subsequent to the American Society for Testing Materials'(ASTM) development of standards for structural plastic, City Council should amend the Building Code to allow plastic as a building material, and to refer to the ASTM standard once finalized.

6. Examine opportunities for recycled aggregate to be used for specified non-load bearing applications.

Aggregates from glass, tile or concrete, virgin or recycled, are not currently listed among accepted fill materials in the NYC Code, due to health and safety concerns. However, there may be specific situations in which these materials could be deemed acceptable. The Task Force intends to establish a working group with the NY State Department of Environmental Conservation, NYC Department of Environmental Protection, and other experts to determine if there are specific circumstances under which recycled aggregate could be used for non-load bearing applications.

7. Legislation to allow use of plastic sprinkler and drainage pipes in some classes of residential structures.

The Department of Buildings' Rules Governing the Installation of Plastic Sprinkler will become effective on October 18, 1999. DOB has requested its Plumbing and Fire Suppression Licensing Board to consider recommending that the City Council amend the Building Code to permit the use of PVC pipe for outdoor drainage in all occupancy groups. The legislation specific to plastic sprinklers should provide a new opportunity to use recycled plastic in construction, as will any potential legislation that could be passed related to the use of PVC pipe for outdoor drainage.

8. Promotional efforts.

The Task Force intends to pursue promotional efforts to encourage the building and construction industry to capitalize on the opportunities and resources anticipated to result from the actions of the Inter-Agency Task Force.

9. Other initiatives.

Agencies that participated in the Task Force intend to continue to examine opportunities to promote recycled-content building materials and other cost-effective initiatives that are consistent with the City's objectives of conserving natural resources and protecting public health and the environment.

# Section I:

## Recycled-Content Building Materials and NYC Approval Process

### Types of Recycled-Content Building Materials

There is a wide variety of recycled materials that can be used in construction. The categories of recycled-content building materials of greatest interest to the NYC Department of Sanitation are those which can be made from materials collected for recycling by the City. This is because greater use of these recycled materials in construction can help expand markets for recyclable materials collected by the City, benefitting the City's Recycling Program.

Manufacturers, recycling facility operators, trade groups, research organizations and officials from the NYC Department of Sanitation (NYCDOS) and the NYS Department of Economic Development (NYSDED) were asked to recommend recycled-content materials to target for potential increased use by the building and construction industry.

After reviewing the resulting list of possible materials to target for evaluation, and per the recommendation of the consultants, NYCDOS Bureau of Waste Prevention Reuse & Recycling (BWPRR) directed the focus of the study to construction products made from glass, plastic and construction and demolition (C/D) waste. NYCDOS decisions were based on the consultants' advice regarding: a) the quantities of materials currently disposed and b) the opportunities for recycling these materials into construction products.

The consultants identified existing recycled-content building materials in the glass, plastic and C/D categories, in consultation with the parties listed above, supplemented by industry databases and product catalogues. The use of mixed glass cullet as aggregate in concrete masonry and for fill and drainage material is currently being studied by NYSDED. Additional markets that have been identified for recycled glass include foam insulating glass, fiberglass insulation, glass bricks, and conventional window glass. Uses of crushed glass in reflective paint and as an abrasive in sandblasting operations also were identified.

Recycled-content plastic products include plastic construction members, plastic drainboard, film plastic membranes and perforated plastic drainage pipe. Structural applications for recycled-content plastic include foam board insulation, as well as surfacing, flooring and roofing products. Marine structures are increasingly using plastic, much of it with recycled-content, for decking and sheathing of pilings. The NYC Building Code applies to marine structures and it is enforced relative to marine structures by the Department of Business Services. The growing popularity of plastic piping makes manufacturers of this product a potential market for all types of plastic, including recycled plastic.

Some important uses for products made with recycled C/D materials — which include concrete, asphalt, sheetrock, wood, metals and a variety of paper — are gypsum board from recycled gypsum core, recycled concrete aggregate (RCA) fill material, salvaged wood products, and wall and floor panels made from recycled wood fiber. Recycled paper also is used for floor and wall underlayment and in roofing products. Recycled-content products, as well as the

waste materials from which they are made, are shown in **Table 1**.

**Table 1**

**Recycled-content Products Made from Glass, Plastic and C/D Waste**

| Waste Stream | Intermediate Material | Recycled-Content Product |
|---|---|---|
| Glass bottles | - Glass aggregate | - Aggregate for backfill or drainage<br>- Aggregate - filled geotextile sleeves for drainage |
| Glass bottles | - Crushed glass | - Ceramic pavement & wall tiles<br>- Glass beads in reflective paint<br>- Roofing shingles<br>- Abrasive for sandblasting |
| Plate Glass | - Recycled glass | - Insulating glass<br>- Window glass<br>- Glass curtain walls<br>- Glass brick |
| Glass (mixed) | - Miscellaneous glass products | - Foam glass blocks<br>- Faced or unfaced fiberglass insulation |
| Plastic bags | - Film plastic | - Plastic sheets for sitework applications<br>- Construction film for vapor barrier |
| Polystyrene | - Plastic foam | - Rigid foam board insulation<br>- Exterior trim of polystyrene foam |
| Plastic | - Plastic fiber & fiberglass | - Fiber insulation batts<br>- Fiberglass fencing slats<br>- Fiber plastic construction members for structural applications |
| Plastic (separated by type) | - Vinyl & composite plastics | - Vinyl siding<br>- Plastic floor tiles<br>- Plastic-based roofing materials |
| Plastic (separated by type) | - Extruded plastic forms | - Plastic construction members<br>- Plastic foundation vents<br>- Plastic drain board<br>- Plastic drainage pipe<br>- Plastic flashing<br>- Plastic gutter screens<br>- Interior & exterior plastic surfacing panels<br>- Plastic window & door frames |
| Plastic (mixed) | - Miscellaneous | - Geotextile fabrics<br>- Aluminum-faced plastic core insulation<br>- Structural lumber components with plastic core<br>- Structural panels of foam & plastic studs |
| C/D Concrete | - Recycled Concrete Aggregate (RCA) | - Fill material<br>- Interior surfacing applications |
| C/D Asphalt | - Recycled Asphalt Product (RAP)<br>- Asphalt shingles | - Pavement patching mix<br>- Composite roofing shingles |
| C/D Sheetrock | - Recycled gypsum | - Recycled sheetrock<br>- Lightweight concrete sound barriers from wallboard |
| C/D Wood | - Wood chips<br>- Wood fiber | - Walkways & ground cover from wood chips<br>- Wall & flooring materials from recycled wood fiber |
| C/D Lumber | - Salvaged wood | - Miscellaneous salvaged wood applications |
| C/D Steel | - Recycled steel | - Structural members<br>- Fire doors |
| C/D Misc Metal | - Recycled content metal | - Framework for surfacing systems<br>- Metal siding<br>Metal roofing materials<br>- Recycled-content copper wire<br>- Salvaged plumbing & electrical components |
| C/D source separated & mixed paper | - Panels | - Surfacing panels<br>- Paper floor underlayment<br>- Roofing underlayment |

I:\saic-dos\report\prod-tbl.wk3

The consultants conducted an analysis of the New York City Building Code to determine the status under the Code of the recycled-content products listed in Table 1. This analysis included a review of the Code's requirements for product approval and an examination of the reference standards cited in the relevant sections of the Code.

Reference standards, used as citations in all building codes, are documents of product standards published by trade associations for individual industries and nationally recognized standards agencies (e.g., American Woodworking Institute, the American National Standards Institute (ANSI)). The standards cite specifications of materials for specific uses, installation requirements and tests used to determine product qualifications regardless of whether a product uses virgin or recycled materials. The NYC Code recognizes three categories of recycled-content products:

1) those currently allowed in New York City construction without restriction;
2) those allowed, with restrictions on some or all uses; and
3) those not permitted by the Code or reference standards.

*Restrictions on products containing recycled materials also apply equally to those products manufactured with 100% virgin materials*.

Reference standards and tests are required by NYCDOB for each class of products within the targeted waste groups, *i.e.*, glass, plastic and C/D waste. These classes of products include both recycled- content products and those made with virgin materials. A summary of reference standards and tests required for the products listed in Table 1 is presented in Appendix A. Appendix B contains a brief description of the standards and tests cited in this report.

**MEA Approval Procedures**

One feature of the NYC Building Code that sets it apart from codes in other localities is that it dictates, in circumstances where fire, toxicity or public safety are a consideration, that building materials must be granted an approval number by the Materials and Equipment Acceptance (MEA) Division of the NYCDOB. The New York City approval process appropriately reflects the reality of New York City's building stock — a preponderance of high density, multi-story structures — and the concurrent need to ensure that these structures are designed to maximize the protection of the health and safety of New York City residents, fire fighters, tourists, and other individuals who could otherwise be placed at risk.

MEA approval is required for all interior construction and surfacing materials. It also is required for some exterior materials which, due either to their characteristics or their use within a designated Fire Zone, pose a safety concern to neighboring buildings and occupants. For these materials, MEA certification must be obtained, in addition to prior approval by other institutions that set standards or rate products.

To apply for approval by the MEA, a manufacturer pays an initial application fee of $600 and completes a Materials and Equipment Acceptance Application form (MEA-1), which asks for information about the product and its anticipated uses. A certified laboratory report must be submitted with the application, along with an MEA-2 form stating that the lab report refers to the specific product in the application. The NYCDOB then determines if the product requires an MEA acceptance number. If an MEA acceptance is needed, the product will be given an

MEA acceptance number if its performance under tests shows that it is worthy of one. The MEA seeks Fire Department input, if appropriate.

Following evaluation of the test results, DOB will order additional tests, if deemed necessary, and will determine the product's suitability for its anticipated uses. Up to five related products may be processed in one application. The MEA will allow self-certification through approved laboratories for specific categories of equipment, usually climate control or food preparation equipment, but not for products used in actual building construction. Most of the recycled-content building products discussed in this report are construction materials or components of building systems and, therefore, cannot utilize the self-certification procedure.

In general, widely used materials, such as glass and metal for recognized applications, are permitted without demonstrating compliance with any testing criteria. These materials already have demonstrated their suitability for certain uses and are not judged to have hazardous properties needing closer scrutiny. Examples include glass brick, ceramic wall tile, glass beads in reflective paint, salvaged plumbing and electrical components, recycled copper wire, structural steel, metal frameworks for interior surfacing systems and exterior metal siding.

Most insulation and moisture control products require MEA approval and are tested for combustibility, flame spread and toxicity. All interior surfacing and some exterior surfacing and flooring materials are subject to flame spread and toxicity tests. These materials include plastics, as well as C/D waste such as gypsum board, cardboard, paper, salvaged lumber and wood panels. The fire and wind resistance of virtually all roofing materials also must be demonstrated.

Aggregates from glass, tile or concrete currently are not listed among accepted fill materials in the Code. Use of these materials is therefore not permitted without specific approval of the borough office of the Buildings Department on a per-project basis.

It should be noted that many recycled-content products are "hybrid" products, made of more than one material. These "hybrid" products are not recognized as conventional building materials and acceptance by NYCDOB often necessitates classifying the product and establishing limitations on its uses. Since these products frequently do not contain standard materials, it is often necessary to design new testing procedures and performance levels for them. Applicable standards and testing procedures for new materials are developed by appropriate national organizations such as ASTM or NFPA, and may result in legislative code amendments. "Hybrids" may contain a number of base materials, as well as adhesives and coatings. In addition, if the product is accepted, proper usage and installation procedures must be established. The performance of "hybrids" may be tested as an assembly for certain products such as wall, floor or finish systems. However, if any component is combustible, then the assembly may only be used in buildings of Group II construction.

# Section II:

## Examination of Building Codes in Other Jurisdictions

To protect public health and safety, the New York City Building Code, enforced by the NYC Department of Buildings, specifies construction methods and performance of materials for structures. The NYC Building Code does not apply to non-structural construction, such as walkways, parking lots, or roads, but does apply to marine structures. In the context of marine structures, it is enforced relative to them by the Department of Building Services. The consultants reviewed various building codes and interviewed agency and business representatives to identify opportunities, within the practical parameters of the New York City Building Code, to promote the use of recycled-content building materials.

### Selection of Building Codes for Comparison to the New York City Building Code

Jurisdictions recognized in the industry as having progressive waste management programs were contacted for the purpose of identifying codes for comparison with the New York City Building Code. The localities initially contacted were: Minneapolis, MN; Seattle, WA; Portland, OR; and Newark, NJ.

The consultants conducted telephone interviews with officials of the waste management and buildings departments at each locality to inquire whether: 1) that locality had an aggressive recycling program; 2) it had undertaken an analysis of its building codes to determine instances where recycled-content products were summarily excluded; and 3) it had made any changes to its building code to correct such instances and to make the code more "friendly" to recycled-content products. Officials also were asked whether any local government agency had amended its purchasing specifications to encourage or mandate the use of recycled-content products; whether recycled-content products were being used widely in that locality; and if they knew of any other locality that had made revisions to its building code to increase the use of recycled-content building materials.

Building codes from additional states and localities were targeted for review and evaluation, based on information obtained from these initial interviews, as well as referrals from individuals contacted in the product interviews (Section I), and recommendations from representatives of the waste industry, buildings department officials, and/or academic sources. In some cases, localities that were recommended by recycled-content product distributors as having "recycled-content-friendly" building codes were selected. The following codes were obtained for study:

Seattle Building Code (Seattle, Washington)
State of Oregon Structural Specialty Code (Portland, Oregon)
Minnesota State Building Code (Minneapolis, Minnesota)
Building Code of the City of Austin (Austin, Texas)
New Jersey State Building Code (Newark, New Jersey)
Ontario Building Code (Toronto, Canada)
Building Officials' Code Association (BOCA) National Building Code
Uniform Building Code (UBC)

**Analysis of Codes from Other Jurisdictions**

These eight building codes were reviewed to determine whether they contain provisions that encourage or discourage the use of the targeted recycled-content products which might be applicable in NYC. None of the codes specifically calls for the use of, or has special provisions that encourage the use of, recycled-content products.

Except for the code of New York City, nearly all building codes in the nation are based on two model building codes, the Uniform Building Code (UBC) and the Building Officials Code Administration (BOCA) National Building Code. States and municipalities generally adopt a model code and then overlay modifications administratively, according to local needs. For this study these "locality modifications" were not relevant to the acceptance of recycled-content materials. Therefore, a further search for innovative building codes, pertaining to the use of recycled materials, would yield no additional information.

Of the codes reviewed, those from the states of Oregon and Minnesota, as well as the codes of the cities of Seattle WA and Austin TX are based on the UBC. The New Jersey code is based on BOCA and the Ontario code is based on the Canadian Building Code, another model code. In contrast, the Building Code of the City of New York was developed independently and is not based on any standard model code. The New York State Building Code was considered, but offered no significant provisions for this study, since the code is more general and less restrictive than BOCA, the UBC or the New York City Building Code.

All of the building codes reviewed for this study permit the use of materials that comply with given performance criteria based on acceptable results of defined standardized tests. None of the codes specifically restricts the types of materials used in manufacturing products for the construction industry. A summary of requirements for use of those materials targeted by this study is presented in Appendix C of this report.

**Status of Code Revisions to Promote Use of Recycled-Content Products in Other Jurisdictions**

Most local and state information sources interviewed for this study indicated that officials in their jurisdictions had considered making changes to their building codes. None, however, had actually changed provisions specifically to promote the use of recycled-content materials.

Most codes, like New York City's, are based on performance standards for individual materials. In such codes, recycled-content and virgin materials theoretically have an equal chance for acceptance, based on the relative performance properties of the materials.

Codes that are materials-based, *i.e.*, codes that require specific approval of materials used in construction within a jurisdiction, do not specifically exclude recycled-content materials, provided that the materials meet the specified performance standards related to fire, toxicity, load-bearing capacity and other characteristics. In reality, however, there are specific performance standards which present barriers to the recycled-content products under consideration.

When performance standards were written, virgin materials served as the reference. Plastic was in use for such items as toys or furnishings, but not as a building material. The omission of recycled-content products leaves acceptance open to interpretation, which can inhibit use. In some instances, codes list acceptable materials for specific uses, but since these lists were assembled before the development of some of the newer recycled-content products, the lists can have the effect of precluding the use of recently developed recycled products.

Interviews with state and local officials revealed the following actions that are being taken by other state and local jurisdictions to promote the use of recycled-content products in the local building and construction industry:

- The State of Washington, prompted by recommendations made by the Clean Washington Center, is in the process of deleting standards in its code requiring the use of virgin materials, adopting performance-based standards whenever possible, and adding a general endorsement of recycled-content materials. Again, there are no requirements to use virgin materials in the NYC Building Code.

- The City of Toronto, Ontario, Canada is pursuing several initiatives to promote the use of recycled-content materials by the building trades. Strategies being planned, but not yet enacted, include:

  1. Providing a statement in the code that products made with recycled-content materials are acceptable provided they meet the performance requirements of the code. This statement would be inserted to remove any doubt about the acceptability of recycled-content products.

  2. Initiating a policy stating that when a manufacturer of a recycled-content product experiences difficulties in having the product accepted, the use of that product will be evaluated with respect to possible changes to the city's performance standards to reduce any barriers restricting the use of the product (provided these standards do not present any safety or health problems).

  3. Changing the Ontario Building Code to a performance-based code rather than a materials-based code. The code would still retain the option of listing currently approved materials to guide applicants in meeting standards. It would, however, also list recycled-content materials that meet the same standards.

- The State of Wisconsin is changing from a materials-based to a performance-based code. Although the state has made some progress, it has been difficult for public officials to determine the basis on which the original performance standards for some products made with virgin materials were specified. Determining performance criteria for products made with newer materials, both virgin and recycled-content, has therefore, at times, been difficult. Wisconsin also is developing a database of recycled-content building products that lists relevant specifications, as well as complete descriptions, of available products. Wisconsin's code was not evaluated, since the change to performance standards does not specifically address recycled-content products.

In addition, two other localities have taken specific steps to promote the use of recycled-content building materials.

- The Orlando, Florida Buildings Department allows a 10% price preference for recycled-content products.

- The Triangle J Council of Governments, serving the area that includes Research Triangle Park, North Carolina, published a guide on materials specifications for use by agencies that want to encourage or mandate the increased use of recycled-content building materials.

**Market Factors Influencing the Use of Recycled-Content Materials**

Several market factors affecting the use of recycled-content building products were identified as a result of the interviews and other research conducted for this report.

- While some recycled-content building products have been available for decades, overall, the industry is relatively new. In most cases, recycled-content products are competing against traditional building materials that have wide acceptance in the industry. Recycled-content products are often produced by new companies without proven track records, with minimal financial resources for product testing and with a limited history of honoring warranties, a situation that might serve to discourage some purchasers. Despite these potential limitations, the minimal financial resources of a new company producing recycled-content products should not preclude having the appropriate tests performed and filed for their products, which will serve to enhance their products' reputations.

- The long life expectancy of most structures makes customer evaluation of new materials, with respect to such qualities as decomposition or stress, a lengthy process. Since many recycled-content products have been developed within the past few years, there has not been sufficient time for the products to "prove" themselves to consumers.

- According to industry sources, the fact that recycled-content products may require different, and sometimes unfamiliar, installation techniques makes some builders reluctant to use them. This factor may necessitate re-training of workers, an expense contractors will avoid if possible.

- Product labels do not indicate whether they are made with recycled materials, thus, many architects and builders do not know about the number of recycled-content products available.

- Finally, the cost to introduce and purchase recycled-content products can be greater than for conventional materials. Costs are comprised of initial costs to gain product approval and/or acceptance in NYC, and the on-going costs of the material and installation. Use of recycled-content building products can have different economic consequences for a builder, depending on production methods, comparative costs of materials, labor considerations at the job site and the popularity of the product.

# Section III:

## Recommendations and Action Plan for Promoting the Use of Recycled-Content Building Materials

### Inter-Agency Task Force and Action Plan

On October 17, 1997, the Department of Sanitation convened an Inter-Agency Task Force on Recycled-Content Building Materials. Representatives from the following agencies participated at the Task Force meeting: Department of Sanitation; Department of Buildings; Department of Design and Construction; Mayor's Office Construction, Office of the Director of Construction; Fire Department; Corporation Counsel; and the Mayor's Office of Operations.

The following Action Plan items were selected at the moderated session led by SAIC and K&K based on interactive discussion among the Task Force participants and information and recommendations provided by the consultant team.

1. Issue Policy Statement.

Based on the expertise of the consultants, and the numerous interviews described previously, the consultants concluded that there is a misconception within the building industry that the New York City Building Code prohibits the use of recycled-content materials in construction. Many recycled-content products are relatively new on the market. In addition, they are often made of different materials than the materials used in conventional products currently used for the same purpose (*i.e.*, recycled plastic instead of wooden panels). Therefore, some builders and architects are unsure whether the use of recycled-content building materials is allowed.

There are no restrictions in the NYC Building Code that specifically prohibit the use of recycled-content building materials. The consultants recommended that the City issue a policy statement to address the misconception, and to encourage builders to use recycled-content building materials. At the October Task Force meeting, responding to the consultant's recommendation, the New York City Department of Buildings indicated the intent to issue a formal policy statement to raise awareness within the building and construction industry that recycled content building materials can be allowed for use in New York City.

> **Action Item:** At the October Task Force meeting, responding to the consultant's recommendation, the New York City Department of Buildings indicated the intent to issue a formal policy statement to raise awareness within the building and construction industry that recycled content building materials can be allowed for use in New York City. On November 26, 1997, Gaston Silva, Commissioner of the Department of Buildings (DOB), issued Executive Order 3/97 to clarify that the New York City Building Code permits the use of plastic, asphalt, glass and concrete recycled content construction materials that meet nationally accepted performance standards and specifications and code criteria. Appendix E of the Action Plan contains a copy of the Executive Order.

2. Sponsor a Seminar.

It appears that architects, builders, structural specification writers, engineers, purchasing agents and others in the building/construction industry would be more inclined to use recycled-content building materials if they knew more about the quality, performance and availability of these products, as well as opportunities and strategies for over-coming obstacles to their use. Government agencies, manufacturers, vendors and current users of recycled content building materials could share their experiences with those who may be interested in considering their use. A seminar would serve as a forum for interactive dialogue, sharing of information and discussion of issues relevant to both regulators and potential users of recycled-content building materials.

> **Action Item**: The Task Force will pursue planning a seminar for the building industry to raise awareness, and discuss and promote opportunities for increased use of recycled-content building materials in New York City.

3. Establish a dedicated phone line and provide information via the Internet.

While the seminar recommended above can be very useful for generating interest in recycled-content building materials, it is anticipated that the industry will continue to have questions and will want access to information on an as-needed basis. Providing information via the Internet, and offering personal assistance over the telephone would complement and build upon the anticipated seminar.

> **Action Item**: DOB anticipates establishing a dedicated telephone line, staffed during designated hours, to answer questions about recycled-content building materials. Information on recycled-content building materials also will be included on DOB's Web Site, linked to DOS's Web Site.

4. Examine the Merits of Developing a Recycled-Content Building Materials Directory.

The consultants recommended that the City explore the merits and feasibility of assembling a directory of available recycled-content building materials, including the distributors of these products, in the metropolitan area. This initiative has been undertaken in Portland OR, Toronto, Canada, Los Angeles CA and the state of Wisconsin (Please refer to *Appendix D)*. The following information is intended to assist the City in determining whether or not to develop, produce, and disseminate a directory, and includes guidance and analysis intended to assist the City if it is determined that a development of a directory is a worthwhile initiative.

*Outreach to Industry, Including Potential Co-Sponsors and Funding Sources*

Before devoting resources to developing a directory, it is essential to reach out to intended users, industry organizations, and others. Input from the intended users of the directory will enable the City to determine if a directory would be useful and would be used. Industry input and endorsement can enhance the usefulness and credibility of the directory, as well as its acceptance by the building and construction industry.

The City will need to recruit potential endorsers, co-sponsors and funders who can assist the City by underwriting some of the costs or by developing, producing, printing, distributing, and/or promoting the directory. As a starting point, in order to achieve some "buy in" by the intended users of the directory, the Department of Buildings could request feedback from its Building Advisory Committee.

The consultants directed some initial inquiries to construction industry associations in New York City to assess whether a recycled-content building materials directory would be used by their members and, if so, what format would be preferable. Representatives of the Building Trades Association, the New York Building Congress, and the General Contractors Association were consulted. Calls also were placed to the Building Contractors Association. All groups contacted indicated that they would cooperate with any surveys or focus groups that the City might initiate, and would make an effort to inform their members about the directory. These organizations and others might also be requested to fund the directory. McGraw Hill has published a catalog for architects, and could be queried regarding interest in publishing a recycled-content building materials directory.

*Develop a Mailing List and Recruit Listings*

If it is determined that a directory will be developed, a first step could be to obtain a mailing list of the manufacturers of recycled-content products that are commercially available from the Harris Directory (the consultants can provide such a mailing list to the Department of Sanitation on disk). Next, manufacturers could be sent a letter advising them of New York City's interest in encouraging the use of recycled-content building materials, and asking for product information. An attached form could provide a format for product specifications, a determination of the PRM, and the local sales representatives of the products. The form could require that the data be supplied digitally, on a computer disk or by e-mail, so that it could be assembled into a uniform report and database, without having to manually retype all information.

To underwrite the costs of a directory, in addition to recruiting co-sponsors as discussed in the section above, a modest fee could be charged for each listing to cover the cost of compiling the directory. The directory could be printed, initially, and then made available on the Internet, as the industry becomes more familiar with on-line services. The directory could be prefaced by the caveat that all data are based on manufacturer representations.

*Cost of Providing a Recycled Content Building Materials Directory*

The most expensive and time-consuming component of developing the database for a directory could be contacting manufacturers and suppliers, and entering the data. The consultant has estimated, based on the experiences of other jurisdictions that have developed directories, that once the scope and format are established, it would require approximately 200 - 300 person hours and less than $20,000, to produce an initial

edition of such a directory. Updates would take approximately 200 hours, at a cost of about $10,000 annually or bi-annually.

The type-setting and printing of 5,000 copies of a 100 page booklet, such as that produced by Portland OR, with one color on 8.5 X 5.5 inch recycled 60 lb. paper stock would cost about $28,000. Los Angeles CA copies their 100 page guide in- house and distributes the stapled copies for a cost of approximately $0.40 per copy. Installing the same information on the Internet on an existing Web site (e.g., the Construction Institute's site, *(http://dax.recol.net/ci/ci.100.asp)*, is estimated to cost in the range of $5,000 to $10,000.

*Format of Directory*

To achieve a user-friendly directory, the consultants recommend that the City adapt the format utilized by Los Angeles CA and Portland OR. Unlike the Wisconsin directory, which covers all products made from recycled-content materials and is directed toward state agencies, the Los Angeles and Portland guides target the construction industry. In the Portland example, data are organized by functional categories of recycled-content materials, with each specific type of material identified by a master format number. The consultants concluded that a desirable feature of the Los Angeles publication is an introduction which contains general recycled-content product information that is helpful to a reader not familiar with the recycling industry (i.e., most architects, builders and agency procurement personnel.) An added feature that may be necessary in NYC is an indication of whether or not the product is union-made.

*Method of Producing the Publication*

Directories listed in *The Directory of Recycled Product Directories* published by the Recycled Products Business Letter can be used to identify manufacturers of recycled-content products. Specific product information can be obtained by faxing an initial solicitation for information to manufacturers, rather than by making cold calls.

A one-page "fill in the blanks" form to be returned by fax is recommended. The form should request information on the use of the product, its composition and percentage of recycled material used, installation specifications, if any, and the names of local distributors and suppliers, with space for additional comments, and provision to attach product literature. The form could enable a manufacturer or distributor to report whether or not the product has been approved for use by the NYC Department of Buildings and, if not, to indicate if they are interested in learning how to obtain approval for use in New York City. The form also could be used to inquire if the product is union-made, since this information may merit inclusion in the directory.

Follow-up phone calls to contact persons listed on the form may be needed to clarify information or to spot-check the accuracy of listed distributors. Whenever possible, seek listings from several sources of each product to provide users with competitive choices. The consultants recommend following the city of Los Angeles and the state

of Wisconsin in not pursuing non-responsive manufacturers unless desired product categories are under-represented.

*Content*

The content of the directory would be determined based on the input of industry and government advisors. However, the City may wish to consider including the classification, reference standards and tests that are required for different types of recycled-content construction materials. It also could state the types of construction in which each product can be used, and the procedures necessary to obtain approval from the Materials and Equipment Acceptance Division (MEA). MEA application forms, resource materials and names and numbers of contact persons also could be included. Such information could be particularly helpful to small firms that are developing recycled-content products. As an additional service, the directory can inform applicants that Code modifications are at times possible by applying to the NYC Department of Buildings Deputy Commissioner of Technical Affairs, (currently Satish K. Babbar, R.A.), and could outline the procedure necessary for this process. It also can point out obstacles that might be encountered in this process and give advice on overcoming them.

*Methods of Dissemination*

The consultants recommended a printed directory initially, with an on-line version in about two years when the construction industry, generally, is expected to feel more comfortable with the Internet.

Once a database is established, it could be adapted to both types of use. To date, based on inquiries by the consultants, printed versions of directories have proved more popular than computerized databases in the three locales that were investigated; however, this is expected to change as a result of Internet access. Wisconsin is planning to put its directory on the Internet. A readily updated on-line version of a recycled-content building materials directory offers a currency that is important to structural specification writers, architects, engineers, and purchasing agents, many of whom obtain information via computer networks.

The use of either hard-copy or computerized format recycled content building materials directory by the construction industry appears to be directly related to the marketing effort. The city of Los Angeles, which pursued an aggressive marketing strategy through the ABI database, appeared to enjoy better results than Portland OR, which did not actively market its guide. Interest in the Wisconsin guide also appears directly related to the level of promotional effort.

Either or both printed and on-line versions could be promoted via the New York Construction News and other trade press as well as newsletters and mailings to members of groups such as the General Contractors Association, Buildings Trade Association, Building Contractors Association, local chapters of the American Institute

of Architecture and the Construction Specifications Institute, and supplier trade groups, such as The Plumbing Foundation of New York.

**Action Items**: The Task Force plans to sponsor a focus group of representatives of the targeted audience for a directory and potential co-sponsors to explore the merits and feasibility of developing a New York City directory to promote increased use of recycled-content building materials. The Building Advisory Committee of the Department of Buildings would be included in this process. Alternatively, or in addition to the focus group, the Task Force may conduct a survey.

Depending upon the outcome of the focus group and/or survey, the Task Force may take steps to develop, produce, print, and distribute a recycled-content building materials directory, while considering the recommendations of the consultant, presented above. If deemed appropriate and feasible, the directory could ultimately appear on DOB's Web Site, linked to DOS's Web Site.

5. Develop standards for plastic construction members.

Plastic construction members is a product made from recycled plastic, which resembles wood, but has properties that warrant its consideration as a building product. These properties include durability, strength, flexibility, and resistance to organisms that can attack and ultimately weaken or disintegrate alternative wooden products. Plastic construction members also does not contain toxic wood preservatives that may be used in wood construction materials.

Plastic construction members has been tested and used by other jurisdictions for many products, such as picnic tables and benches, boardwalks, and marine uses such as pilings for piers. Plastic construction members was tested at the Tiffany Pier in Manhattan, but the pier was severely damaged by a fire started by lightning.

Concerns regarding plastic construction members have focused on the need for standards that ensure that plastic construction members consistently meets the performance and safety requirements of government officials and the building and construction industry. The plastic construction members industry has matured. Specifications have been developed and product tested extensively. Plastic construction members is viewed by the industry and regulators, who must ensure the health and safety of the public, as a potentially viable, safe, and cost-effective product for certain uses.

**Action Item**: The American Society for Testing Materials is developing reference standards for structural plastic. ASTM Section D20.20.01 has been working on this standard since 1994. It will cover allowable bending, compressive and shear stresses, density and sagging due to creep, as well as fire tests. This process is still ongoing. A Building Code Amendment to sub-chapter 10 is needed by the City Council to allow plastic as a building material, and to refer to the ASTM standard, once it is finalized.

6. Examine opportunities for recycled aggregate to be used for certain specified non- load bearing applications.

Aggregates from glass, tile or concrete —regardless of whether from recycled-content or virgin materials — are not currently listed among accepted fill materials in the NYC Code, due to health and safety concerns. For example, recycled concrete obtained from a nuclear power plant could contain radioactive material. Recycled glass generated in other countries might contain lead, which could potentially leach from the site where it is used and pose health risks to the public.

The consultants recommended that the City consider specific situations where specific types of aggregate materials, including recycled aggregates, could be deemed acceptable. In consideration of the environmental, health and safety issues, the input of environmental regulatory agencies would be important. The Department of Sanitation also would be consulted, because of its jurisdiction in providing approvals for land fill projects. The Parks Department would be consulted to regarding the use of recycled aggregate fill materials for use as sub-soil in landscaping applications

**Action Item**: The Task Force intends to establish a working group with the NY State Department of Environmental Conservation, NYC Department of Environmental Protection, NYC Department of Sanitation, and other experts to determine if there are specific uses and conditions that might allow the use of recycled aggregate for non-load bearing applications. This undertaking would be pursued in consultation with the Building Advisory Committee of DOB.

7. Legislation to allow use of plastic sprinkler and drainage pipes in some classes of residential structures.

Currently, the NYC Building Code does not allow any plastic water supply plumbing for any circumstances, and limits use of plastic drainage, vent and waste plumbing pipe to residential buildings under three stories. Other cities permit much wider use of such materials. Since the Plumbing Code, included as part of the NYC Building Code, is governed by law, any change would entail a change in local law.

The consultants believe that allowing use of plastic pipes for those applications that are deemed not to pose structural, health, or safety risks could lead to substantial savings for builders, which could be passed on to consumers.

The consultants estimate that the materials and labor costs for installing light-weight plastic drainage piping, whether made with virgin or recycled-content plastic, are approximately 33% less than the cost for installing metal piping. If heavier-grade plastic piping is needed, the savings are estimated by the consultants to be approximately 25%. Since plastic pipe can be produced with recycled material, specified, allowable uses of plastic pipe could support markets for recycled plastic.

**Action Item:** The Department of Buildings has requested its Plumbing and Fire Suppression Licensing Board to investigate recommending that the City Council amend the Building Code to permit PVC (Polyvinyl chloride) outdoor underground drainage piping in all occupancy groups. The Department of Buildings' Rules Governing the Installation of Plastic Sprinkler Pipe will become effective on October 18, 1999. These rules will allow the MEA to accept CPVC (Chlorinated Polyvinyl Chloride) sprinkler pipe for use in long-term residential buildings, and will establish standards for its installation in buildings. The Department of Buildings is also meeting with Consolidated Edison and the Brooklyn Union Gas Co. regarding those companies drafting of proposed legislation to allow the use of outdoor buried plastic gas pipe inside of lot lines. (The NYS Public Service Commission presently allows plastic gas pipe buried in the street).

8. Promotional efforts.

Implementation of the recommendations and action items presented in this report can be facilitated through various promotional efforts, in addition to those specific to each of the initiatives presented above. Press events, press releases, articles in trade journals, exhibition booths at trade fairs, and other promotional strategies could be pursued by the Department of Buildings with the Inter-Agency Task Force and other interested parties.

**Action Item:** The Inter-Agency Task Force intends to pursue efforts to encourage the building and construction industry to capitalize on the opportunities anticipated to result from the actions of the Task Force.

9. Other initiatives.

Through continued research, and review of studies conducted by non-City Agencies, and in other jurisdictions, the City may identify other initiatives that merit examination and consideration for implementation. For example, two companion studies to the Action Plan have recently been completed. INFORM, a national research organization, completed a study in June 1998 entitled "Building for the Future". This study examined cost-effective strategies to reduce the amount of construction and demolition waste generated by municipal projects. The Department of Design and Construction also completed a companion study to the Action Plan in April 1999, entitled "High Performance Building Guidelines". This study focuses on environmentally responsible initiatives in the construction industry. The research, which extends beyond the realm of recycled-content building materials, includes an examination of national and international environmentally responsible building initiatives and opportunities and obstacles to development of guidelines. In addition, other organizations such as EDC and Empire State Development might be resources for future activities intended to promote recycled content building material initiatives.

**Action Item:** Agencies that participated in the Task Force intend to continue to examine opportunities to promote recycled-content building materials and other cost-effective initiatives consistent with the City's objectives to conserve natural resources, protect public health and the environment, and otherwise benefit the City.

# References

**New York City Agencies**

Mayor's Office of Construction
Louise Woehrle
212-788-2508

Department of Buildings
Materials & Equipment Acceptance Division
Mark Jachneiwicz
212-312-8330

Department of Design & Construction,
Office of Sustainable Construction
Hillary Brown
718-391-1371

Department of Sanitation
Bureau of Waste Prevention, Reuse and Recycling
Dave Kleckner
212-837-8175

**Other Agencies**

Clean Washington Center
Dept. of Community, Trade & Economic Development
2001 6th Avenue, Suite 2700
Seattle, WA 98121
206-464-7040
Preston Horne-Brine
Manager, Business Assistance Division
John Yeasting
Business Assistance Specialist: construction
206-389-2808

Greater Toronto Homebuilders Assn.
Build Green, Inc./Ortech
20 Upjohn Road
North York, Ontario, Canada M3B 2V9
416-327-3777

Integrated Solid Waste Management Office
200 North Main St., Rm. 508 DHE
Los Angeles, CA 90012
Kelly Ingalls
213-237-1444

King County Solid Waste Division
400 Yesler Way, Suite 600
Seattle, WA 98104
206- 296-8800

Metro
600 NE Grand Ave.
Portland, OR 97232-2736
503- 797-1650
Jim Goddard
Pat Varley
503-797-1672

Ministry of Environment and Energy
Waste Reduction Office
40 St. Clair Avenue West, 7th Floor
Toronto, Ontario, Canada M4V 1M2
Dennis Onn
416-314-4630

Ministry of Municipal Affairs and Housing
Housing Development and Buildings Branch
77 Bay Street, 2nd Floor
Toronto, Ontario, Canada M5G 2E5
J. Michael de Lint, Senior Policy Advisor
Planning & Building Policy Section
416-585-7583

Minneapolis
Solid Waste & Recycling
612- 673-2917

NYS Dept. of Environmental Conservation
State Recycling Division
50 Wolf Road, Albany N.Y. 12233
Pete Pettit 518-457-7337
Suzanne Ports 518-457-3966

NYS Department of Economic Development
One Commerce Plaza
Albany, N.Y. 12245
Tom Kacandes,
Office of Recycling and Market Development
518-486-6291

Newark
Sanitation Administration 201-733-3860
Recycling Dept: 201-733-6685

Orlando, Florida
Bureau of Solid Waste: 407-246-2314
Building & Zoning Dept: 407-246-2271

Triangle J. Council of Governments
P.O. Box 12276
Research Triangle Park NC 27709
919-549-0551

State of Wisconsin
Dept. of Procurement
Madison, Wisconsin
Dan Wherman
608-267-6922

**Recycling Organizations**

Cornell Cooperative Extension
Waste Management Institute -
Center for Environmental Research
607-255-8102
Ken Cobb
607-255-1185

The Freedonia Group, Inc.
3570 Warrensville Center Road, Suite 201
Cleveland, OH 44122-5226
216-921-6800

Healthy Properties
Barry Dimson
212-758-1815

Inform
120 Wall St.
New York, N.Y.
Bette Fishbein
212-361-2400

Resource Recovery Systems, Inc.
50 Main Street
Centerbrook, CT 06409
Matthew McCauley, VP
203-767-7065

University of Florida
School of Building Construction
Charles Kebert
904-392-5965

**Recycling Industries and Manufacturers**

Cellotex
Wayne, PA
Hal "Lyn" Hatton
610-964-1925

Domtar
P.O. Box 543,
Anne Arbor, MI 48106
Jack Hodges

The Homasote Company
Box 7240
West Trenton, NJ 08628-0240
609-883-3300
800-257-9491

Plastic Lumber Council
520 S. Main St. Suite 2446
Akron OH, 44311-1010
800-886-8990 or 216-762-8989

**User and Construction Industry Organizations**

Building Trades Association
Louis Colletti
212-481-0240

Building Contractors Association
Paul O'Brien
212-683-8080

General Contractors Association
Frank McCardle
Ben Esner
212-481-9230

McDonald's Restaurant Chain
Environmental Affairs Dept.
Executive Offices
Oak Brook Ill.
708-575-3000

New York Building Congress
Richard Anderson
212-481-9230

Plumbing Foundation of New York
Mark Whalen George Whalen - Consultant
212-233-6555 508-240-3436

# Appendix A:

## NYC Building Code Requirements for Building Materials Listed in Table 1

### GLASS

#### Sitework

**Glass aggregate for backfill and drainage:** Not permitted by code for bearing substrate. Not restricted for other fills.

NYC Building Code (27-675): Glass aggregate for backfill material is not listed as an acceptable fill material. For glass aggregate to be permitted as a fill material glass aggregate must be tested to establish its load bearing capability. There is no current code criteria for establishing substitute bearing materials.

**Glass aggregate for geotextiles:** Geotextiles are not identified in the code and are therefore permitted by code by virtue of non-exclusion.

**Ceramic pavement tile from crushed glass:** Permitted by non-exclusion but must meet slip resistance criteria of ADA. Ref. Standard: ANSI 117.1 Americans with Disabilities Act for slip resistance.

#### Thermal and Moisture Protection

**Unfaced or faced insulation:** Permitted by code provided the fire resistance criteria is met. No restrictions, except for toxicity, where noncombustible construction is permitted.

NYC Building Code (27-335) sets standards for acoustical and thermal insulation for use in noncombustible construction. The code uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion.

#### Structure

**Structural glass curtain wall systems:** Permitted provided materials and systems meet structural performance criteria in the building code.

NYC Building Code Reference Standard: RS9-5 sets the allowable minimum design wind pressures. This standard defines the wind velocity resistance requirements by setting structural design criteria.

NYC Building Code Subchapter 8 Article 12 regulates the use of glass as part of an exterior wall and references ASTM C1036 and ASTM C1048 which sets the acceptable standards for glass and glass performance.

## Interior Surfacing

**Glass Wall Systems:** No restrictions on the use of glass as an interior finish material except as may be required to limit fire spread and where fire-resistive construction is required. There are additional structural performance requirements for applications where human impact loads are anticipated. For interior surfacing ASTM E84-87 is used as the basis of flame spread and limits the toxicity of the products of combustion.

**Glass brick:** Permitted. New materials must show compliance with flame spread and smoke development restrictions.

**Foam Glass block:** Permitted. New materials must show compliance with flame spread and smoke development restrictions.

**Ceramic wall tile:** Permitted. New materials must show compliance with flame spread and smoke development restrictions.

**Glass beads in reflective paint:** Permitted. Surface materials less than 0.036" thick are excused from fire resistance rating requirements.

## Windows and Doors

**Insulating Glass:** Permitted provided it meets the performance criteria outlined in the code.

NYC Building Code Reference Standard RS9-5 sets the allowable minimum design wind pressures. This standard defines the wind velocity resistance requirements by setting structural design criteria.

NYC Building Code Subchapter 8 Article 12 regulates the use of glass as part of an exterior wall and references ASTM C1036 and ASTM C1048 which sets the acceptable standards for glass and glass performance.

**Glass Brick:** Permitted.

**Foam Glass Block:** Permitted for insulation. Not recommended for exterior surfacing material.

## Roofing

**Crushed Glass in Roofing Shingles:** Permitted provided the product meets the required fire and wind resistance criteria established in the code.

NYC Building Code (27-337) classifies materials in Reference Standard 5-9 and 5-10 based on fire resistance ratings. Acceptability is based on showing compliance with ASTM E108-87 for determination of fire resistance of roof coverings.

### Miscellaneous

**Crushed Glass for Sandblasting:** NYC Building Code does not cover this subject. Other codes may apply restrictions on use of this material for environmental reasons.

## PLASTIC

### Sitework

**Plastic Construction Members:** Permitted when not used for structural elements. To be used for structural elements proposed materials must be proven to meet structural criteria established for lumber. No current code classification for this material.

**Fiberglass Fencing Slats:** Not currently covered by the building code. Permitted by non restriction.

**Plastic Foundation Vents**: Permitted provided vent is not part of a fire rated exterior wall assembly. If used as part of a rated wall assembly the rules for openings in rated exterior wall construction apply.

**Plastic and Rubber Sheets:** Permitted. Not currently covered by the building code.

**Geotextile Fabrics**: Permitted. Not currently covered by the building code. DOB is currently in the process of issuing a TPPN (Technical Procedure and Policy Notice) that will allow the lining of excavations for buried motor fuel tanks with plastic geotextiles in lieu of the current practice of using concrete piers.

**Plastic Drainage Board:** Permitted. Not currently covered by the building code.

**Plastic Drainage Pipe:** Permitted.

**Plastic Sprinkler Pipe:** Currently permitted for voluntary sprinkler systems in long-term residential buildings, and will be permitted for all sprinkler systems in those buildings.

### Thermal and Moisture Protection

**Rigid Foam board insulation:** Permitted under restrictive use.

> NYC Building Code (C27-335) sets standards for acoustical and thermal insulation for use in noncombustible construction. Uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion. Additional requirements for minimum coverage of 3" of masonry.

**Construction Film for Vapor Barrier:** Permitted with restrictions applying to fire resistance rating in fire resistance rated wall construction.

**Fiber Insulation Batts from Recycled Plastic:** Not permitted in fire rated assemblies unless acceptable fire resistance and non-toxicity is achieved.

Ref. Standard: C27-335 sets standards for acoustical and thermal insulation for use in noncombustible construction. Uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion. Additional requirements for minimum coverage of 3" of masonry.

**Aluminum Faced Plastic Core Insulation:** Permitted with restrictions. Roofing and limited exterior assemblies only.

NYC Building Code (C27-335) Sets standards for acoustical and thermal insulation for use in noncombustible construction. Uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion. Additional requirements for minimum coverage of 3" of masonry.

**Plastic Flashing:** Not restricted except in fire resistive assemblies.

**Gutter Screens:** Not currently covered by the building code.

**Structure**

**Structural building components from plastic core:** The ASTM is establishing loading criteria for structural plastic, and the NYC Building Code will have to be amended to allow its use. Structural plastic shall not be compared to lumber because it is not wood.

**Fiber plastic construction members from fiberglass waste:** Permitted with restrictions on fire resistance, toxicity and flame spread.

NYC Building Code Reference Standard RS10 defines the basis of accepting wood and wood products. Plastic composition materials are not defined within this class. To be used for structural elements material must be proven to meet loading criteria established for lumber, establish a basis of structural comparison and be accepted by the MEA or BSA.

If the above is considered an interior finish material the following would apply:

NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

**Structural panel of foam and plastic studs:** Not specifically permitted. Each end product must be individually researched and approved. No code criteria for testing exists.

## Interior Surfacing

The use of all interior plastics are subject to toxicity and fire resistance restrictions.

> NYC Building Code (27-348) Defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

## Exterior Surfacing

**General:** The fire districts are not relevant since non-fire related combustible exterior walls may be erected inside or outside of the fire districts under the right conditions. Exterior surfacing on those wall is not required to meet ASTM E84. Exterior surfacing must meet that standard if the walls either must be non-combustible, or must be fire-rated, or both, whether inside or outside the fire districts.

**Vinyl Siding:** Vinyl siding may be used on exterior walls not required to have a fire resistance rating, on buildings of construction class 4,IID or IIE. The MEA has approved a combustible wall assembly having a one-hour fire resistance rating having vinyl siding as a component This wall assembly may be used for one-hour rated exterior walls on buildings of construction class 4, IID or IIE. Whether or not the building is inside or outside the fire districts is not relevant since the above building classes may be used inside or outside of the fire districts under the right conditions.

**Exterior Panels made with Polystyrene foam:** Not permitted within fire districts. Permitted outside fire districts. If used within fire districts, compliance with ASTM E84, is required.

**Exterior Plastic Panels:** Limited use. All load bearing members must comply with code criteria. Plastics must comply with fire resistance requirements. If used within fire districts, compliance with ASTM E84 is required.

**Plastic Blocks for Concrete Substitute:** Concrete substitute implies a load bearing product. Not permitted unless extensive testing is performed. No criteria can be established at this time.

## Flooring

All uses of plastic based interior floor materials are subject to fire resistance requirements.

> NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84

or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

**Windows and Doors**

Window and door materials of plastic based products are not restricted by nature of their materials. They must meet fire resistance, entry resistance and toxicity requirements of the code.

NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

Additional requirements for approval based upon ASTM E152, E163 and NFPA 80 all pertaining to fire tests for doors and windows.

**Roofing**

Permitted provided roof materials meet the classification required by the code. This relates to fire resistance requirements.

NYC Building Code (27-337) classifies materials in Reference Standard 5-9 and 5-10 based on fire resistance ratings. Acceptability is based on showing compliance with ASTM E108-87 for determination of fire resistance of roof coverings.

**C/D**

**Sitework**

**INERT** (Concrete, rock, drywall, masonry or other similar non-organic based materials except metal and glass)

**Fill materials from recycled concrete aggregate:**

NYC Building Code (27-675): Recycled inert materials for backfill material are not listed as acceptable fill materials. To be permitted as a fill material aggregate must be tested to establish its load bearing capability. There is no current code criteria for establishing substitute bearing materials.

Not permitted for building backfill. Not a classified bearing material.

**Asphalt products using recycled aggregate & binders:** None of the building codes reviewed apply to asphalt products used for paving. Refer to state and local municipal highway codes for applicable criteria.

**Insulating materials**

**Unfaced or faced insulation:** Permitted provided fire resistance criteria is met. No restrictions, except for toxicity, where noncombustible construction is permitted.

NYC Building Code (27-335) sets standards for acoustical and thermal insulation for use in noncombustible construction. The code uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion.

**Structural** values for materials made from inert C & D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.

**Interior Surfacing Materials:**

NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

**Exterior Surfacing Materials**

If used within fire districts, compliance with ASTM E84, is required. Restrictions are not based on materials but on fire resistive performance of exterior wall systems.

**Flooring Materials**

No restrictions provided material is attached to properly rated floor covering for specific building type, as per NYC Building Code 27-351. No restrictions other than flame spread and smoke development.

**Roofing Materials**

Permitted provided roof materials meet the classification required by the code. This relates to fire resistance requirements.

NYC Building Code (27-337) classifies materials in Reference Standard 5-9 and 5-10 based on fire resistance ratings. Acceptability is based on showing compliance with ASTM E108-87 for determination of fire resistance of roof coverings.

## WOOD

### Sitework

None of the building codes reviewed apply to wood products used for sitework. Refer to state and local municipal highway codes for applicable criteria.

### Insulating Materials

**Unfaced or Faced Insulation:** Permitted provided fire resistance criteria is met. No restrictions, except for toxicity, where noncombustible construction is permitted.

NYC Building Code (27-335) sets standards for acoustical and thermal insulation for use in noncombustible construction. The code uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion.

**Structural** values for materials made from wood based C & D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.

Reduced values for reused structural lumber.

### Interior Surfacing Materials

NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

### Flooring Materials

No restrictions provided material is attached to properly rated floor covering for specific building type, per NYC Building Code 27-351. No restrictions other than flame spread and smoke development.

### Roofing Materials

Permitted provided roof materials meet the classification required by the code. This relates to fire resistance requirements.

NYC Building Code (27-337) classifies materials in Reference Standard 5-9 and 5-10 based on fire resistance ratings. Acceptability is based on showing compliance with ASTM E108-87 for determination of fire resistance of roof coverings.

**PAPER**

**Sitework**

None of the building codes reviewed apply to paper based products used for sitework. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials** made from paper based C & D waste.

**Unfaced or Faced Insulation:** Permitted provided fire resistance criteria is met. No restrictions, except for toxicity, where noncombustible construction is permitted.

NYC Building Code (27-335) sets standards for acoustical and thermal insulation for use in noncombustible construction. The code uses ASTM E136-65 vertical tube furnace as the basis of combustibility and ASTM E84-87 as the basis of flame spread and limits the toxicity of the products of combustion.

**Structural** values for materials made from paper based C & D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.

**Interior Surfacing:**

NYC Building Code (27-348) defines the basis of acceptance of interior finish materials for resistance to flame spread and smoke developed using ASTM E84 or ASTM E 69 as defined in NYC Building Code Reference Standard 5-5 and is the basis for evaluating interior finish materials.

**Flooring**

No restrictions provided material is attached to properly rated floor covering for specific building types, per NYC Building Code 27-351. No restrictions other than flame spread and smoke development.

**Roofing**

Permitted provided roof materials meet the classification required by the code. This relates to fire resistance requirements.

NYC Building Code (27-337) classifies materials in Reference Standard 5-9 and 5-10 based on fire resistance ratings. Acceptability is based on showing compliance with ASTM E108-87 for determination of fire resistance of roof coverings.

# Appendix B:

## Description of Reference Standards and Tests for New York City Building Code

This listing is provided as a general aid for suppliers and users of recycled-content building material and not as a definitive listing of all Building Code references. In addition to the information provided below, there may be other standards and code provisions applicable to a specific product.

### List of References and Standards

***NYC Building Code (27-335):*** Acoustical and Thermal Insulation: Use in Noncombustible Construction.

***NYC Building Code (27-337):*** Determines Classifications of Roof Coverings.

***NYC Building Code (27-348):*** Interior Finishes

***NYC Building Code (27-351):*** Finish Flooring and Floor Coverings.

***NYC Building Code (27-675):*** Classification of Soil Materials.

***NYC Building Code Reference Standard RS5-5*** Establish Method of Determination of Combustibility of Materials.

***NYC Building Code Reference Standard RS5-9 Roof Coverings:*** Outlines Minimum Standards of Acceptability of Known Roofing Materials.

***NYC Building Code Reference Standard RS5-10 Roof Coverings***: Outlines Minimum Standards of Acceptability of Unknown Roofing Materials.

***NYC Building Code Reference Standard RS9-5*** Minimum Design Wind Pressures.

***NYC Building Code Reference Standard RS10-8*** Lumber and Timber Construction.

***NYC Building Code Reference Standard RS5-1*** Fire Resistance Ratings and Design Manual.

***NYC Building Code Reference Standard RS5-12, 13*** Standard Test Method for Rate of Burning and/or Extend and Time of Burning for Plastics.

***NYC Building Code Reference Standard RS5-16*** Acoustical Tile and Lay in Panel Ceiling Suspension Systems.

*NYC Building Code Reference Standard RS9-12* Minimum Requirements for Uniformly Distributed and Concentrated Live Loads.

*NYC Building Code Reference Standard RS10-3, 4* Requirements for Reinforced Concrete.

*NYC Building Code Reference Standard RS10-5A, B* Load and Resistance Factor and Other Design Specifications for Structural Steel Buildings.

*NYC Building Code Reference Standard RS10-9* Plywood Construction.

*NYC Building Code Reference Standard RS10-13* Span Tables for Joists and Rafters.

*NYC Building Code Reference Standard RS10-18* Structural Glue Laminated Timber and AITC 2000-83 Inspection Manual.

*NYC Building Code Reference Standard RS10-19* Standard Specification for Gypsum Sheathing Board.

*NYC Building Code Reference Standard RS 10-27* Specification for Fiberboard Nail-base Sheathing.

*NYC Building Code Reference Standard RS10-31A, B* Standard Specification for Facing and Hollow Brick.

*NYC Building Code Reference Standard RS 10-40* Standard Specification of Ceramic Glazed Structural Clay Facing Tile, Facing Brick and Solid Masonry Units.

*NYC Building Code Reference Standard RS10-53, 55, 57* Design and Fabrication Specifications and US Product Standards for Plywood-Lumber.

*NYC Building Code Reference Standard RS10-54, 56* Standards and Policies for Structural-Use Panels.

*NYC Building Code Reference Standard RS10-67* Safety Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

*NYC Building Code Reference Standard RS16* Plumbing and Gas Piping.

## List of Tests

*ASTM E 69-80* Test Method for Combustible Properties of Treated Wood by the Fire Tube Method.

*ASTM E84-87* Test for the Surface Burning Characteristics of Building Materials: Using the Steiner Tunnel method the horizontal rate of burning and the products of combustion are calculated.

*ASTM E108-87* Standard Test Method for Fire Tests of Roof Coverings: Tests the measurement of relative fire characteristics of roof coverings.

*ASTM E136-65* Test method for Behavior of Materials in a Vertical Tube Furnace at 750 deg. C.: Tests the combustibility of a material when subjected to a given amount of heat within a controlled closed vertical cylinder.

*ASTM E152 -81* Standard Methods of Fire Tests of Door Assemblies: Determines the duration of resistance of a wall opening to fire.

*ASTM E163-84* Standard Methods for Fire Tests of Window Assemblies: Determines the duration of resistance of a wall opening to fire.

*ASTM C1036-85* Standard Specification for Flat Glass: Specification covers quality standards for flat glass.

*ASTM C1048-87* Standard Specifications for Heat Treated Flat Glass: Specification covers quality standards for heat treated flat glass.

*NFPA 80-86* Standard for Fire Doors and Windows: Establishes the standards for construction for doors and windows having a fire resistance rating.

# Appendix C:

## Comparison of Code Criteria for Acceptance of Recycled-Content Glass, Plastic and C/D Building Products

### GENERAL CODE REQUIREMENTS

**Fire Resistance Requirements:**

All codes use nationally recognized testing criteria to determine acceptable fire resistance criteria. All codes use combustibility as the basis of fire resistance requirements.

**Interior Materials**:

Interior materials are either materials that are interior finishes or form the part of interior construction that is not a finish material. The bases of review and approval of interior materials are resistance to fire spread and amount of smoke developed. None of the codes reviewed uses methods that could be interpreted as more restrictive or less restrictive with respect to the use of recycled materials.

**Requirements For Interior Finish Materials:**

BOCA/UBC: Restricted flame spread and smoke development using the Steiner Tunnel test. No restrictions on trim materials. No toxicity restrictions.

NYCBC: Restricted flame spread and smoke development using the Steiner Tunnel test. No restrictions on trim materials. Toxicity restricted.

**Structural Loading Criteria:**

All codes set loading criteria for exterior and interior materials used as a structural component of a building. Although variations exist in the loading criteria due to location and seismic resistance requirements, there is no appreciable difference among the codes reviewed in approaches used to select materials and directing how materials are to be tested for their load bearing characteristics.

### GLASS:

**General Requirements For the Use of Glass:**

All codes have performance based glass requirements which are not related to material composition. Wind resistance and structural performance determine glass thickness.

**General Requirements For Glass Used For Interior Materials:**

None of the codes reviewed place restrictions on the use of glass as an interior finish material except: 1) as may be required to limit fire spread where fire-resistive construction is required and 2) for structural applications of glass.

**Specific Applications:**

**Fill Materials From Glass Based Aggregate:**
All codes: Not permitted for building backfill. Not a classified bearing material.

**Ceramic Pavement Tile From Crushed Glass:**
None of the building codes reviewed apply to outdoor pavement. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials Made From Glass Waste:**
All codes: Restricted flame spread and smoke developed using the Steiner Tunnel test.

**Exterior Glass Curtain Wall Systems:**
All codes: Glass requirements are performance based and not related to material composition. Wind resistance and structural performance determine glass thickness.

**Interior Surfacing Made From Glass Waste Materials:**
All codes: No restrictions on the use of glass as an interior finish material except as may be required to limit fire spread where fire-resistive construction is required and restrictions for structural applications of glass.

**Glass For Windows:**
All codes: Glass requirements are performance based and not related to material composition. Wind resistance and structural performance determine glass thickness.

**Roofing Materials Made With Glass Waste:**
BOCA: Required wind and rain resistance, pass accelerated weathering tests and meet required fire resistance ratings.
UBC: Materials must fall into defined groups of materials. C & D wastes would have to be proven to fall into specific groups otherwise not permitted. Products must meet required fire resistance ratings.
NYCBC: No restrictions other than fire resistance rating.

**PLASTIC:**

None of the building codes reviewed apply to products used in relation to plastic products used for sitework. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials Made From Plastic Waste Products:**
All codes: Restricted flame spread and smoke developed using the Steiner Tunnel test.

**General Requirements For the Use of Foam Plastics:**

BOCA: Restricted flame spread and smoke developed using the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. 4" is the threshold dimension.

Foam plastics must be separated from the interior with a minimum of 1/2" gypsum board or equivalent thermal barrier. Other additional restrictions apply to different construction applications. More restrictive flame spread ratings apply to exterior wall construction.

Roof applications not restricted provided total roof assembly including roofing, insulation and supporting deck are tested to achieve required fire resistance rating. Permitted roof covering materials are identified.

UBC: Restricted flame spread and smoke development using the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. The threshold dimension is 4".

Foam plastics must be separated from the interior with a thermal barrier. Other additional restrictions apply to different construction applications. More restrictive flame spread ratings apply to exterior wall construction.

Roof applications not restricted provided total roof assembly including roofing, insulation and supporting deck are tested to achieve required fire resistance rating. Restricted thickness with limitations on flame spread. Not identified as a permitted roof covering material.

NYCBC: Restrictions for flame spread and smoke development based on the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. The threshold dimension is 4".

When used as a thermal barrier it must be separated from the interior with a minimum of 3" of masonry.

Roof applications not restricted provided total roof assembly, including roofing, insulation and supporting deck, is tested to achieve required fire resistance.

**Foam Plastics Used For Interior Materials:**

BOCA/UBC: In addition to the fire spread and smoke development rating restrictions for interior materials, foam plastics are required to have a greater fire resistance limited area, thickness and density.

NYCBC: No specific reference to foam plastics for interior finish materials.

**Exterior Surfacing Materials Made From Foam Plastics:**

BOCA: Restricted flame spread and smoke developed using the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. 4" is the threshold dimension.

Foam plastics must be separated from the interior with a minimum of 1/2" gypsum board or equivalent thermal barrier. Other additional restrictions apply to different construction applications. More restrictive flame spread ratings apply to exterior wall construction.

Roof applications not restricted provided total roof assembly including roofing, insulation and supporting deck is tested to achieve required fire resistance rating. Permitted roof covering materials are identified.

UBC: Restricted flame spread and smoke developed using the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. 4" is the threshold dimension.

Foam plastics must be separated from the interior with a thermal barrier. Other additional restrictions apply to different construction applications. More restrictive flame spread ratings apply to exterior wall construction.

Roof applications not restricted provided total roof assembly including roofing, insulation and supporting deck is tested to achieve required fire resistance rating. Restricted thickness with limitations on flame spread. Not Identified as a permitted roof covering material.

NYCBC: Restrictions for flame spread and smoke development based on the Steiner Tunnel test. Additional flame spread and smoke development ratings are based upon the thickness used. 4" is the threshold dimension.

When used as a thermal barrier it must be separated from the interior with a minimum of 3" of masonry.

Roof applications not restricted provided total roof assembly, including roofing, insulation and supporting deck, is tested to achieve required fire resistance.

**General Light Transmitting Exterior Plastics Classifications:**

BOCA/UBC: Sheet plastics are divided into two classifications. The rate of burn determines the classification.

NYCBC: Sheet plastic have only one category based on burning rate. Rate is equivalent to the greater burning rate of the plastics classified by UBC and BOCA.

**Light Transmitting Plastics Used as Exterior Panels:**

BOCA/UBC: Approved plastics can be installed as exterior walls, but use in exterior walls requiring fire-resistive ratings is restricted.

NYCBC: Restrictions are not based on materials but on fire resistive performance of exterior wall systems.

**Light Transmitting Plastics Used as Glazing:**

BOCA/UBC: Approved plastics can be installed in opening with limits on area and height above grade. Limitations for structural ability also apply.

NYCBC: Approved plastics can be used in non-rated opening with limits on height above grade.

**Light Transmitting Plastics Used as Roof Panels:**

BOCA/UBC: Approved plastics can be installed as roof panels with limits on area based on the burning rate of plastic. Additional limitations on use for selected occupancies.

NYCBC: Restrictions are not based on materials but on fire resistive performance of roof system.

**Light Transmitting Plastics Used as Skylights:**

BOCA/UBC: Approved plastics can be installed in skylights with limits on area based on the burning rate of plastic. Additional limitations on use for selected occupancies.

NYCBC: Approved plastics can be installed in skylights.

**Plastic Siding:**

BOCA: Approved plastics can be used for plastic siding with restrictions on fire resistive ratings as applied to exterior wall construction and structural resistance.

UBC: Approved plastics can be used for plastic siding with limitations on permitted amount of surface area of siding and with restrictions on fire resistive ratings as applied to exterior wall construction and structural resistance.

NYCBC: Approved plastics can be used for plastic siding with limitations on permitted amount of surface area of siding.

**Roofing Materials Made From Plastic Based Waste:**

BOCA: Required wind and rain resistance, pass accelerated weathering tests and meet required fire resistance ratings.

UBC: Materials must fall into defined groups of materials. C & D wastes would have to be proven to fall into specific groups otherwise not permitted. Products must meet required fire resistance ratings.

NYCBC: No restrictions other than fire resistance rating.

**C/D INERT:** (Concrete, rock, drywall, masonry or other similar non-organic based materials except metal and glass)

**Fill Materials From Recycled Concrete Aggregate:**
BOCA/UBC: Not permitted for building backfill.
Not a classified bearing material.

**Asphalt Products Using Recycled Aggregate & Binders:**
None of the building codes reviewed apply to asphalt products used for paving. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials:**
All codes: Restricted flame spread and smoke developed using the Steiner Tunnel test.

**Structural** values for materials made from inert C/D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.

**Interior Surfacing Materials:**
BOCA/UBC: Restricted flame spread and smoke developed using the Steiner Tunnel test.
NYCBC: Restricted flame spread and smoke developed using the Steiner Tunnel test. Restrictions on toxicity of products of combustion.

**Exterior Surfacing Materials:**
BOCA: Required weather resistance against wind and rain, resist structural loading from wind and other applied loads, and be flood and rat proof in required applications. Restricted fire resistance as required by construction classification.
UBC: Required weather resistance against wind and rain, resist wind and other applies structural loads. Restricted fire resistance as required by construction classification.
NYCBC: Restrictions are not based on materials but on fire resistive performance of exterior wall systems.

**Flooring Materials:**
BOCA: If material is judged as "traditional" no restrictions other than flame spread and smoke development.
UBC/ NYCBC: No restrictions other than flame spread and smoke development.

**Roofing Materials:**
BOCA: Required wind and rain resistance, pass accelerated weathering tests and meet required fire resistance ratings.
UBC: Materials must fall into defined groups of materials. C & D wastes would have to be proven to fall into specific groups otherwise not permitted. Products must meet required fire resistance ratings.
NYCBC: No restrictions other than fire resistance rating.

## C/D WOOD

None of the building codes reviewed apply to wood products used for sitework. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials:**
All codes: Restricted flame spread and smoke developed using the Steiner Tunnel test.

**Structural** values for materials made from wood based C/D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.
NYCBC: Reduced values for reused structural lumber.

**Interior Surfacing Materials:**
BOCA/UBC: Restricted flame spread and smoke developed using the Steiner Tunnel test.
NYCBC: Restricted flame spread and smoke developed using the Steiner Tunnel test. Restrictions on toxicity of products of combustion.

**Flooring Materials:**
BOCA: If material is judged as "traditional" no restrictions other than flame spread and smoke development.
UBC/ NYCBC: No restrictions other than flame spread and smoke development.

**Roofing Materials:**
BOCA/UBC: Wood shingles must meet defined criteria for wood shingles.
NYCBC: No restrictions other than fire resistance rating.

## C/D PAPER

None of the building codes reviewed apply to paper based products used for sitework. Refer to state and local municipal highway codes for applicable criteria.

**Insulating Materials:**
All codes: Restricted flame spread and smoke developed using the Steiner Tunnel test.

**Structural** values for materials made from paper based C/D waste can be evaluated on an end use product point of view. A proposed material and its use would be evaluated for the applicable structural resistance required.

**Interior Surfacing Materials:**
BOCA/UBC: Restricted flame spread and smoke developed using the Steiner Tunnel test.
NYCBC: Restricted flame spread and smoke developed using the Steiner Tunnel test. Restrictions on toxicity of products of combustion.

**Flooring Materials:**
BOCA: If material is judged as "traditional" no restrictions other than flame spread and smoke development.
UBC/ NYCBC: No restrictions other than flame spread and smoke development.

**Roofing Materials:**
BOCA: Required wind and rain resistance, pass accelerated weathering tests and meet required fire resistance ratings.
UBC: Materials must fall into defined groups of materials. C & D wastes would have to be proven to fall into specific groups otherwise not permitted. Products must meet required fire resistance ratings.
NYCBC: No restrictions other than fire resistance rating.

# Appendix D:

## Experience of Los Angeles CA, Portland OR and the State of Wisconsin in developing a Directory of Recycled-Content Construction Products

Los Angeles CA:

The LA Integrated Solid Waste Management Office publishes a *Resource Guide to Recycled-Content Construction Products*. The first edition, published in 1992, consisted of a short list of 24 - 36 building materials compiled primarily by outside sources, $E^2$ Environmental Enterprises Inc. and NRDC, who served as pro- bono consultants to the agency.

Materials which could be shipped readily were selected from existing directories of recycled-content products. The Harris directory was not used, because it was too large and covered too much territory. After the list was created, the agency sent out letters to all manufacturers of the products selected requesting the names and telephone numbers of distributors and suppliers of their recycled-content products in the LA area. The agency obtained most detailed product information from local suppliers.

For local suppliers of hard-to-ship items, such as concrete, wood chips and soil amendments, the agency searched their databases of applicable facilities in the LA area. Trade associations also were asked to provide the names of local distributors and manufacturers for specific recycled-content products, when possible.

Approximately 80 hours were spent (including consultants' time) in compiling the first edition of the resource guide, which was considerable smaller than the current 104 entry edition. Updates of the larger, revised editions have taken approximately 200 hours each. Some of the work is clerical, such as sending out mailings and entering responses, but some requires specialized construction knowledge. All entries are contacted for the updates, which take place approximately once a year. Since the resource guide is supposed to be a convenient method of obtaining information, if a supplier does not respond to initial or update calls, they are not included in subsequent editions.

The agency has an ABI (Architect and Builder's Institute) database which they use to send out press releases and notices of the directory's availability. It is considered important to include an order form with each mailing. A staff person, Kelly Ingalls, also speaks at conferences and local architecture schools to publicize the guide. There is no charge for the resource guide and no charge for a manufacturer or supplier to be included in the product listings.

When the guide was first published the Internet was not popular; there is presently no on-line edition of the guide available. Approximately 2,000 - 2,500 copies of the guide are distributed per year, and about 10,000 - 30,000 have been distributed since the first publication.

Publication is done in house. The guides are run off on a photo copy machine and stapled together for distribution. Duplication costs are approximately $1,000 per year for 2,500 copies.

Source: Kelly Ingalls
Integrated Solid Waste Management Office
Los Angeles, California
213-237-1444

Wisconsin:

Dan Wherman of the Wisconsin Bureau of Procurement has completed a computerized database of distributors and suppliers of recycled-content materials serving Wisconsin and neighboring states. The database is not limited to construction materials, but rather is intended to serve as a purchasing guide for state government agencies, to encourage employees to make as many public sector purchases of recycled-content materials as possible. The database is currently in a bulletin board format and can be accessed via modem or by requests through Procurement. Both state agencies and the general public have access to the bulletin board. During the last 5 years, there have been approximately 300 - 400 direct inquiries made to the bulletin board and the Bureau has gotten approximately 100 - 200 requests for information per year. Mr. Wherman estimates that approximately half of the usage is from government agencies, the rest from the general public.

Mr. Wherman used commercial directories to identify manufacturers of recycled-content materials. He then sent a one-page fax to all manufacturers of materials suitable for inclusion in the database requesting product information, the percentage of recycled material used, installation specifications, if any, and the names of local distributors and suppliers. Calls were made to the latter to verify their existence and their stocking of the products concerned. The Bureau of Procurement has a computer program, called Win Fax Pro, by the Delrina company which will send out 100 faxes from a single prototype, and can be timed to send at night when rates are lower and fax machines not generally in use. He emphasized the importance of stating on the fax that there is no charge for the company to list their products in the database. Approximately 50% of the contacts responded to the initial fax. Manufacturers who didn't reply to the initial fax were given follow-up calls only if Mr. Wherman felt the directory needed additional listings for that specific product type. Otherwise, non-responding manufacturers were not included in the final database.

In addition to construction materials, the Wisconsin database of recycled materials includes office supplies and other items needed by state and local governments. For that reason, the number of hours used to compile the database is not relevant to the task being considered by NYCDOS. Mr. Wherman was not able to provide a breakdown of the amount of time needed to compile just the portion of the database related to construction materials but did state that he thought the 200 hours cited by other agencies as necessary for updates was low. The database currently lists 600 - 700 companies and has approximately 2,500 product entries, many of which cover a number of closely related products. When originally begun in 1990, the database was considerably smaller; it has grown over the years.

On a general note, Mr. Wherman stated that there is customarily a brief flurry of activity on the database after one of his periodic presentations to government agencies. Following this, however, requests for information customarily die down or cease entirely until the next presentation. In 1993 the Bureau of Procurement also put out a limited edition of 2,000 hard copy directories. These have all been distributed to government agencies, libraries and "information providers" throughout the state and have proved more popular than the computerized database. Unfortunately they began to go out of date the moment they were distributed and Mr. Wherman advises putting an "expiration date" on any hard copy items

distributed. The agency is now working on an Internet version of the directory, which will be organized by subject in a simple format which users can read or download and print. Mr. Wherman stated that one of his biggest problems in maintaining the directory is keeping his listings current. For this reason, he has become more aggressive in removing non-responsive manufacturers and suppliers from the database and makes spot checks of the listings when answering requests for information. It is his contention that marketing of recycled-content products would be more effective if they were included as such by specification in the various engineering product catalogues. Engineers and builders, he feels, look in trade catalogues by specification when choosing materials, and do not specifically seek out recycled-content products.

Source: Dan Wherman
Wisconsin Department of Procurement
Madison, WI
608-267-6922

Portland OR:

The original guidebook was compiled by Portland officials in 1989 from a collection of existing directories, (Including the Harris directory). Personnel from the Regional Environmental Management Department of Metro, the Portland area regional government, called each manufacturer listed (throughout the US) and got distributors and suppliers for each recycled-content product in the Northwest area. Calls were then made to the suppliers to verify the information obtained from the manufacturer.

The directory, which is officially called *A Guide to Recycled Products*, is organized in the Masterformat system, with products grouped according to function and each specific type of material given a classification number. The directory is primarily distributed in hard copy. There is a database disk available, but demand for this is limited. Ms. Patricia Varley, the agency person in charge of creating the guide, mentioned that the database is clumsy to operate and disk users have experienced difficulties obtaining information. When the directory was first published the Internet was not around; the agency does not currently plan to put this information on-line.

Updates have been performed by an intern who calls all existing listings to verify they are still current, and contacts additional manufacturers in updated commercial guides. Updates required a total of approximately 180 hrs. for clerical investigation and writing, but the original took longer (she was not sure how much longer). The last update was done in 1995-6, with 197 product entries, and there are no additional updates planned.

Due to the large number of complete, low-cost directories available in the commercial market, it was decided to discontinue the Metro guide. It was also decided that it was not useful to limit the location of suppliers since products can be shipped from manufacturers anywhere in the US. Many suppliers indicated that they were not aware their products were in a recycled products directory, and often did not even know the products they were supplying were made from recycled-content materials.

The guide was not aggressively marketed, but furnished upon request. When the guide is now requested, Ms. Varley sends out the Recycled Products Business Letter's *Directory of Recycled Product Directories*.

Source: Patricia Varley
Regional Environmental Management Department, Metro
600 NE Grand Ave.
Portland, OR 97232-2736
503-797-1672

# Appendix E:

## Executive Order of the New York City Department of Buildings

The City of New York

DEPARTMENT OF BUILDINGS

EXECUTIVE OFFICES
60 HUDSON STREET, NEW YORK, N Y 10013-3394

GASTON SILVA, R A., Commissioner

(212) 312-8000
TTY (212) 312-8188

ISSUANCE # 530

EXECUTIVE ORDER # 3/97

TO: Distribution

FROM: Gaston Silva, R A
Commissioner

DATE: November 26, 1997

RE: **Use of Recycled Materials in the City of New York**

Recently an inquiry was made as to the use of recycled plastic, asphalt, glass and concrete in the City of New York

The purpose of this memorandum is to clarify that the New York City Building Code is based largely upon nationally accepted performance standards and specifications for materials and construction assemblies

Therefore, the use of a construction material, including recycled glass, plastic, asphalt and concrete, which meets the required standards would be permitted in New York City as long as it shows compliance with the code criteria