RC 3: USE RECYCLED AGGREGATE IN CONCRETE

NYC Building Code and Administrative Code
Proposal developed by the Materials & VOCs Committee

Summary

Issue:
Waste concrete, asphalt, and glass can be reused as bedding material or as aggregate in new concrete, reducing construction waste and the need for virgin materials.

Recommendation:
Require a minimum amount of recycled concrete, asphalt, or glass as bedding material and within new concrete.

Proposed Legislation, Rule or Study

Amendments to the New York City Building Code:

1. Amend Section 1905 as follows:

   1905.2 Selection of concrete proportions. Concrete proportions shall be determined in accordance with the provisions of Sections 1905.2.1 through 1905.2.5.

2. Add a new Section 1905.2.5 as follows:

   1905.2.5 Minimum Recycled Content. In all concrete mixes for cast-in-place concrete, requiring a compressive strength of 4,000 psi or less, a minimum of 10% of the aggregate, as measured by weight, shall be recycled concrete. After July 1, 2013, this minimum shall be raised to 15% of the aggregate, as measured by weight. Concrete aggregate shall not exceed .75 inches in diameter, with no more than 1% deleterious material. The provisions of Section 1905.2.5 shall not apply to structures designed for the containment, storage, or conveyance of water, sewage, or other liquids.

3. Add a new Section 1911.2 as follows:

   1911.2 Minimum Recycled Content in Base Course Materials. A minimum of 15% of all base course materials, measured by weight, shall consist of recycled concrete, recycled asphalt, or glass cullet. The recycled concrete materials shall have a maximum diameter of .75 inches, with no more than 5% deleterious material, and any glass shall have a maximum diameter of .375 inches. After July 1, 2013, this minimum shall increase to 25% of the base course, as measured by weight. Recycled asphalt shall not exceed 5% of the total weight.

4. Amend Tables 720.1(1), 720.1.(2), 720.1(3), 721.2.1.1, 721.2.1.2(1), 721.2.1.4(1), 721.2.2.1, 721.2.3(1), 721.2.3(2), 721.2.3(3), 721.2.3(4), 721.2.3(5), 721.2 and 721.3.2, and Figures 721.2.2.2, 721.2.2.3(1) and 721.2.2.3(2) by adding a footnote as follows:

   For the purposes of fire resistance, recycled concrete shall be considered siliceous aggregate, unless the aggregate in question can be documented, to the satisfaction of the building commissioner, to be of another type.

Amendments to the Administrative Code of the city of New York:

1. Add a new Section 6-308.1 as follows:

   § 6-308.1 Minimum recycled content in concrete and base course materials. a. No concrete mixes purchased by any agency that require a compressive strength of 4,000 psi or less shall contain concrete aggregate that is composed of no less than 10% recycled concrete, as measured by weight. After July 1, 2013, no such concrete mixes shall contain concrete aggregate that is composed of less than 15% recycled concrete, as measured by weight. All concrete aggregate shall not exceed .75 inches in diameter, with no more than 1% deleterious material. Notwithstanding the foregoing, the provisions of this subdivision (a) shall not apply to any concrete mixes intended to be used in structures...
designed for the containment, storage or conveyance of water, sewage or other liquids.

b. No base course materials purchased by any agency shall contain less than 15% recycled concrete, recycled asphalt or glass cullet, as measured by weight. All such recycled concrete materials shall be a maximum of .75 inches, with no more than 5% deleterious material. All such glass cullet shall be a maximum of .375 inches in diameter. Recycled asphalt shall not exceed 5% of the total weight. After July 1, 2013, no such base course materials shall contain less than 25% recycled concrete, recycled asphalt or glass cullet, as measured by weight.

c. The department of transportation shall promulgate rules no later than July 1, 2011 that incorporate the standards for base course materials as set forth in subdivisions (a) and (b) in all specifications for sidewalk construction.

Supporting Information

Issue - Expanded
Each year in New York City, miles of concrete sidewalks and roadways are built or replaced, using thousands of tons of concrete. Much of the aggregate in this concrete is quarried gravel, as are much of the base courses below the streets and sidewalks, and the process of quarrying and shipping the gravel and shipping causes environmental degradation. The need to quarry and transport gravel could be reduced by utilizing waste materials, which are plentiful in New York City, for some of the aggregate or in the base courses. This process could also save money by reducing the costs of disposing of these waste materials. Due to a lack of sufficient demand, the city’s construction waste transfer stations generate excess concrete from demolition of buildings and infrastructure, which they pay to get rid of, driving up demolition costs. Similarly, the City is saddled with excess asphalt from resurfacing the roads and glass from the residential recycling program; disposing of the excess costs taxpayers money. Therefore, New Yorkers will experience multiple benefits by reusing waste concrete, asphalt, and glass as aggregate in new concrete or in base courses.

The use of recycled concrete as an aggregate and in base courses is well established technically. It is accepted by ASTM and AASHTO as a source of aggregate in new concrete and can meet or exceed all applicable state and federal specifications. It is currently being used in concrete and asphalt products with better performance over comparable virgin aggregates and it provides for superior compaction and constructability.

Recycled concrete also has the benefit of weighing 10%-15% less than quarry products, reducing material and hauling costs.

Environmental & Health Benefits
This proposal will reduce the use of virgin materials, the impacts of land disturbance form quarrying and the quantity of material sent to landfills. Because recycled concrete usually originates and is consumed in the same geographical area, fuel consumption for transporting quarried aggregate will also decrease. This proposal was found to have a low, positive environmental impact per building and to impact a small number of buildings. It was thus given an environmental score of 1.

This proposal was found to have no significant positive health impact.

Cost & Savings
This proposal is not expected to have any significant impact on capital costs.

While exact savings are difficult to quantify, savings will be realized in the feedstock costs for concrete and material costs for base courses, which should be distributed to some degree from the concrete and stone suppliers up the supply chain to the customers/residents of the facility, or, in the case of civil works, the taxpayer. Additional savings will come from the reduction in transportation costs and landfill fees due to the reduced disposal of old concrete.

Precedents
Although no known precedents exist requiring the use of recycled concrete as an aggregate, this is allowed by several municipalities and required by many federal agencies. For example, California includes the use of both recycled concrete and blast furnace slag as recycled aggregates in concrete mixtures.

LEED
LEED credits are available for the use of recycled Concrete Aggregate.

These credits include:

- LEED NC- MR cr.4.1 & 4.2 Recycled Content;
• LEED CI-MR cr. 4.1 & 4.2 Recycled content;
• LEED EB-MR cr.2 Optimize use of Alternative Materials;
• LEED for Schools MR cr.4.1 & 4.2 Recycled Content;
• LEED for Homes MR cr. 2 Environmentally Preferable Products; and
• credits under the various pilot programs.

Additionally, for concrete recycled on site, LEED MR credits relating to Construction Waste Management are available for diverting waste from disposal.

Implementation & Market Availability
There are no known implementation issues for this proposal. Recycled concrete from demolition waste is readily available.

Some smaller concrete batch plants may need to create new mix designs to document their successful use of recycled aggregates, but the American Concrete Institute will provide technical assistance in to such companies. Technology does not impose any upper limit on the percent recycled concrete used in bedding material.

Notes
Concrete standards may be specified in tables or figures other than those identified in the fourth proposed amendment to the Building Code above and should be amended likewise.

ENDNOTES:

