Technology Brief

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION SPECIFICATIONS FOR GLASS AGGREGATE

The reverse side of this technology brief provides the Washington State Department of Transportation (WSDOT) specifications for recycled glass in unbound construction aggregate applications. Use of crushed glass in these applications represents a major breakthrough in the acceptance of recycled materials in construction. The specifications are precedent-setting in terms of the number of applications permitted and the high percentage content of glass aggregate allowed. With these specifications, aggregate producers will be able to capitalize on the cost and performance advantages of using glass as a construction aggregate. Practical considerations to supplying glass aggregate are discussed below.

Key Words

Materials:	Crushed glass.
Technologies:	Aggregate size reduction and blending.
Applications:	Construction aggregate unbound (non-composite) applications.
Market Goals:	Increased access to local, high-volume market.
Abstract:	Description of practical considerations for glass aggregate producers based on WSDOT specifications.

Aggregate Producer Considerations

WSDOT specification 9.03.21(1) enables aggregate producers to blend up to 15% glass with aggregate or recycled aggregate products in most unbound (non-composite) applications (see reverse side). The blended product must meet the gradation requirements for the specific application. Specification 9.03.21(2) allows 100% glass aggregate in six applications. The 100% allowance means that blending prior to installation is not necessary, eliminating the cost of an additional step in product preparation. The quarterly gradation testing called for in the specifications assures buyers that producers are meeting standards. A gradation test at a certified lab costs about $60.

While aggregate mills can be used to produce a product meeting gradation specifications, the high abrasiveness of glass may require a separate, dedicated system for crushing glass.

The WSDOT specifications reference the American Geological Institute (AGI) visual classification method that provides a field-verifiable standard for judging contamination levels. Copies of AGI Data Sheets 15.1 and 15.2 are available from ReTAP. In practice, qualification under this contamination standard may require that the producer screen-off contaminants after crushing, particularly if the glass source is the mixed color byproduct of color sorting performed for bottle manufacture. Typical glass contaminants (aluminum caps, paper labels, etc.) do not crush as efficiently as glass and are easily screened and removed.

No level of hazardous materials is acceptable. Environmental testing has determined that the only material in glass recycling programs that is of potential environmental concern is lead foil, which is sometimes used for wine bottle wrappers. The specifications require five random samples to be tested quarterly for total lead. Total lead tests cost less than $25 per test.

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Amendment to 1994 Standard Specifications Section 9-03.21, 1994 Standard Specifications for Road, Bridge, and Municipal Construction. Washington State Department of Transportation. 1994.

9-03.21(1): Reclaimed Glass (Mixed Waste Cullet) Additive to Aggregates. Reclaimed glass may be blended with the following:

- Ballast 9-03.9(1)
- Shoulder Ballast 9-03.9(2)
- Crushed Surfacing Base Course 9-03.9(3)
- Aggregate for Gravel Base 9-03.10
- Gravel Backfill for Foundations, Class A 9-03.12(1)A
- Gravel Backfill for Foundations, Class B 9-03.12(1)B
- Gravel Backfill for Walls 9-03.12(2)
- Gravel Backfill for Pipe Bedding 9-03.12(3)
- Gravel Backfill for Drains 9-03.12(4)
- Backfill for Sand Drains 9-03.13
- Sand Drainage Blanket 9-03.13(1)
- Gravel Borrow 9-03.14
- Bedding Material for Rigid Pipe 9-03.15
- Bedding Material for Flexible Pipe 9-03.16
- Foundation Material Class A and B 9-03.17
- Foundation Material Class C 9-03.18
- Bank Run Gravel for Trench Backfill 9-03.19

Aggregates containing reclaimed glass shall conform to the requirements of these Specifications for each item listed above. No aggregate shall contain more than 15% glass. No more than 10% of the material retained on an individual sieve 1/4 inch or larger shall be glass, based upon visual examination and weight.

9-03.21(2): Recycled Glass Aggregate. Aggregate composed solely of glass may be used as gravel backfill for walls, pipe bedding, and sand drains; sand drainage blanket; gravel borrow; and bedding material for flexible pipe.

One hundred percent of the glass shall pass a 3/4 inch square sieve and not more than 5% by mass shall pass a U.S. No. 200 sieve. Sieve analyses shall be conducted according to WSDOT Test Method 103-C on at least a quarterly basis by the product supplier. All test results shall be kept on file by the product supplier.

The maximum debris level shall be 10%. Debris is defined as any deleterious material which impacts the performance of the engineered fill and includes all non-glass constituents of the glass feedstock. The percentage of debris in cullet shall be quantified using the following visual method: Approximately 200 grams of processed cullet shall be placed in a flat pan or plate. The percentage of debris shall be estimated using American Geological Institute (AGI) Data Sheets 15.1 and 15.2, "Comparison Charts for Estimating Percentage Composition", 1982.

Total lead content testing shall be performed quarterly by the product supplier. Tests shall include a minimum of five samples. Sample collection shall be conducted according to ASTM D75. The mean of these tests shall not exceed 80 ppm. Total lead content testing will be conducted according to EPA Method 3010/6010. All test results shall be kept on file by the product supplier.

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For More Information

For more information call CWC at (206) 444-7746, email info@cwc.org, or visit the CWC Internet Website at www.cwc.org.

This technology brief was prepared by **CWC,** Managing Partner of the **Recycling Technology Assistance Partnership (ReTAP)**. ReTAP is an affiliate of the national Manufacturing Extension Partnership (MEP), a program of the U.S. Commerce Department's National Institute of Standards and Technology. ReTAP is also funded by the U.S. Environmental Protection Agency and the American Plastics Council.

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