



Best Practices in Glass Recycling

Sampling and Testing Procedures for Recycled Glass

Material: Recycled Glass

Issue: *Specifications are the criteria by which materials are judged to be fit for use in particular applications. As new alternative uses for recycled glass are developed, there is a need for a parallel development of specifications and tests to define the fitness for use of specific supplies of glass in specific applications. If glass is to be traded as a raw material, both sellers and buyers must agree, in advance of delivery, on sampling and testing methods that will be used to define the quality of the delivered glass.*

Best Practice: This best practice is intended to introduce methods used in the sampling and testing of glass cullet. It gives an overview of test program elements without defining the criteria for any particular use. A complete sampling and testing program may consist of the following elements:

- Obtaining Field Samples of Glass
- Reducing Field Samples to Testing Size
- Determination of Glass Color
- Determination of Moisture Content
- Determination of Size Distribution
- Determination of Contamination

Obtaining Field Samples Field samples can be obtained from flowing streams of material, stockpiles, or directly from transportation units. An initial visual inspection helps to identify obvious non-uniformity or significant contaminants within a lot. Field samples must be representative of the entire lot. Typically, several samples are taken to establish statistical validity and combined to form a composite sample.

Reducing Field Samples to Testing Size Once collected, field samples must be reduced to a size that is convenient for testing. Various procedures are used, including mechanical splitting and quartering, to reduce a sample to a manageable size. The objective is to obtain a testing sample that is representative of the field sample. Valid testing samples range from 5 to 10 pounds for uniformly crushed cullet to roughly 40 pounds for whole and broken bottles.

Determination of Glass Color The testing sample is sifted to remove particles smaller than 8 mesh. The larger pieces are spread on a clean, dry, illuminated surface. The material is sorted into color categories required for the application. The sorted material is weighed and recorded. Weight percentage is calculated for each color ([See Cullet Specifications for Container Manufacturing Best Practice](#)).

Determination of Moisture Content The original sample, as collected, is weighed. The sample is then dried in an oven at 110°C for two hours, or to a constant weight. Once the sample has cooled, it is weighed again. The total moisture content is calculated as a percentage of the original weight.

Determination of Size Distribution A testing sample that has been dried to a constant weight is screened into particle size categories on U.S. Standard Sieves, selected in accordance with the specifications of the

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desired application. The material retained on each screen is weighed. Each weight is then calculated as a percentage of the dry weight of the sample.

Determination of Contamination. Contamination found in recycled glass generally falls into the following categories: organic materials (e.g., labels, plastic closures, and other combustibles); ferrous; non-ferrous metals (e.g., aluminum and lead); and ceramics and other inorganic materials (e.g., non-container glass, flat glass, ovenware, mirrors, lead crystal and art glass).

Organic materials: Dried samples are weighed and placed in an uncovered ceramic crucible and heated to 540°C for 1/2 hour, or until all flame and smoke have stopped. The sample is cooled and weighed again. The percent organics is calculated from this “loss on ignition.”

Ferrous metals: The test sample is spread on a clean dry illuminated surface. A magnet is passed slowly over the test sample while holding a clean sheet of paper or plastic film between the magnet and the sample. The paper and magnet are held above a weighing tray and the magnet is removed. This process is continued until the entire sample has been exposed to the magnet and all ferrous metal has been transferred to the tray. The percent ferrous metal is calculated as a percent of the original sample.

Non-ferrous metals and inorganics: A dry test sample is screened through 1/4 inch and no. 12 mesh sieves. The minus No. 12 mesh material is discarded. The plus 1/4 inch and plus No. 12 mesh sample is weighed and spread on separate clean dry surfaces and illuminated. All non-glass particles are removed from each surface as non-ferrous and inorganic materials. The fractions of both sizes are combined and the weight of each is calculated as a percent of the dry weight of the sample.

Implementation: Testing protocols have been described above in a cursory manner to give the reader a sense of procedures used to determine physical properties of glass. Detailed procedures, along with development of the statistical bases for testing, are available from the American Society for Testing Materials (ASTM).

Benefits: Using the methods for sampling and testing of glass cullet as defined here will yield objective results for evaluating a transaction involving recycled glass. Standardized protocols provide the opportunity to compare data across several transactions involving different suppliers and material users.

Application Sites: Glass processing facilities, container and fiberglass manufacturing facilities.

Contact: For more information about this Best Practice, contact CWC, (206) 443-7703, e-mail info@cw.org.

References: Specific methods for sampling and testing glass cullet for a number of established uses have been introduced by the Chicago Board of Trade (CBOT) as part of its recycled commodity exchange (see [CBOT Recyclables Exchange Protocols Best Practice](#)).

Methods for Sampling and Testing Glass Cullet, ReTAP, Clean Washington Center, 1996.

Global Recycling Network - CBOT exchange literature, published at www.cbot-recycle.com September 1996.

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