

Waste Protocols Project

Specification for flat glass cullet used in flat glass manufacture

Introduction

This specification is for flat glass cullet which is delivered to the glass manufacturer for use in the manufacture of new flat glass. The purpose of the specification is to provide cullet processors with guidance on the quality of cullet required by the glass manufacturer. It is for guidance only as each manufacturer may have their own requirements depending on site equipment and the final product.

The specification has been developed as part of the BREW Waste Protocols Project in consultation with UK flat glass manufacturers and cullet processors.

Composition

All cullet supplied for use in flat glass manufacture shall be of known origin. It shall consist of the following glass types only:

- clear soda lime silica window glass;
- less than 5% lightly tinted flat glass (bronze, green, blue and grey); and
- flat glass with highly transparent thermal insulating coatings (eg. ClimaGuard, K glass and Planitherm).

The following glass types are not permitted in any quantity:

- mirrored glass (some manufacturers may accept low levels of <0.8%);
- wired glass (any type);
- laminated glass;
- fire resistant laminates (e.g. Pyrodur, Pyrostop, Pyroguard);
- container glass;
- lead glass;
- borosilicate glass (e.g. Pyrex, Borofloat, Pyran, labware, cookware);
- glass ceramics (e.g. Robax, Ceran);
- windscreens or antenna glass;
- glass printed with ceramic inks; and
- dark tinted glass

Particle size

The particle size of the cullet load has implications for material handling at the glass manufacturing site. It is important to keep the fine fraction to a minimum as this can cause airborne dust problems, whilst the larger pieces can cause blockages in the cullet transfer system.

Upon analysis of a representative sample the particle size shall be within the limits set out below.

- **No more than 5% <4mm**
- **No more than 15% <6mm**
- **Maximum fragment area: 100cm²***

* Where loads are routinely inspected on delivery to the glass manufacturer's site the particle size shall be as large as possible so that contamination can be more readily identified.

Contamination

All cullet shall be free from contamination (contaminants which cause problems and their typical sources are shown in Table 1 below). Even very low levels of contamination will cause glass defects, however, examples of levels which may be accepted by individual agreement with the glass manufacturer are summarised in Table 2 below. It is not possible to detect contamination at these low levels, it is therefore essential that the cullet quality is controlled at source. For advice on prevention of contamination please refer to the Good Practice Guide associated with this specification.

Table 1 Flat glass contaminants and common sources

Contaminant	Typical source
Ferrous metals	Cutting blades
Non-ferrous metals	Spacer bars, drinks cans and leaded glass
Nickel-containing steels or alloys	Grinding equipment and cullet movement machinery
Inorganic material	Porcelain, aggregate, silicon carbide cutting wheels
Organic material	Plastics (PVB ¹ , PVC ²), wood, cardboard, paper, rubber gasket, foam spacers, floppy disks

Table 2 Example of contamination levels which may be permitted by the glass manufacturer

Contaminant	Typical source	Limit
Ferrous metals	Cutting blades	Particles >0.5g: none Particles <0.5g: 2g/t maximum
Non-ferrous metals	Spacer bars, drinks cans and leaded glass	Particles >0.1g: none Particles <0.1g: 0.5g/t maximum
Nickel-containing steels or alloys	Grinding equipment	No particles
Inorganic material	Porcelain, aggregate, silicon carbide cutting wheels	No particles >0.2mm
Organic material	Plastics (PVB, PVC), wood, cardboard, paper, rubber gasket, foam spacers, floppy disks	Particles >2g: none Particles <2g: 45g/t maximum

Chemical composition

The chemical composition is determined by XRF³ analysis of a fused bead produced from a representative sample of ground cullet.

The typical range in chemical composition of flat glass cullet is shown in Table 3. Individual manufacturers will have their own specifications for chemical composition which may differ from that set out below.

Table 3 The typical chemical composition of flat glass cullet

Analyte	% by weight	
	Minimum	Maximum
SiO ₂	70.0	73.0
Al ₂ O ₃	–	1.5
MgO	3.5	4.5
CaO	8.0	9.7
Na ₂ O + K ₂ O	13.4	14.6
Fe ₂ O ₃	–	0.20

1 Polyvinyl butyral

2 Polyvinyl chloride

3 X-ray fluorescence

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