

## Consultation Questionnaire Exemption Ex. No. 29

### *Exemption for „Lead bound in crystal glass as defined in Directive 69/493/EEC (cat. 1, 2, 3, 4)“*

#### Abbreviations and Definitions

EEE	Electrical and Electronic Equipment
EDG	European Domestic Glass
LE	LightingEurope
Pb	Lead
RoHS	Directive 2011/65/EU on the Restriction of Hazardous Substances in Electrical and Electronic Equipment

#### Background

The Oeko-Institut has been appointed by the European Commission, within a framework contract<sup>1</sup>, for the evaluation of applications for exemption from Directive 2011/65/EU (RoHS), to be listed in Annexes III and IV of the Directive.

European Domestic Glass (EDG) and Lighting Europe (LE) submitted a request for the renewal of the above-mentioned exemption, which has been subject to an initial evaluation. A summary of the main argumentation for justifying the request is provided below. The applicants have been requested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation (<http://rohs.exemptions.oeko.info/index.php?id=366>).

For further details, please check the applicant's exemption request under the above link.

The objective of this consultation and the review process is to collect and to evaluate information and evidence according to the criteria listed in Art. 5 (1) (a) of Directive 2011/65/EU (RoHS 2), which can be found under:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT>

If you intend to contribute to the stakeholder consultation, please read the summary of the argumentation provided and answer the questions that follow.

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<sup>1</sup> The contract is implemented through Framework Contract No. ENV.B.3/FRA/2019/0017, led by Ramboll Deutschland GmbH.

## 1. Summary of argumentation of applicant on the justification of the exemption

### 1.1. Background

Lead in the form of lead oxide and lead tetroxide are used as raw materials to produce lead bound in crystal glass. The crystal glass is a component of different lighting and decoration applications. According to the applicants, substitutes for these specific EEE applications have been sought for nearly three decades, but without success. The performance of alternative materials is inferior and does not allow the production of the same items from lead crystal glass. Particularly, alternatives provide insufficient performance in comparison to the processing time enabled by the lead oxide component.

European Domestic Glass (EDG) and LightingEurope (LE) thus request the renewal of Ex. 29 for:

“Lead bound in crystal glass as defined in Directive 69/493/EEC (cat. 1, 2, 3, 4)<sup>2</sup>”

The renewal is requested for EEE falling under categories 3, 4, 5 and 11 of Annex I of the RoHS Directive for a duration of 10 years. The consultants note that Article 5 of the RoHS Directive specifies a maximum duration for which exemptions can be granted of 5 years for the categories referred to.

### 1.2. Volume of lead bound in crystal glass to be placed on the EU market through the exemption

The applicants estimate that about 50 tons/year of  $Pb_3O_4$  or  $PbO$  is used to produce lead bound in crystal glass for electrical and electronic items entering the EU market. Thus, the  $Pb$  contained in  $Pb_3O_4$  and  $PbO$  can be calculated to be 46 tons/year.

### 1.3. Technical description

The applicants describe the properties of lead oxide as a raw material for the production of crystal glass on the basis of the technical parameters listed below:

- The *refractive index* is defined as the ratio of the speed of light in a vacuum to a dimensionless number that describes how light propagates through a medium. The higher the refractive index, the more light effects (rainbow) occur.
- The *Abbe number* is a measure of the variation of refractive index with wavelength, so the refractive index of a glass with a low Abbe number varies less across the visible spectrum than a glass with a high Abbe number. Lead crystal glass has a low Abbe number, which reduces chromatic aberration while maintaining a high refractive index.
- *Dispersion* describes the phenomenon in which the phase velocity of a wave depends on its frequency. The bigger the dispersion, the greater the visible colour spectrum (rainbow).
- The *cooling time* is the time span between two viscosity states. Below and above this time span, glass cannot be shaped. The greater the cooling time, the more specific (longer, thinner and more complex) shapes can be made. This specificity increases the craftsman's ability to produce high quality products. Analogous to the cooling time, the *working range* indicates the temperature range with the same purpose as the cooling time, expressed in °C or Kelvin instead of time.

<sup>2</sup> Council Directive of 15 December 1969 on the approximation of the laws of the Member States relating to crystal glass, in OJ L326 of 29 December 1969

- *Vickers' Hardness* is a specific measure of the hardness of the material. The lower the hardness, the more possibilities there are for cutting and engraving complex artistic designs on unusual and prestigious objects that can only be achieved by handcrafting.

Lead in the form of lead oxide and lead tetroxide are used as raw materials to produce lead bound in crystal glass. The crystal glass is a component of different lighting and decoration applications. In this context, the applicants name the following applications and products:

- Fixed/portable luminaires
- Lamps
- Electrified mirrors
- Horology (clocks, watches etc.)
- Display cases
- Digital photo frames
- Tablet and smart phone docking stations
- Furniture and home décor items, if including electrical or electronic products (carrousel, tables, sofas, plumbing elements etc.)
- Building materials (illuminated bricks)

Accordingly, from the applicants' point of view, the products can be assigned to the following categories of Annex 1 of the RoHS Directive:

- 3. IT and telecommunications equipment
- 4. Consumer equipment
- 5. Lighting equipment
- 11. Other EEE not covered by any of the categories above

The applicants further state, that there is no use of lead bound in crystal glass in other categories.

#### **1.4. Applicant's justification for the requested exemption**

The applicants justify the request for exemption essentially on the basis of technical aspects that are decisive for the fact that no adequate alternative substances are available that fulfil all the required properties. In addition, advantages of leaded crystal glass in terms of energy efficiency are presented and socio-economic impacts are detailed that relate to the case that an exemption renewal is not granted.

##### **1.4.1. Availability of alternatives (Substitution or Elimination, roadmap to substitution, reliability of substitutes)**

From the applicants' point of view, there is no substitute for crystal glass (categories 1, 2, 3, 4) according to Council Directive 493/69/EEC. Although research has provided patterns that achieve some of the properties compared to crystal glass categories in which Pb is bound, none of these patterns achieve all the same essential properties. This is particularly true for the thermo-mechanical-optical properties, which are particularly important for the elaboration of the product.

The applicants state that there is already a wide range of glass types on the market with or without bonded lead ions. The criteria, for selecting the type of glass applied, are the specific needs or the

required technical properties : clarity (according to ISO IWA8:2009), density, sound, optical properties, ability for specific shaping techniques for works of art, ability for cutting and polishing.

Full Lead Crystal and Lead Crystal correspond to the categories with the highest density and refractive index in Directive 69/493/EEC (category 1 and 2 respectively, see annex I). These categories also have the highest PbO content of the crystal glass types addressed by Directive 69/493/EEC, namely  $\geq 30\%$  and  $\geq 24\%$  lead oxide, respectively. The applicant specifies these categories as the most relevant for applications benefiting from the exemption but cannot exclude the relevance of other categories (crystal glass using<sup>3</sup>).

Most of the machine-produced quality glass for domestic use has moved from lead crystal glass to alternatives. The remaining part, which is the subject of this request for exemption renewal is of highly specialised manufacture and requires a significant amount of handwork.

In summary, the applicants assess the substitution situation to the effect that crystal glass without intentionally added lead does not meet the required combination of essential properties:

- Shorter cooling time/working range would not permit the production of complex items.
- Higher Vickers hardness will trigger musculo-skeletal disorders for the workers because the cutting difficulty will dramatically increase. In addition, quicker damage and need to replace industrial tools will drastically increase. It will become impossible to make very intricately engraved articles as employers are required to protect the health of their workers.
- The combination of optical properties (refractive index, Abbe number, dispersion) generated by the use of lead bound in crystal glass are unique and unmatched by other materials (the latter are unable to obtain the same low value of chromatic aberration).

The applicants justify their doubts as to whether promising substitutes will ever be found with the fact that there are a limited number of elements in the periodic table available that can be combined to form some kinds of crystal glass in EEE applications (BaO, ZnO, SrO, CaO, MgO). Moreover, those combinations that exist form glasses only within relatively small composition ranges. After three decades of research, all possible combinations of elements have been prepared and evaluated by some major lead crystal manufacturers and this has shown that for lead bound in crystal glass applications used in EEE, there are no alternatives to compositions that use lead oxide as an intermediate.

When asked about the prospects of success of further research efforts on substitutes, the association explained the state of affairs as follows<sup>4</sup>:

- *“The lead crystal companies are actively involved for many years in research projects to find an alternative which could guarantee the same criteria of quality and excellence and to preserve their know-how.*
- *Certain projects have reached a pilot phase in order to approximate the final conditions for validation towards a shift to crystal (i.e. non lead based composition). This phase is still subject to an iterative process in order to check, determine and correct any bias which could appear in the final process / composition. That iterative process will take some more years.*

<sup>3</sup> Exclusion from scope of Directive 69/493/EEC categories 3 and 4 would in any case not lead to a lower use of lead, as their use of various metal oxides such as PbO is lower than that of categories 1 and 2.

<sup>4</sup> European Domestic Glass Answers to Oeko Institut Clarification Questions, 19 March 2021

- It is expected that in about 10 years time, about half of the remaining lead crystal companies will have shifted to crystal. That delay depends on the result of research towards high quality crystal production and on the end of life of lead crystal furnace.
- Please note that the planned shift does not mean that a substitute will have been found to lead crystal glass, but that companies will abandon lead crystal glass for high quality crystal glass whose production process determination is still ongoing.”

#### **1.4.2. Environmental and health arguments (also LCA aspects)**

According to the applicants, the addition of lead oxide enables a better energy efficiency. The evaluation of a literature publication on measurements carried out shows that with the same light source (LED), the luminous flux transmitted through a lead crystal article is at least 10% greater compared to the luminous flux transmitted through the same article when produced in (lead-free) flint glass. The energy efficiency (lumens/watt) of lead crystal is therefore much better than that of flint glass. In certain cases, the IEE rating of an electrical lighting fixture may change from category B (with flint glass) to category A (with lead crystal).

With regard to the prevention of waste, the applicants state that lead bound in crystal EEE applications are prestigious und expensive items which are kept, transferred, inherited or resold. Against this background the volume of articles or parts of articles which might be discarded is seen to be negligible.

#### **1.4.3. Socioeconomic impacts**

The applicants make it clear that the crystal glass industry is already facing an economically challenging situation. EEE applications account for about one third of the turnover of some of them. If the exemption is not extended, this would have serious repercussions:




- Loss of economic wealth;
- loss of European patrimonial wealth and cultural diversity;
- loss of ca. one third of turnover of related manufacturing companies and in the medium/long term, their disappearance; and
- 2,750 direct jobs lost and 6,950 indirect jobs in the glass industry in Europe.

## **Annex I**

Directive 69/493/EEC specifies the following categories of lead crystal in its annex, clarifying the characteristics in terms of the amount of lead contained in the matrix and the properties that the glass needs to have.

ANNEX I

List of crystal glass categories

No	Description of category		Explanatory notes	Characteristics				Labelling	
				Metal oxides (%)	Density	Refractive index	Surface hardness	Shape of symbol	Remarks
a	b	c	d	e	f	g	h	i	
1	CRISTAL SUPERIEUR 30% CRISTALLO SUPERIORE 30% HOCHBLEIKRISTALL 30% VOLLOODKRISTAL 30%	Description may be freely used, whatever the country of origin or the country of destination	PbO $\geq 30\%$	$\geq 3.00$	x			Round label. Colour: gold $\phi \geq 1$ cm	
2	CRISTAL AU PLOMP 24% CRISTALLO AL PIOMBO 24% BLEIKRISTALL 24% LOODKRISTAL 24%	The percentage figure refers to the lead oxide content	PbO $\geq 24\%$	$\geq 2.90$	x				
3	CRISTALLIN VETRO SONORO SUPERIORE KRISTALLGLAS KRISTALLIJNGLAS <sup>1</sup> SONOORGLAS <sup>2</sup>	Only the description in the language or languages of the country in which the goods are marketed may be used  Exception: On the German market pressed glass containing 18% PbO and having a density of at least 2.70 may be sold under the description 'PRESSBLEI-KRISTALL' or 'BLEI-KRISTALL GEPRESST' (in capital letters)	ZnO BaO PbO K <sub>2</sub> O single or together $\geq 10\%$	$\geq 2.45$	nD $\geq 1.520$			Square label. Colour: silver Side: $\geq 1$ cm	
4	VERRE SONORE VETRO SONORO KRISTALLGLAS SONOORGLAS		BaO PbO K <sub>2</sub> O single or together $\geq 10\%$	$\geq 2.40$		Vickers $\pm 20$		Label in the shape of an equilateral triangle. Colour: silver Side: $\geq 1$ cm	

x nD  $\geq 1.545$  as criterion for an additional non-destructive determination of the products (at the time of import).

<sup>1</sup> In Belgium.

<sup>2</sup> In the Netherlands.

Source: Directive 69/493/EEC, Official Journal of the European Communities No L326/36 from 29.12.69, pg. 600

## 2. Questions for stakeholders

- The applicants requested an exemption, proposing the following wording formulation:
 

“Lead bound in crystal glass as defined in Directive 69/493/EEC (cat. 1, 2, 3, 4)<sup>5</sup>”

  - Do you agree with the scope of the exemption as proposed by the applicant?
  - Please suggest an alternative wording and explain your proposal, if you do not agree with the proposed exemption wording.
  - Please explain why you either support the applicant's request or object to it. To support your views, please provide detailed technical argumentation / evidence in line with the criteria in Art. 5(1)(a) to support your statement.
- Please provide information concerning possible substitutes or developments that may enable reduction, substitution or elimination, at present or in the future, of “Lead bound in crystal glass as defined in Directive 69/493/EEC (cat. 1, 2, 3, 4)<sup>6</sup>”;

<sup>5</sup> Council Directive of 15 December 1969 on the approximation of the laws of the Member States relating to crystal glass, in OJ L326 of 29 December 1969

<sup>6</sup> Council Directive of 15 December 1969 on the approximation of the laws of the Member States relating to crystal glass, in OJ L326 of 29 December 1969

- a. In this regard, please provide information as to alternatives that may cover part or all of the applicability range of lead bound in crystal glass;
  - b. Please provide quantitative data as to application specifications to support your view.
3. Please provide information as to research initiatives which are currently looking into the development of possible alternatives for some or all of the application range of “*Lead bound in crystal glass*”.
- a. Please explain what part of the application range is of relevance for such initiatives (in what applications substitution may be possible in the future).
  - b. Please provide a roadmap of such on-going research (phases that are to be carried out), detailing the current status as well as the estimated time needed for further stages.
4. As part of the evaluation, socio-economic impacts shall also be compiled and evaluated. For this purpose, please provide details in respect of the following:
- a. Please estimate possible amounts of waste to be generated through a forced substitution should the exemption not be granted. In this respect, please clarify whether devices placed on the market before the 22 July 2021 could still be serviced through the spare parts provision stipulated in the Directive under Article 4.
  - b. Please estimate possible impacts on employment in total, in the EU and outside the EU, should the exemption not be granted. Please detail the main sectors in which possible impacts are expected – manufacture, supply chain, retail, etc.
  - c. Please estimate additional costs associated with a forced substitution should the exemption not be granted, and how this is divided between various sectors (e.g. private, public, industry: manufacturers, suppliers, retailers, end-users).
5. Please provide any further information and/or data that you think is of importance to substantiate your views.

**In case parts of your contribution are confidential, please provide your contribution in two versions (public /confidential). Please also note, however, that requested exemptions cannot be granted based on confidential information!**

**Finally, please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that Oeko-Institut can contact you in case there are questions concerning your contribution.**