

CADMIUM AND CADMIUM COMPOUNDS IN PLASTICS

**UPCOMING REQUEST FROM THE COMMISSION FOR ECHA TO PREPARE AN ANNEX XV
DOSSIER: STATUS AND PRELIMINARY IMPLICATIONS**

PREPARATORY REPORT

9 November 2012

1. Introduction

ECHA expects to receive a request from the Commission to prepare an Annex XV dossier in which it should be assessed whether the existing restriction on cadmium and cadmium compounds can be widened to cover all plastic materials (additional to the 16 plastic materials covered by the existing restriction), taking full account of the Council Resolution of 25 January 1988.

This paper aims to describe the assessments needed in the Annex XV dossier and the uses to be investigated based on information gathered so far. Section 4 summarises the information on uses obtained from consultation with industry associations and Member State Competent Authorities, as well as information obtained from registration dossiers. Section 5 describes the approach that ECHA currently considers most appropriate for the preparation of the dossier and the assessments needed.

2. State of play

The draft Regulation amending entry 23 of Annex XVII of REACH was voted on in the REACH Committee 19 April 2012 and was adopted 18 September 2012 (Regulation (EU) No 835/2012). In accordance with that regulation the formal Commission request to prepare an Annex XV dossier should be sent to ECHA by 19 November 2012.

In anticipation of the request ECHA has carried out preparatory work. In order to find information on still existing uses not covered by the current restriction, ECHA has consulted industry associations and Member State Competent Authorities in a preliminary fashion. It has also screened registration data. In addition, ECHA has considered the approach/strategy in terms of the assessments to be carried out in the restriction dossier and considered procurement needs.

ECHA launched a call for tender for services to support the preparation of a possible Annex XV restriction dossier on cadmium and cadmium compounds in the plastic materials not previously covered by restriction. The tasks for the contractor cover the identification of uses of cadmium compounds in plastic materials and the technical and economical feasibility of alternatives as well as risk assessment of cadmium and its compounds in plastic materials as well as their alternatives. A contract with Risk and Policy Analysts (RPA) was signed on 31 October 2012.

3. Reason for action

Since 1988 EU has had a common aim to substitute the use of cadmium as far as possible. This aim has resulted into, amongst others, the restriction entry 23.

According to the EU RAR (2007) cadmium is considered to be a non-threshold carcinogen. According to the CLP Regulation (EC) No 1272/2008 Annex VI cadmium is a type 1B carcinogen and a category 2 mutagen and reproductive toxicant. There is high concern regarding the toxicity of cadmium and recent assessments show that subgroups of the EU population, such as children and vegetarians, are significantly exceeding the tolerable intake of cadmium and that exposure to cadmium at population level should be reduced (EFSA, 2009). The ultimate toxicity of cadmium compounds is due to cadmium itself. Release of any cadmium compound would potentially lead to human exposure to cadmium via the environment or directly. Thus, restrictions of any remaining uses of cadmium compounds in plastics that would result in reduced emissions of cadmium compounds to the environment would contribute to the reduction of human exposure to cadmium.

Finally, one reason for action is to improve the clarity of entry 23 of Annex XVII, to the extent possible.

4. Information from registrations and stakeholder consultations

Registration data

ECHA has received registrations for Cadmium and the following nine cadmium compounds: cadmium carbonate, cadmium oxide, cadmium hydroxide, cadmium sulphide, cadmium chloride, cadmium sulphate, cadmium nitrate, cadmium tin oxide and dicadmium tin tetraoxide. Altogether there are more than 90 registration dossiers for cadmium compounds. ECHA has screened the IUCLID data for these dossiers. This showed that most dossiers have not identified uses of cadmium compounds in polymers/plastics. Several of the substances are, however, used as starting material in the manufacture of pigments.

Cadmium carbonate and cadmium oxide are the only substances for which the registration dossiers indicate uses in polymers. The identified uses are "Component for polymer-matrices, plastics and related preparations", "Use of CdCO₃-containing polymers for cable protecting & isolating coatings" and "Use of CdCO₃-containing polymers for tube & sheet articles" and "Use of CdCO₃-containing polymers for moulded articles". For cadmium oxide there are corresponding identified uses of CdO-containing polymers. It is not possible to establish what the function of the cadmium compound in the material is or in which kind of polymeric material(s) it is used. The same substances are however used in the production of pigments and in catalysts. There was very little additional information on the uses in the Chemical Safety Reports of the registrations. However, they mention a maximum concentration of the cadmium compound in the polymerised substrate. They also note that certain uses are restricted. The tonnages for these specific applications are not given. Exposure information is provided for occupational exposure and environmental releases from industrial/professional uses, but there is no description of the service life of the articles. For the consumer exposure reference is made to the consumer scenarios in the EU RAR for cadmium and cadmium oxide. The analysis made in the RA is used as a worst case scenario for the present situation.

The three cadmium pigments of main interest (from the court case) were pre-registered but are not yet registered. The three cadmium pigments do not have a harmonised classification. For one of them, cadmium sulphoselenide red, there are C&L notifications notifying it as Acute tox. 4 (H302, 312, 332, i.e. harmful if swallowed, inhaled or in contact with skin), Skin irritant 2 (H315, causes skin irritation), STOT SE 3 (H335, may cause respiratory irritation).

Preliminary consultation of Member State CAs

ECHA contacted all MSCAs in May 2012 via CircaBC¹ and asked for information on any current uses of cadmium or of its compounds in plastic materials other than the 16 already regulated. ECHA also asked for experience from any national legislation or voluntary commitments that would have restricted cadmium and compounds in additional plastic materials. ECHA received only eight replies (of 29 CAs in EU and EEA): Austria, France, Greece, Italy, the Netherlands, Norway, Slovak Republic and Sweden. Furthermore, mostly the replies did not give any information to ECHA. Below we give the summary of the information that ECHA received.

¹ CIRCA BC is a website that ECHA uses for sharing documents and consulting with Member States.

The French CA replied that currently, due to the European regulation, pigments based on cadmium are gradually replaced (by iron oxide for example), but for certain plastics as Poly Acrylonitrile Butadiene Styrene (ABS), Polymethylmethacrylate (PMMA), Polyoxymethylene (Acetal) (POM), polycarbonate and polyamide, cadmium is still used.

The Dutch CA replied that the use of cadmium in PMMA was restricted in the Netherlands in 2003.

The Norwegian and Swedish CAs replied that according to their national products registers there is no registered use of cadmium in any plastic material manufactured in their countries. The Norwegian CA added that their analyses on imported articles in the period 2005-2009 have shown some cadmium in imported articles, among them coated material, other plastic products and jewellery.

The Swedish CA also sent a report '*Experiences of the Swedish regulation concerning cadmium in stabilisers and pigments in plastics*' from 1997². A Swedish national ban on cadmium, including a total prohibition on the use of cadmium as colouring agent and stabiliser in plastics had entered into force in 1982. Initially Sweden had issued a large number of general exemptions to the ban, mostly valid for a limited time period. The study focused on an analysis of the technical and economical implications of the ban in affected industry subsectors. Impacts of the Swedish cadmium regulation on use patterns, industrial structures and trade were also presented in the report (See Text Box 1).

Text Box 1: Extract of information from '*Experiences of the Swedish regulation concerning cadmium in stabilisers and pigments in plastics*' (1997)

In the middle of the 1980's ABS and HDPE applications were reported to account for almost 70% of the use of Cadmium pigments for plastics in Europe. The replacement of cadmium pigments in ABS and High Density Polyethylene (HDPE) applications in Sweden was performed without technical or economic implications in the long term perspective. However, initial implications were experienced.

The replacement of cadmium pigments in plastics processed at a high temperature was a problematic issue. Due to high processing temperatures ABS and PA applications generally posed more technical problems than other thermoplastics.

Initial problems with uneven colouring and decreased colour fastness with substitute pigment in HDPE were reported, e.g. in the pigmentation of HDPE boxes and crates. The use of organic pigments caused uneven colouring and warping of the products. The problems were solved by adjusting formulation and processing equipment.

Cadmium pigments were generally substituted by organic pigments. They were generally more expensive than cadmium based pigments. However, organic pigments also tend to have higher colour strengths than their cadmium or inorganic equivalents. Consequently less pigment was used in the final blend.

Preliminary consultation of industry associations

After the adoption of Regulation (EU) No 494/2011, the Commission learned about niche applications (eg the colouring of some engineering plastics), where suitable

² Öberg and Granath, 'Experiences of the Swedish regulation concerning cadmium in stabilizers and pigments in plastics', KEMI PM nr 4/97, 1997,

alternatives to the use of cadmium compounds may not be available. According to this information, the cadmium compounds used as pigments in these applications are: cadmium zinc sulphide yellow (EC 232-466-8, CAS 8048-07-5), cadmium sulphoselenide red (EC 261-218-1, CAS 58339-34-7) and cadmium sulphoselenide orange (EC 235-758-3, CAS 12656-57-4).

In May and June ECHA sent questions to eight industry associations. Four associations replied. These were International Cadmium Association (ICdA), Eurocolour, Vinyl Plus and European Plastics Recyclers. The information provided by these associations is presented below. ECHA did not receive a reply from Eurometaux, PlasticsEurope, European Plastics Converters or the European Aviation Safety Agency (EASA). The company Boeing however replied. (Boeing had already been in touch with the Commission regarding cadmium for safety applications and was in copy of ECHA's letter to EASA.) ECHA asked the associations about any still existing uses of cadmium and cadmium compounds in plastic materials (other than the 16 already regulated), not only about 'non-safety applications'. Therefore we also received information on uses for safety applications.

- According to Eurocolour the three pigments (mentioned above) are used in the polymers; low-density polyethylene for the production of coloured master batches, SAN, and mostly in polyamides. For signal colours and security applications all kinds of polymers are used. The applications are: wall anchors and joining elements for the building sector, cramps for the electric sector, plastic cages for the textile sector, parts for rescue boats for ships, parts for security equipment for outdoor applications, seats, reels and diverse technical parts for outdoor applications. In total about 4.1 tonnes of these pigments are used in plastics in the EU. The concentration of the pigment in the final article is ~0.5%
- According to ICdA the plastics where the pigments are used include, but are not restricted to, HDPE, polycarbonate, polytetrafluoroethylene (PTFE), nylon, ABS, PMMA, silicones, and Polyphenylene Oxide (PPO). Examples of critical applications are safety piping and cabling, aerospace and automotive. End applications where there are no suitable technical alternatives include, in addition to safety critical uses, those uses where UV stability, temperature and humidity stability and/or migration are important. There are only two manufacturers of these pigments in the EU and they have pre-registered the pigments in the tonnage band 100-1000 t/y.
- Regarding alternatives to the three pigments Eurocolour state that colorants with the same technical properties does not exist. Cadmium pigments provide the highest achievable values for weather resistance, light fastness, heat resistance for the converting processes and chroma. Without cadmium pigments outdoor security applications will, according to Eurocolour, become less secure due to a loss of signal colour strength (fading). Substitutes could be found with lead chromate pigments, but they are part of REACH Annex XIV.
- Other alternatives – which do not give the same colour shade and with limited weather fastness – are organic pigments in combination with UV-stabilisers. Costs of suitable red organic pigments are about a factor 6-10 higher than inorganic counterparts.
- Regarding potential exposure to cadmium compounds in plastics ICdA stated that once encapsulated in the polymer – whatever this is – these substances are firmly bound into the matrix and it requires the use of acid to extract even very low levels of cadmium from the coloured polymer.

- According to ICdA many of the pigments sold as “substitutes” for cadmium pigments do not have the same performance in terms of heat stability, resistance to fading if used outside. This is particularly true of the engineering polymers which are processed at very high temperatures (perhaps up to 375°C). Also, when polymers are injection moulded, there are inevitably feed channels involved which have to be removed from the finished articles. In the case of cadmium pigments these so-called “sprues” can be granulated and re-sued, as the pigment can withstand the processing temperature almost indefinitely. The high-performance organic pigments used as alternatives can only survive the processing temperature once without partial breakdown to give dirty colour effects. This results in waste of both the polymer itself and the expensive organic pigment. Inorganic pigments, in general, are also immune from migration, where the colorant can travel slowly through the organic polymer matrix and appear at the surface.
- Boeing provided the information that at present they are not aware of any problems with extending the current restriction on plastic materials beyond the 16 covered by the restriction. They did, however, have concerns regarding possible changes in the restriction relating to the derogation for use in safety applications.
- ICdA noted that the following substances which have potential use as stabilisers have been pre-registered under REACH: barium cadmium tetrastearate (EC 214-740-9, CAS 1191-79-23), cadmium distearate (EC 218-743-6, CAS 2191-93-0), cadmium dilaurate (EC 220-017-9, CAS 2605-44-9) and cadmium didecanoate (EC 220-650-0, CAS 2847-16-7). The REACH cadmium Consortium has not produced any registration dossiers covering these substances and ICdA had no information as to whether they are used for this purpose in the EU.
- ICdA had no information on cadmium compounds in imported articles but suggested that the only cadmium compounds used generally were the three mentioned pigments. None of the consultees had any information on cadmium containing stabilisers in imported articles.
- ICdA stated that, to the best of their knowledge, there is no use of cadmium compounds as stabilisers in plastics other than PVC, and they know of no other function in plastics than to stabilise or give colour.
- A representative of the French customs laboratories recently informed the Commission that cadmium could be used as a catalyst in the manufacture of Ethylene Vinyl Acetate (EVA).

5. Likely main tasks to prepare an Annex XV dossier

In this section we give the preliminary outline of the kinds of issues we consider relevant to address in preparing an Annex XV dossier after the adoption of the “current restriction”. These are intended to form the basis of the Commission’s request to ECHA bearing in mind the possible links with the other cadmium related issues (which are addressed in four separate reports).

We envisage that the scope of ECHA’s investigation would focus on the identification of those uses (in plastics) of cadmium and its compounds not addressed by the current restriction and on the availability as well as technical and economic feasibility of alternatives.

The basis for the work is EU's cadmium strategy as stated in the Council Resolution of 25 January 1988: i.e. "limitation of the uses of cadmium to cases where suitable alternatives do not exist". Thus, ECHAs approach would be to make the restriction entry cover all plastic materials and to derogate specific uses where technically and economically feasible alternatives cannot be found. The current derogation for articles for safety applications (see the separate report on this issue) would be valid also for additional plastic materials.

ECHA plans to conduct a brief review of the main existing studies related to the risks posed by cadmium and its compounds. The purpose of the review is to define the general framework for the restrictions based mainly on EU Risk Assessment (ESR) and the reports written by RPA as well as the EFSA reports on dietary exposure. ECHA is not planning to make a new assessment of the hazard of cadmium and its compounds. A brief risk assessment of the alternatives would be carried out the hazards of cadmium are well known. Thus, the NOAEL and LOAEL values used in these previous risk assessments will be used and no new literature search on hazard will be conducted. ECHA plans to complement the assessments with information from any newer studies or other information on relevant uses and emissions e.g. during the waste stage.

The uses to be investigated are relatively minor. The volumes of cadmium pigments may also be relatively low. Around 4 tonnes of the pigments are used in EU per year according to Eurocolour. Cadmium content of imported articles is not known. According to the EU RAR, however, in 2003 the consumption of pigments in EU-16 (including an estimate for imported articles) was estimated at 499 tonnes, corresponding to 299 tonnes cadmium, per annum).

We believe that the most appropriate approach is to estimate the emissions from the identified uses, estimate to what extent these emissions contribute to the exposure and risk for the overall population and estimate the cost of reducing these emissions. We assume that risk assessments for each specific application would most likely only show a very small risk. Therefore we see no point in making a quantitative exposure assessment for the specific applications. Making such assessments would be very costly in terms of money (if outsourced) and staff resources.

The most important cadmium sources to human exposure are emissions from phosphate fertilisers, fossil fuel combustion and iron/steel production. EFSA has concluded that the tolerable intake of cadmium is exceeded in parts of the EU population and that the exposure to cadmium should be reduced. The remaining uses of cadmium in plastics results in a very small share of the total emissions of cadmium in the EU. Still these uses may be responsible for a not insignificant share of the total amount of cadmium brought into the EU market intentionally. Note that pigments are estimated to make out 8% of the world consumption of cadmium³). Furthermore, use of Cadmium in plastics may be one of the sources of emissions that can be reduced in the EU in a cost-effective manner. Thus, it may be justified to restrict the cadmium content remaining uses in plastics if economically and technically feasible alternatives are available.

³ U.S.Geological Survey for the US Department of the Interior, Mineral commodity summaries 2009, Washington DC, 2009

From the information gathered so far it seems that there are three cadmium containing pigments still in use in the EU⁴. We also have an idea of the materials in which they are used. We only have an understanding of the applications in general terms but more detail would be needed on the specific applications in order to understand whether these are safety applications. In this case they would be covered by the derogation. Still we would need to assess whether a use is of specific importance for society, whether it is technically possible to switch to alternatives and how costly that switch would be. Also for any non-safety applications we need more information on the technical and economical feasibility of alternatives.

Analytical options

For uses, where a switch to alternatives is likely to be technically difficult and (thus) costly (i.e. economically infeasible), the following analytical options could be considered:

- 1) *Cost-effectiveness*: We estimate the cost per kilo of reducing the use and/or emission (as appropriate/feasible) of cadmium for each use/sector. This would be compared against each other to identify which, if any, uses/sectors would face costs significantly higher or lower than any others. If a use/sector has a cost which is significantly higher than others, this could be said to provide a *prima facie* case for derogation. This is the least data-demanding approach. However, it cannot state whether any restriction or derogation is actually justified in the first place, nor what level of additional cost compared with other uses/sectors should be regarded as 'significant'.
- 2) *Cost-effectiveness with a benchmark from previous EU wide decisions*: We estimate the cost per kilo as in (1), and then compare the estimates against some benchmark, for instance, the cost per kilo estimated for some other cadmium regulation which has already been adopted. For instance, in an impact assessment for the agreed legislation⁵ on batteries for cordless power tools the costs for industry to eliminate one kilo cadmium was estimated (proposal for a Directive amending Directive 2006/66/EC on batteries and accumulators, adopted by the Commission 26 March 2012). Because this legislation was adopted, it would imply that the benefits of reducing cadmium were considered to be at least as much as the estimated cost of removal. Therefore, the issue is if costs estimated in the current case were found to be lower than this cost of removal. If so, the proposed restriction would be "equally good" or "in the same ballpark". Restrictions having much higher costs per kg would no longer be "in the same ballpark" and so could have a case for derogation⁶. This approach would ensure consistency with prior legislative decisions, although in the absence of an explicit monetary comparison of costs and benefits, the fact that a previous piece of legislation was adopted cannot be taken to demonstrate that the benefits of that legislation actually did (and do) outweigh the costs in reality.

⁴ Also, the use of cadmium carbonate containing polymers has been registered. This needs further investigation in order to understand the function of the cadmium compound and whether cadmium is used only for safety applications or not

⁵ ESWI, Exemption for the use of cadmium in portable batteries and accumulators intended for the use in cordless power tools in the context of the Batteries Directive 2006/66/EC, Final Report, 26 January 2010

⁶ Enforceability and practicability would naturally need to be considered too.

- 3) *Cost-impact.* We use approaches to impact assessment which are not based on strict risk assessment principles. Rather we would use a more 'pragmatic' combination of evidence and data to provide indicative, albeit potentially uncertain, estimates of the impact of cadmium (and any reduction in exposures) on human health. Previous studies have, for instance, estimated the number of premature deaths from cadmium on the basis of information on deaths related to smoking (as done in the report mentioned in the previous point), and similar approaches could be used to estimate the impact on mortality and morbidity in the current case. This can then be compared against the estimated cost to provide a 'cost-impact' comparison. However, this approach can result in the problem that there are multiple endpoints identified (e.g. different illnesses), with different scales of impact (e.g. illness severity), and no way to combine them into a single measure of impact (e.g. 'outcome per kilo'). Even where only one endpoint (e.g. illness) is indicated, meaning that a 'cost per case' estimate can be generated, the approach would be subject to the similar problem as (1), with no way of judging what is a 'reasonable' or 'unreasonable' amount of benefit per unit of substance removed.
- 4) *Cost-benefit:* We make an impact assessment as in (3) and apply monetary values to the estimated health impacts to produce a cost-benefit analysis. This is subject to the uncertainties inherent in the approach described at (3), and requires monetary estimates which match (at least approximately) the endpoints identified for quantification in the impact assessment. However, it has the strength that it provides a relatively unambiguous approach to judging when a derogation might be justified and when not, based on a comparison of costs and benefits. Uncertainty can be dealt with through sensitivity analysis. However, if Option 3 was possibly difficult to conduct, this Option 4 would have those difficulties as well as those related to valuation of endpoints.

A more detailed assessment of the available data and evidence is necessary to identify which of the options above might be viable in the current case. The ability to implement Option 1 is a prerequisite for the other options. Given the availability of existing cost per tonne estimates, Option 2 would seem to be feasible and could produce policy relevant results. Option 4 would build on and extend Option 2, but is most demanding in terms of data and evidence, and would not necessarily provide more certain estimates and conclusions.

Possible call for evidence on ECHA's website

It may be advantageous for ECHA to hold a 'call for evidence' consultation on its web-site. In this consultation ECHA would gather information relevant to the possible restriction in a transparent manner (and thus have hopefully no/less surprises during public consultation of the Annex XV restriction dossier). The contractor would need to analyse the outcome. Thus, it would make sense to involve the consultant in this phase. The consultation round could start e.g. in January 2013.

Timing issues

Although a more detailed time and resource planning that takes full account of the 'scope' of the necessary analysis has not yet been performed, it is clear that it will not be possible for ECHA to submit an Annex XV dossier in August 2013. The consultant will have about 8 months to finalise the work from the signing of the contract (31 October 2012) and all final reports should be accepted by ECHA after 10 months. ECHA will need a couple of months to finalise the restriction report after the receipt of the consultants report. In practise it might be possible to submit the

Annex XV dossier in October 2013. However, January 2014 is a more realistic submission date.

6. Conclusion

ECHA will prepare an Annex XV restriction dossier on cadmium in plastics on the basis of a request from the Commission. If the request arrives in 2012 ECHA estimates that the dossier would most likely be ready in January 2014.

The dossier is proposed to focus on identifying remaining applications of cadmium in plastics and the technical and economical feasibility of alternatives for those applications. Any restriction proposal resulting from the dossier is proposed to be risk based, summarising existing assessments and refining them with any new existing data on use and exposure related to the applications of interest. The costs and the risks of alternatives are proposed to be assessed based on, inter alia, the information received during the call for evidence.

Annex I

The content of Entry 23 of Annex XVII of REACH after the adoption of Regulation (EU) No 835/2012

Unofficial compilation for the purpose of this report

Cadmium and its compounds...

1. Shall not be used in mixtures and articles produced from the following synthetic organic polymers (hereafter referred to as plastic material):

- polymers or copolymers of vinyl chloride (PVC) [3904 10] [3904 21]
- polyurethane (PUR) [3909 50]
- low-density polyethylene (LDPE), with the exception of low-density polyethylene used for the production of coloured masterbatch [3901 10]
- cellulose acetate (CA) [3912 11]
- cellulose acetate butyrate (CAB) [3912 11]
- epoxy resins [3907 30]
- melamine – formaldehyde (MF) resins [3909 20]
- urea – formaldehyde (UF) resins [3909 10]
- unsaturated polyesters (UP) [3907 91]
- polyethylene terephthalate (PET) [3907 60]
- polybutylene terephthalate (PBT)
- transparent/general-purpose polystyrene [3903 11]
- acrylonitrile methacrylate (AMMA)
- cross-linked polyethylene (VPE)
- high-impact polystyrene
- polypropylene (PP) [3902 10]

Mixtures and articles produced from plastic material as listed above shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,01% by weight of the plastic material.

By 19 November 2012, in accordance with Article 69, Commission shall ask the European Chemicals Agency to prepare a dossier conforming to the requirements of Annex XV in order to assess whether the use of cadmium and its compounds in plastic material, other than that listed in subparagraph 1, should be restricted

2. Shall not be used in paints [3208] [3209].

For paints with a zinc content exceeding 10 % by weight of the paint, the concentration of cadmium (expressed as Cd metal) shall not be equal to or greater than 0,1 % by weight.

Painted articles shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,1 % by weight of the paint on the painted article.

3. By way of derogation, paragraphs 1 and 2 shall not apply to articles coloured with mixtures containing cadmium for safety reasons.

4. By way of derogation, paragraph 1, second subparagraph shall not apply to:

- mixtures produced from PVC waste, hereinafter referred to as “recovered PVC”,
- mixtures and articles containing recovered PVC if their concentration of cadmium (expressed as Cd metal) does not exceed 0,1 % by weight of the plastic material in the following rigid PVC applications:

- (a) profiles and rigid sheets for building applications;
- (b) doors, windows, shutters, walls, blinds, fences, and roof gutters;
- (c) decks and terraces;
- (d) cable ducts;
- (e) pipes for non-drinking water if the recovered PVC is used in the middle layer of a multilayer pipe and is entirely covered with a layer of newly produced PVC in compliance with paragraph 1 above.

Suppliers shall ensure, before the placing on the market of mixtures and articles containing recovered PVC for the first time, that these are visibly, legibly and indelibly marked as follows: “*Contains recovered PVC*” or with the following pictogram:

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In accordance with Article 69 of this Regulation, the derogation granted in paragraph 4 will be reviewed, in particular with a view to reducing the limit value for cadmium and to reassess the derogation for the applications listed in points (a) to (e), by 31 December 2017.

5. For the purpose of this entry, ‘cadmium plating’ means any deposit or coating of metallic cadmium on a metallic surface. Shall not be used for cadmium plating metallic articles or components of the articles used in the following sectors/applications:

(a) equipment and machinery for:

— food production [8210] [8417 20] [8419 81] [8421 11] [8421 22] [8422] [8435] [8437] [8438] [8476 11]

— agriculture [8419 31] [8424 81] [8432] [8433] [8434] [8436]

— cooling and freezing [8418]

— printing and book-binding [8440] [8442] [8443]

(b) equipment and machinery for the production of:

— household goods [7321] [8421 12] [8450] [8509] [8516]

— furniture [8465] [8466] [9401] [9402] [9403] [9404]

— sanitary ware [7324]

— central heating and air conditioning plant [7322] [8403] [8404] [8415]

In any case, whatever their use or intended final purpose, the placing on the market of cadmium-plated articles or components of such articles used in the sectors/applications listed in points (a) and (b) above and of articles manufactured in the sectors listed in point (b) above is prohibited.

6. The provisions referred to in paragraph 5 shall also be applicable to cadmium-plated articles or components of such articles when used in the sectors/applications listed in points (a) and (b) below and to articles manufactured in the sectors listed in (b) below:

(a) equipment and machinery for the production of:

— paper and board [8419 32] [8439] [8441] textiles and clothing [8444] [8445] [8447] [8448] [8449] [8451] [8452]

(b) equipment and machinery for the production of:

— industrial handling equipment and machinery [8425] [8426] [8427] [8428] [8429] [8430] [8431]

- road and agricultural vehicles [chapter 87]
- rolling stock [chapter 86]
- vessels [chapter 89]

7. However, the restrictions in paragraphs 5 and 6 shall not apply to:

- articles and components of the articles used in the aeronautical, aerospace, mining, offshore and nuclear sectors whose applications require high safety standards and in safety devices in road and agricultural vehicles, rolling stock and vessels,
- electrical contacts in any sector of use, where that is necessary to ensure the reliability required of the apparatus on which they are installed.

8. Shall not be used in brazing fillers in concentration equal to or greater than 0,01 % by weight.

Brazing fillers shall not be placed on the market if the concentration of cadmium (expressed as Cd metal) is equal to or greater than 0,01 % by weight.

For the purpose of this paragraph brazing shall mean a joining technique using alloys and undertaken at temperatures above 450 °C.

9. By way of derogation, paragraph 8 shall not apply to brazing fillers used in defence and aerospace applications and to brazing fillers used for safety reasons.

10. Shall not be used or placed on the market if the concentration is equal to or greater than 0,01 % by weight of the metal in:

- (i) metal beads and other metal components for jewellery making;
- (ii) metal parts of jewellery and imitation jewellery articles and hair accessories, including:
 - bracelets, necklaces and rings,
 - piercing jewellery,
 - wrist-watches and wrist-wear,
 - brooches and cufflinks.

11. By way of derogation, paragraph 10 shall not apply to articles placed on the market before 10 December 2011 and jewellery more than 50 years old on 10 December 2011.