

**“DOCUMENT ON RECOMMENDATIONS TO BE IMPLEMENTED BY THE RELEVANT AGENCIES ALL OVER THE NATIONAL TERRITORY REGARDING LIGHT BULBS” . BRAZIL.**

São Paulo, November 28th, 2007

The present document reflects the conclusion on the discussions carried out by the participants of Work Group on Light Bulbs, called WG - Light Bulbs and do not necessarily represent the official position of the involved public agencies.

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## JUSTIFICATION

Worldly acknowledged as an extremely toxic metal, mercury has been causing humanity tragedies along the centuries, causing deaths and irreversible lesions, many of which incapacitating and extremely severe. Although statistically irreversible, mercury has been causing serious environment and public health problems, especially to the workers' health. High concentrations may be fatal to the human body and even low doses have been causing adverse effects to the central nervous, renal, cardiovascular, immunological, reproductive and other systems.

Persistent in nature, it is spread all over the planet, thus contaminating the environment, flora and fauna, without ever becoming inert and inoffensive.

In the last years there was such an increase in the quantity of mercury resulting from human manipulation that several agencies and entities have been calling the attention to the risks for humanity and been prepared to reduce/eliminate its use.

According to published studies, mercury levels in the whole planet have been increasing since the beginning of the industrial era and in the last decades the concentration has increased considerably. Due to its easy mobility, there has been a world dissemination of mercury, affecting distant regions, such as the Arctic. In several places the planet it has been found in fish, in amounts able to cause adverse effects to the health of human beings and animal life.

In the environment, metallic mercury can change the chemical form and be transformed in organic mercury, which is cumulative when ingested through food contamination. It quickly crosses the placental and hematoencephalic barrier, possibly causing severe lesions and death, as well as compromising future generations by the transmission of generated effects.

Based on a report prepared by a group of international specialists, the Ruling Council of the UN Environment Program - UNEP concluded, in a meeting carried out in February 2003, that there is evidence enough and significant of adverse global impacts on health and the environment caused by mercury and its components requiring world, national, regional and local actions. And it recommended that each country should set up goals and adopt measures to reduce/eliminate anthropogenic sources of mercury.

In the 24th Meeting of the United Nations Environment Program Ruling Council, which took place in Nairobi on February, 2007, the urgent need of international actions due to the adverse effects of mercury on the environment, wild life and human health was reaffirmed, and it deemed it a priority for the reduction of risks, effective actions to eliminate its use where already possible and a reduction/elimination of atmospheric emissions of mercury from human action and the finding of environmentally sound solutions to refrain losses of mercury and its components, as well as solutions to stock and reduce its supply for the global demand of mercury.

The European Union (EU) has adopted concrete measures to reduce mercury. Almadén mines, in Spain, where the greatest world mercury extraction has been secularly taking place, was closed in 2003. The European Parliament has a proposal to regulate the mercury export prohibition as of July 2011. The strategy defined by the European Union is that of an International Covenant on mercury, provisioning mercury prohibition for the whole rest of the world until 2020, thus eliminating the world consumption. As far as light bulbs are concerned, the EU has set up maximum quantitative parameters for the several types of mercury bulbs, not to be exceeded.

In Brazil, the production, import and trade of fluorescent bulbs is approximately 40 million bulbs annually.

Mercury bulbs are of the fluorescent type, compact fluorescent, mixed bulbs with Hg, halogenic bulbs, mercury vapor and mercury/sodium lamps. Broadly used all over the country, such bulbs may cause environment impact accounting for air, water and soil contamination due to their leaked mercury and resulting harm they cause to human health.

Mercury manufacture, transportation, storage, separation, stowage, recycling and reuse should be carried out in a technically safe and appropriate way and the final disposal of the products in landfills should be avoided until it is thoroughly eliminated, with a view at preventing risks to human and animal health and the soil, air and water environment.

In Brazil there is no specific legislation encompassing the several aspects of the issue, so as to prevent the risks from the use of mercury in light bulbs. However, there is legal rational giving supporting a standardization of procedures and requirement. Also, there is no legal determination as to the quantity of mercury to be used per type of bulb so as to reduce life risks.

*The 1988 Constitution defines, in article 225, that “Every person is entitled to an ecologically balanced environment, an asset of people's common use and essential to a healthy quality of life, the Public Power and the collectivity having both the responsibility to defending it and preserving it for the present and future generations”.*

It is considered a crime provisioned in the Brazilian Penal Code to “*expose other people's life or health to direct or imminent hazard*”.

The Brazilian Code of Civil Procedure sets up that “*the individual who cause harm to another, due to an illegal act, is compelled to remedying it*”, even though the harm caused by mercury is irreparable on both the social and public health viewpoint.

According to the “Environment Management on Special Residues of Universal Generation and After-Consumption Responsibility”, signed by Mercosul countries' Ministries of the Environment, expands the responsibility of the environment management to manufacturers and companies importing mercury bulbs and fluorescent tubes, among other products.

Basic rights provisioned in the Consumer's Defense Code are: the protection of life, health and security against risks provoked by practices of providing products and services deemed dangerous or harmful, as well as appropriate and clear information on different products and services, with correct specification on quantity, characteristics, composition, quality, price and their risks. In this sense, it rests with the manufacturer to provide information by means of appropriate printing materials accompanying the product. Whether being or not guilty, manufacturers and importers are accountable for remedying the harm caused to consumers due to defects of their

products' design, manufacture, handling, presentation or stowage, as well as insufficient or inadequate information as to their use and risks.

Therefore, it rests with the public power as well as agencies of the organized civil society to control the production, trade and use of techniques, methods and substances imposing risks to life, quality of life and environment, so as to demand better environment standards.

In order to make up for this legislative gap, the coordination of the Ministry of Labor and Employment/São Paulo State Regional Offices of Ministry of Labor Mercury National Program invited several government and the organized civil society agencies at the beginning of 2006 to discuss and prepare a common-agreement document focusing on all aspects regarding risk prevention on the manufacture, import and export, use, transportation, disposal, collection, recycling and final disposal of mercury bulbs and forward it.

The first meeting took place on March 17th, 2006, when a workgroup was created, the WG - Bulbs, comprising representatives of the agencies attending the meeting, who took on the commitment to participating in the group meetings until the completion of the works, aiming at discussing and preparing a document focusing on all issues related to mercury bulbs, from their manufacture to the products' final destination, passing by the quantity of mercury used in each type of bulb, type of recycling, mercury recovery, collection, transportation, storage, handling and disposal, including domestic disposal, which will serve as a subsidy for procedures and ruling to be implemented by relevant agencies.

ABILUX - an agency representing bulb-manufacturing companies participated in the group's initial meetings and subsequently withdrew from them.

The current document is the result of this work and tackles issues stemming from the use of mercury bulbs, taking into account that, with respect to the low consumption of electric power today, there is no known technology to replace the use of mercury in light bulbs.

Next, specific topics are approached, so that every company manufacturing, importing, exporting, trading, recycling and/or transporting mercury bulbs adopts the procedures being now set up with the aim at improving environment quality and protecting public health Imported bulbs should comply the same specifications of those produced in the country.

## I – MANUFACTURE OF MERCURY LIGHT BULBS

The procedures laid down in the items below are addressed to the companies which manufacture, store, import, export or trade mercury bulbs, according the activities developed in their premises.

1. Replace the technology using the introduction (injection) of liquid mercury in the tube for other technologies, such as, for example, that of mercury capsule and that of amalgamated mercury, which allow a better exposition control in the production.
2. Replace the process of fluorescent powder dilution using xylol-based solvents, butyl and ethyl acetate or other similar ones for a process using water as solvent.
3. Standardize the quantity of mercury used per bulb according to type, size and model, being able to vary from 3 mg of Hg (or less) up to a maximum of 10 mg per bulb. The quantity of mercury in compact fluorescent bulbs should not exceed 5 mg per bulb; in simple halophosphate fluorescent bulbs 10 mg per bulb; in normal medium-term duration triphosphate bulbs 5 mg and in long-duration triphosphate bulbs 8 mg.
4. Produce tubular fluorescent bulbs not exceeding 1.50 m long, due to handling, manufacture, transportation and recycling risks.
5. Visibly print on the body of the bulb the manufacture's name, the quantitative amount of mercury contained in it as well as the warning: “do not break: it contains toxic substance”, aiming at educating the consumer.
6. Pack bulbs per unit and place them in boxes, including those transported, imported, exported and traded. Keep the boxes organized in pallets, with piling up in quantity and height not representing any risk of accident, fall or breaking, storing them in place specific for that purpose.
7. Make arrangements so that the packing have highlighted and easy-to-read information with regard to mercury risk, attention to be adopted in case of break, guidance to the consumer not to break the bulbs after using them and return them duly packed and preferably within the original packing, as well as the steps to be taken in case of accidental break.
8. Pack the defective (waste) bulbs in resistant packing, in good state of preservation, not allowing the evaporation of mercury, correctly piled and in a specific location, with efficient ventilation.

9. Adopt the same procedures and the same protective measures settled for recycling companies, in the treatment given to the bulbs not approved in the production process or accidental break, in specific place for such end, the break of bulbs being production line being prohibited.
10. Carry out a process of mercury purification/distillation in an appropriate place, specific for the safe development of this activity and isolated from the other production sectors. This process should be confined in a closed cabin or something like that and with exhausting local ventilation system. The air captured from the exhaustion should receive a previous treatment, employing the best technology available in the market, for mercury retention, before it is released to the external environment. Any manual process of mercury cleansing should be eliminated, such as, washing with chemical products or similar ones, separation by means of funnel or others. No equipment, machine, container or product necessary for the mercury purification/distillation/recovery process should remain in the place.
11. Make mercury-containing workplace floors, walls and ceiling waterproof, with products keeping them from being impregnated and penetrated by mercury.
12. Take all necessary measures do prevent capsules and amalgam from being scattered by the benches or on the floor during the production process.
13. Monitor the room temperature of the bulb producing sectors so as to assure the workers thermal comfort. Endow the workplaces with a ventilation system with constant air renovation, containing a system of filters with mercury retention and ongoing monitoring of the air being released to the environment.
14. Endow the mercury-using machines and equipment with a system of efficient local exhausting ventilation, with mercury recovery and retention filters, being the gaseous effluents of the subject system permanently monitored before they are released into the environment.
15. Carry out ongoing monitoring of the environment air and possible emissions through sources and escaping points, workplaces and all environments subject to contamination. In case an exhaust ventilation or rate excessive to the one settled in the present document is detected, the company should adopt immediate measures to eliminate the risk.
16. Monitor also the mercury around the company, encompassing winter period, so that the air quality of the regions might be evaluated The company area soil, as well as the water used

by it, should be monitored, the sampling, collection and procedures complying with the norms set up by the relevant agencies.

17. Provide information in writing and train workers on the correct procedures to be adopted with regard to the risk existing in all activities in which mercury handling is carried out or mercury products are present
18. Submit liquid effluents and solid residues to a mercury decontamination process.
19. Direct all and any contaminated product, such as mercury retention devices, mercury impurity residues and others for due decontamination in specialized companies licenced by relevant environment agencies.
20. The bulb import companies should:
  - a) Print on imported bulbs in Portuguese language the same information and warnings settled for those factories in the country.
  - b) Have and make available documents containing the producer's company name and full address, as well as packing information.
  - c) Have a registry with the company's name, Corporate Taxpayer Registry number (CNPJ), full address and average quantities imported per year, which should be available to the interested public agencies.
  - d) Adopt all procedures with regard with mercury bulbs settled for manufacturing and recycling companies.

## II – TRANSPORTATION OF MERCURY LIGHT BULBS

The care and procedures for the transportation and stowage of used bulbs are under the solidary responsibility of the manufacture, importer, sender and the company providing the displacement.

Bulb transportation having or being contaminated by mercury should comply with the rules and procedures settled below.

1. Carry out the transportation by means of a closed vehicle, with the external warning "transportation of hazardous product – mercury bulbs".
2. Endow the transportation vehicle with risk labels and specific security panels.
3. Pack the containers in the transportation vehicle so as to avoid the bulbs' displacement and/or break.

4. Stick on the transportation tax invoice an instruction note which should be read by those in charge of the transportation service before the cargo departure and should be complied with during the whole route up to the final destination. People involved in the transportation should be duly qualified and submitted to regular updating as to the secure handling of the bulbs due to the health and environment hazard represented by mercury as a result of its toxicity.
5. Transport mercury bulbs or mercury-contaminated products only if they are duly classified, packed, labeled, signed and have a statement issued by the sender in a required transportation document and in compliance with regulatory conditions.
6. Transport useless bulbs separately from any other residues or garbage in vehicles appropriate for this end. Broken bulbs will not be able to be transported without due stowing, in special hermetic packing, with a view to avoid contaminating the cargo driver, the transport vehicle and places on the way.
7. Consider the traded new bulbs as products containing a toxic element and take the same care settled for transportation of used bulbs.

### III – MERCURY LIGHT BULBS STOWING

1. Individually pack the useless (used) bulbs, without apparent damage, and place them preferably in their original packing, keeping them intact and protected against occasional shock which might cause their break, and store them in a dry place. If not possible to reuse the original packing, cardboard, paper or newspaper and resistant tape should be used to involve the bulbs, thus protecting them against shocks.
2. Stow the individually packed bulbs in portable recipient or resistant box appropriate for transportation, so as to avoid breaking them.
3. Carry out the stowage of broken or damaged bulbs, separately from the others, in hermetically closed pressure-resistant recipients, internally lined with a special plastic bag to avoid its contamination and with the information that it contains broken mercury bulbs.
4. Carry out the handling of broken bulbs (shards), with the sole use of adequate individual protection equipment (IPEs), such as mercury mask, globes, impermeable apron and safety shoes in all phases of product moves, collection, storage and transportation.

5. Alert the consumer on the mercury contamination risk, which is associated to the break of the outlet pipe or flask, or damage to the bulb ends, situations in which the scape and evaporation of the pipe shall take place and consequently contaminate human beings and the environment.
6. Also guide the consumer towards arranging, in case of accidental bulb break, immediate collection, local cleaning and opening of doors and windows for the air to circulate. Mercury drops should be collected with a (needleless) syringe or paper sheet, avoiding manual contact with the product, and placed into resistant plastic recipients, which should be hermetically closed. Fragments should be collected in such a way as not to hurt the person handling them and placed into packets, sealed, so as to avoid mercury evaporation. Plastic bags with broken bulb bits shall be placed into resistant cardboard boxes so as to avoid the risk of hurting accidents.

#### IV – PICK UP AND STORAGE OF MERCURY LIGHT BULBS AFTER COLLECTION

The policy adopted by the Environment Ministry is that of after-consumption responsibility, where the responsibility chain is defined and attributions resting with manufacturers/importers, distributors/dealers and consumers.

Mercury light bulb manufacturers and importers are responsible for the collection, transportation, decontamination and forwarding of these residues, so as not to violate the environment and the worker's health.

Distributors and dealers (businessmen) have the responsibility to receive, temporarily storage and pack the bulbs in a safe and segregated way, according to direction previously mentioned for their later collection by manufacturers and importers.

Consumers have the responsibility to deliver useless bulbs at the premises that commercialize them, ideally within their very packing, following the directions and making sure not to break them.

Next, the specifications referred to in this item:

1. It rests with the manufacturers and importers:
  - a) Collect the bulbs of their make or import (according to identification on the body of the product) deposited in the commercial premises and collection points;

- b) Be responsible for recycling and sending them to the appropriate destination, according to the sanitation law and best practices of environment pollution control;
  - c) Collect the bulbs duly identified by the manufacturer, as specified in this document, in the same type of vehicle carrying out the distribution and according to the same criteria laid down in the transportation item.
2. It rests with the importers to:
- a) Import only bulbs with the due identification of the manufacturer and its origin;
  - b) Be responsible for the appropriate residue recycling and destination in the same bulb volume distributed;
  - c) Duly prove the import and destination of the bulbs, by means of documents, and keep them available for the inspecting agencies.
3. It rests with businessmen and points of bulb collection:
- a) To accept the return of used units by users, as provisional trustees, for their later collection by manufacturers or importers, being the later destination of common garbage prohibited;
  - b) To duly pack received bulbs in the form of the previous item, storing them in a segregated way, being the relevant environment and public health norms complied with, as well as the recommendations defined by manufacturers or importers, up to their repass to these latter;
  - c) To display in visible collection places at commercial premises and collection points, the recipients with information alerting and raising the consumer's awareness on the importance and need to send used bulbs to a correct destination and the risks they represent to health and the environment when not dealt with the proper attention.
4. It rests with the users to:
- a) Return the bulbs after using them, to businessmen or collection points, packed according to what is provisioned in the document herein.
5. It rests with everyone, while having under their custody mercury bulbs (manufacture, transportation, use, storage, recycling and destination), the responsibility for such product, being co-responsibilities not exempted from this case.

## V – RECYCLING

It is considered mercury bulb recycling the set of procedures encompassing the bulb decomposition, material separation, mercury recovery, mercury-less decontamination and destination to be reused in productive process.

It is considered decontaminated the material without mercury or having minimum detectable levels of this metal.

The recommendations related to recycling are the following:

1. All and any recycling procedure should be carried out by a legally incorporated society, licenced by a relevant agency and registered at Ibama Federal Technical Registry, besides being consolidated in a property built up on a fixed address.
2. Provide bulb storage and recycling areas with waterproof floor, wall and ceiling, and with products keeping mercury from impregnating and penetrating.
3. Breaking or handling mercury bulbs on mobile units, be they a vehicle or something like that or still on any means subject to displacement, is forbidden for this kind of activity.
4. Keep received recycling bulbs on a local place specific for this end, covered and with a ventilation system.
5. Confine all procedures carried out at the recycling so as to prevent fugitive emission of mercury, with an efficient local ventilation system and a device for capturing and collecting mercury and treating the air issued in the atmosphere.
6. Decontaminate phosphorated dust and other particulate from inside the bulbs, as well as the metallic parts taken out from the bulbs, submitting them to a closed decontaminated process by means of enough heating for the thorough evaporation of mercury impregnated in them, recovering it and bottling it in an appropriate recipient before its adequate destination.
7. Pack the whole recovered mercury in metal recipients not amalgamated with mercury, nor deteriorated and provided with a hermetic closure.
8. Properly store the generated residues until their appropriate destination.
9. Submit the waters used in the decontamination treatment process before they are released into the environment, keeping them monitored on an ongoing basis.
10. Effluents released on any course of water and the environment should not contain detectable tenor of mercury.
11. Prior to the contamination treatment, all contaminated products should be separately packed in hermetically closed recipients and provisionary stored in a specific place for this purpose, including the lots containing broken bulbs.
12. Keep evidence of the destination of the material generated in the recycling, with the receptor's type, weight, volume and address available for inspecting and control agencies.

13. Materials resulting from the recycling to be reused should be processed up to the removal of mercury and monitored through quality control tests, with a methodology avoiding losses at sampling handling, being it necessary for the sampling of all lots to be forwarded to third parties.
14. The recycling company should issue and forward a quantitative analysis of the mercury in the lots sent to the receptors of these residues, proving the decontamination of the materials.
15. The mercury bulb recycling companies should carry out a half-yearly evaluation to monitor the mercury in the workplace and surrounding air, including the winter period, to evaluate the air quality of the region. The company area soil, as well as the water used by it, should be monitored, the sampling, collection and procedures complying with the norms set up by the relevant agencies.

## VI – DESTINATION

The final disposal of mercury bulbs is forbidden in sanitation landfills, in natura, landfills, as it is forbidden its burning or incineration, having they to be sent for recycling.

## VII – GENERAL PROVISIONS

The amounts for mercury levels in the air settled by the Brazilian legislation for workplaces lagged totally behind. Although no limit amount for mercury steam in the air is safe, the international minimum amounts recommended by worldly renowned agencies should be adopted, provided they do not result in contamination or alteration to the health of those exposed to it.

1. Limit Amount of Tolerance of 0,025 mg/m<sup>3</sup> (0,025 mg of mercury per cubic meter of air) for a normal 8 daily-hour and 40 weekly-hour journey (adopted by the ACGIH - American Conference of Governmental Industrial Hygienists).
2. Limit Ceiling of 0,1 mg/m<sup>3</sup> of air. This amount should not be surpassed any time during the work journey (adopted by OSHA – Occupational Safety and Health Administration).
3. All places where any procedure with mercury, contaminated material or mercury-containing products is carried out should be the object of environmental evaluation as to the presence of mercury in the air, including the possible mercury escape points which, once detected, should be immediately remedied.

4. Import and export companies, storing places and large traders of mercury bulbs shall carry out evaluation of mercury in their workplace air where there are broken bulbs.
5. Adopted measures of collective protection should guarantee the inexistence of mercury in the workplace air, as well as levels of urinary mercury or alterations to the health of people exposed to this metal and those exposed to areas under the influence of this process .
6. The use of individual protection equipment - IPEs, appropriate for the safe performance of the activity developed by employees, should be provided by employers. Besides providing uniforms, employers are also responsible for decontaminating and hygienizing those garments.
7. Manufacturing companies importing and recycling mercury bulbs should complete IBAMA's Federal Technical Registry. Other interested public agencies may request IBAMA information regarding this Federal Technical Registry.
8. It rests with manufacturers and importers of mercury bulbs to carry out national-network informative/education campaigns on responsibility, risks and care network to be adopted by users. The campaigns should be submitted to the appreciation of relevant environment and health agencies.

## FINAL CONSIDERATIONS

The present document shall be forwarded to the involved public agencies management for arrangements and to serve as subsidy for the implementation of relevant legislation. It will be also sent to institutions and agencies for their notice, dissemination and possible referrals.

This document points out procedures to be adopted while there are no bulbs with alternative technology to replace the mercury ones with the same or lesser consumption of energy. It is urgent the availability of commercial bulbs with new technology that are also economic and bring no health and environment risks.

Although there is enough information regarding the spread of mercury in the world and the danger it brings, it is important for studies to be more deeply carried out on its effects on the environment and public health, as a result of the contamination caused by the use of mercury bulbs in the country.

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