

# Minimising the emission of mercury from dental amalgam – guidelines for dental care in Sweden



## Contents

Background	3
Purpose	4
Aims (project aims, efficiency goals)	4
Method	4
Schedule	5
Final version of the guidelines	5
Description of terminology used	6
Requirements for dental amalgam separators	13
Number of dental amalgam separators	14
Installation of suction system	16
Installation of wet suction system	16
Installation of dry suction system	20
Suction tubes	22
Sink amalgam separators (amalgam separators connected to sinks)	23
Disinfectant	26
Patient treatment routines	27
Labelling	28
Waste water sampling	29
Cleaning and emptying of water locks and floor drains	30
Upkeep of amalgam separator at dental practices	34
Each and every workday	34
Each and every week	35
At least once a year	35
Self Inspection	36
Handling of amalgam waste	37
Environmental maintenance service	39
At least once a year	39
At least once every two years	39
At least once every three years	39
Records and transport documents	40
Decontamination of pipe system	41
Requirements on enterprises which carry out decontamination	42
Incident Management (deviations and improvement proposals)	44
Expertise	46

## Background

This proposal for guidelines forms part of the environmental project Hg-Rid LIFE, which is being run by the health and dental care company Praktikertjänst in partnership with Sweden Recycling and the IVL Swedish Environmental Research Institute.

The main purpose of the project is to minimise the emission of dental amalgam from dental clinics in Sweden, and in the longer term throughout the European Union (minimisation of emissions at source).

The aim of the project is to:

- ✓ develop technology for environmental remediation which is efficient, user-friendly and cost-effective.
- ✓ increase awareness of the environmental impact of mercury
- ✓ increase the knowledge of how the environmental impact of mercury can be minimised from dental care (training of dental care team, environmental inspectors and maintenance technicians).
- ✓ review and update existing guidelines which can be implemented in Sweden and which can form the basis of the development of such measures within the EU. The guidelines will be implemented within Praktikertjänst.

The project commenced in September 2016 and will run for a period of three years.

The project's reference group includes representatives from the Swedish Chemicals Agency, the Swedish Environmental Protection Agency, the Swedish Water Authority for Västerhavet, the Swedish Dental Association and the Stockholm International Water Institute.

The EU has determined that a new statute concerning mercury will enter into force on 1 January 2018. The regulations which comprise the statute will include, among other areas, dental care. The use of dental amalgam is to be limited, and it may only be used in a predosed, encapsulated form. Children under the age of 15 and pregnant or breastfeeding women may not be treated with dental amalgam unless this is considered to be absolutely necessary on medical grounds. Dental surgeries at which mercury alloy is used, or which carry out removal of dental amalgam fillings, must be equipped with dental

amalgam separators with a specified level of efficiency.

## Purpose

The purpose of the proposal is to establish a consensus among dental care players and environmental authorities concerning the regulation of mercury. In the longer term the proposal may initiate the formulation of national guidelines.

## Aims (project aims, efficiency goals)

The aim of the proposal is to establish a clear work specification and checklists for regulation of dental amalgam within dental care, together with increased consensus among environmental inspectors. The guidance should be a knowledge support and is not supposed to be read from cover to cover, the aim is to use it as a reference book

The efficiency goal is minimised emission of mercury, which is also a contribution to achieving the national environmental quality objective "A Non-Toxic Environment" and also the Sustainable Development Goals of the 2030 Agenda, adopted by all United Nations Member States, Goal 6 "Clean water and sanitation", "Ensure availability and sustainable management of water and sanitation for all"

Dental care is an environmentally hazardous activity according to the Swedish Environmental Code. The handling of mercury-containing, hazardous waste and chemicals poses risks. Large amounts of mercury can also remain in the drainage pipes from dental care centres. This guidance is based on the provisions of the Swedish Environmental Code (1998: 808), including the precautionary principle, and the Swedish Waste Ordinance (2011: 927).

## Method

On the basis of the collected material (e.g. checklists from environmental inspectors), recommendations and legislation the working group will prepare a proposal for guidelines and checklists which can be used within Praktikertjänst, other Swedish dental care centres and by environmental inspectors.

In order to obtain perspectives on the proposal, a number of so-called dialogue meetings will be arranged with dental care players, environmental inspectors and maintenance technicians.



## Schedule

Perspectives on the proposal will be collected through to spring 2018.

## Final version of the guidelines

Submitted perspectives have been compiled and evaluated, the guidelines will be revised continuously if necessary and published on the project's webpage [www.praktikertjanst.se/life](http://www.praktikertjanst.se/life) and on [www.hg-rid.se/en](http://www.hg-rid.se/en)

Please e-mail comments to [lifehg@ptj.se](mailto:lifehg@ptj.se)

*Stockholm, Sweden, November 2018*

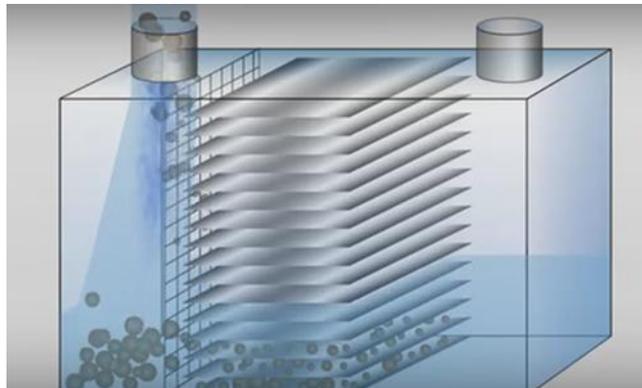
## Description of terminology used

**Dental amalgam:** Amalgam which, up until 2009, was permitted for use as dental filling material in Sweden. Consists of mercury (40-50%), silver (20-35%), tin (12-15%), copper (5-15%) and zinc (2%).

**Dental amalgam separator:** A device which collects amalgam particles in the water which is used in dental treatment before it reaches the drain. By means of filtration, sedimentation, centrifugation or a combination of these methods the amalgam is separated and retained in the container. The amalgam is subsequently handled as environmentally hazardous waste.



*Sedimenting dental amalgam separator*



*In the case of sedimentation, the amalgam particles are separated in the waste water by means of gravity. The waste water from dental units, suction tubes and sinks initially flows through a pre-sedimentation zone in which the large particles are captured. In the next phase of the process the amalgam particles are collected in a silt chamber. Finally the smallest waterborne amalgam particles are captured in a fine sedimentation zone by means of lamellas.*

**Wet suction system/central amalgam separator:** a number of dental chairs are connected to a **sedimenting dental amalgam separator**. Air, water and particles are transported by a vacuum pump to a central place mostly to the utility room. Technical solutions can treat one or also many chairs with one unit. This room can be located on the same floor or beyond. In front of the vacuum pump the air is separated from the water and afterward the particles from the water at the amalgam separator. After the separator the water is cleaned and can be drained.



*Example of use of wet suction system with a sedimenting amalgam separator*

**Dry suction system:** Within the dry suction system the separation of air, water and particles is located directly in/at the chair. A technical solution is separating the water from the air before water with particles go to the amalgam separator. Most common system for amalgam separation is based on a centrifuge directly in the chair. Water is then drained to a pipe system what is mostly installed in the floor. The vacuum engine is based centrally and can treat different rooms at once.



*Example of a dry suction system with centrifuging dental amalgam separator*

**Sink amalgam separator:** Dental amalgam separator which captures amalgam particles in the water in sinks used when rinsing dental instruments and other equipment which has been in contact with amalgam. The instruments shall be rinsed before being washed in a washer disinfector, or/and cleaned in an ultrasonic bath and/or sterilized in an autoclave.

**Surge tank:** A 10-litre surge tank is typically installed in connection with a sink amalgam separator. This has no effect on the amalgam separation process, but allows for sluicing at a higher flow rate. The use of a surge tank makes it possible to avoid water remaining in the sink.



*Sink amalgam separator with surge tank, installed beneath sink.*

**Pre-separator:** Installed ahead of the dental amalgam separator in order to collect large particles which have the potential to block the dental amalgam separator. Installation occurs mostly in older suction systems.



*Pre-separator*

**Pump box:** Pump box is most prevalent in older wet suction systems where secretary vessels and or buffer tank are installed.



*Pump box*

**Check valve:** Wet systems must incorporate a check valve ahead of the amalgam separator in order to prevent backflow.



*Check valves*

**Water lock:** A section of a water pipe which is curved such that a quantity of water comes to a standstill in the bend by means of gravity and separates the pockets of air on either side of the trap. In this way the water in the water lock prevents unpleasant odours, disease and vermin from passing through the drainage system. At a dental surgery water locks are situated at washbasins e.g. in the treatment room, sterilisation areas and in the patient toilet.



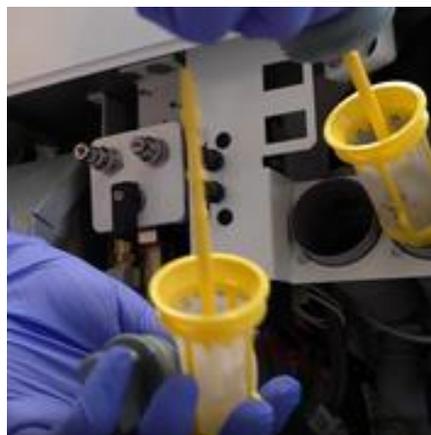
*Water trap at washbasin in treatment room.*

**Water sampling:** Analysis of mercury emissions in waste water. Samples are taken after the water has passed through the dental amalgam separator.



*Water sampling*

**Chairside filter/trap:** In order to improve the functioning of the amalgam separator and remove large solid particles, the dental unit's suction unit is equipped with a chairside filter/trap. The latter is of the disposable variety.



*Chairside filter/trap in dental chair*

**Decontamination:** Mercury pollutant emitting drainage pipes, water locks and floor drains are flushed clean. Decontamination water is subject to aftertreatment and has to be treated as hazardous waste. Pipes which have been

decontaminated are labelled with the date decontamination was carried out and by whom.

**Decontamination log:** Documentation recorded by the practice concerning decontamination carried out, including the method used and the quantity of dry sludge, mercury concentration and calculated weight of pure mercury.

**Operational decontamination:** The activities must continue following the decontamination procedure. This may be done in the event of e.g. transfer, at the behest of the municipal environmental office, to remedy stoppages or obstructions to the drainage system.

**Decontamination in the event of closure:** Decontamination carried out when a dental practice is no longer to be operated at the premises. In addition to flushing of drainage pipes, water locks and floor drains, dismantlement of suction pipes shall be carried out. Flushing points shall be filled and labelled.

**Dental unit:** Dental chair and associated equipment.

**Certified waste container:** Containers for hazardous waste such as mercury / amalgam waste must be UN-certified and fulfil requirements for transportation of hazardous waste.



*Certified waste container*



## Requirements for dental amalgam separators

- ✓ Dental amalgam separators must be certified pursuant to ISO standard 11 143:2008.
- ✓ Dental amalgam separators have to be maintained and changed in accordance with the manufacturer's instructions.

### **Information:**

Dental amalgam separators certified pursuant to ISO standard 11 143:2008 fulfil requirements for best available technology as set out in the Swedish Environmental Code.

As a part of the ISO standard centrifuging dental amalgam separators must incorporate an alert which indicates when the separator requires emptying/replacement, in accordance with the manufacturer's written instructions.

## Number of dental amalgam separators

- ✓ All dental units where activities are carried out which have the potential to result in emissions must be affiliated with dental amalgam separator. Dental unit without amalgam separators must be clearly marked indicating this to be the case.
- ✓ In the case of dry suction systems, each dental unit must be equipped with a dedicated dental amalgam separator.
- ✓ In the case of wet suction systems, the amalgam separator must be connected before draining.
- ✓ There should be an amalgam separator installed where instruments and other equipment, which come into contact with amalgam, are rinsed before being washed in a washer disinfector, or/and cleaned in an ultrasonic bath and/or sterilized in an autoclave.

### **Information:**

In a number of rulings the Swedish Environmental Court has required that dental clinics must have an approved sink amalgam separator connected to a sink/basin.

Dental units used by dental hygienists drilling and polishing amalgam fillings must also be connected to a dental amalgam separator, since amalgam particles are released.

A washer disinfector may not be connected to the dental amalgam separator as this would entail the risk of mercury vapour being released and entering the waste water.



## Installation of dental amalgam separator

- ✓ The dental amalgam separator must be installed in accordance with the supplier's instructions and by a fitter approved by the supplier (see further the section Pipe works, new builds and refurbishment).
- ✓ A sink disinfectant may not be connected to the dental amalgam separator as this would entail the risk of mercury vapour being released and entering the waste water.
- ✓ If the wet suction systems do not have strainer installed for collecting coarse particles, a pre-separator is inserted before the amalgam separators.
- ✓ Ensure that the flow rate through the amalgam separator does not exceed the flow rate at which the separator has been tested, pursuant to ISO 11143: 2008. Refer to the supplier's instructions

### Information:

A range of dental amalgam separators have been tested at various flow rates, and this is stated in the certificate for each separator. In the event of an excessive flow rate amalgam which has sedimented in the dental amalgam separator and the waste water pipes may be flushed through.

The technical documentation supplied by the supplier or labelling on the dental amalgam separator itself must clearly indicate the direction of flow (in- and outflow).

## Installation of suction system

When installing a new suction system it is essential to proceed according to the guidelines for the system in question. A failure to do so may result in a high level of emission of amalgam and significant sanitation costs, and in the worst cases reconstruction of the system.

## Installation of wet suction system

Follow the manufacturer's instructions, see installation manuals for the specific equipment.

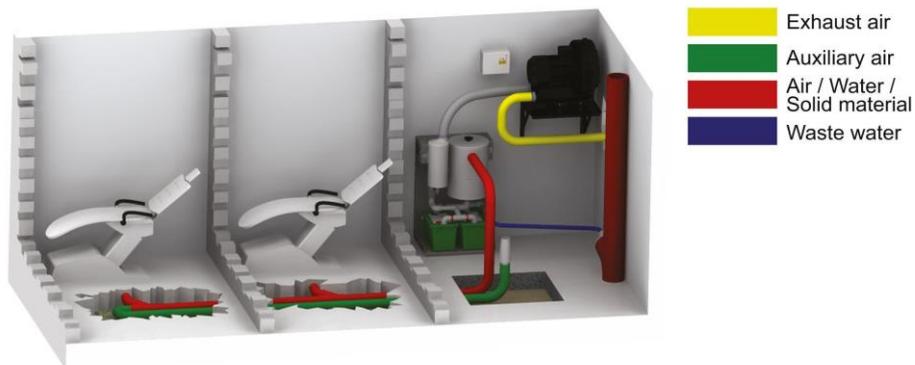
When installing piping in a wet suction system it is particularly important to take into consideration the following points:

- Correct dimensions of pipes
- Use of correct material in the pipe system.
- Sufficient flow in all pipes in the system
- Avoid any sagging pipes, risks for sedimentation
- Relief valve connected to the far end of the pipe system
- No 90 degree° bends, 2 x 45° should instead be used

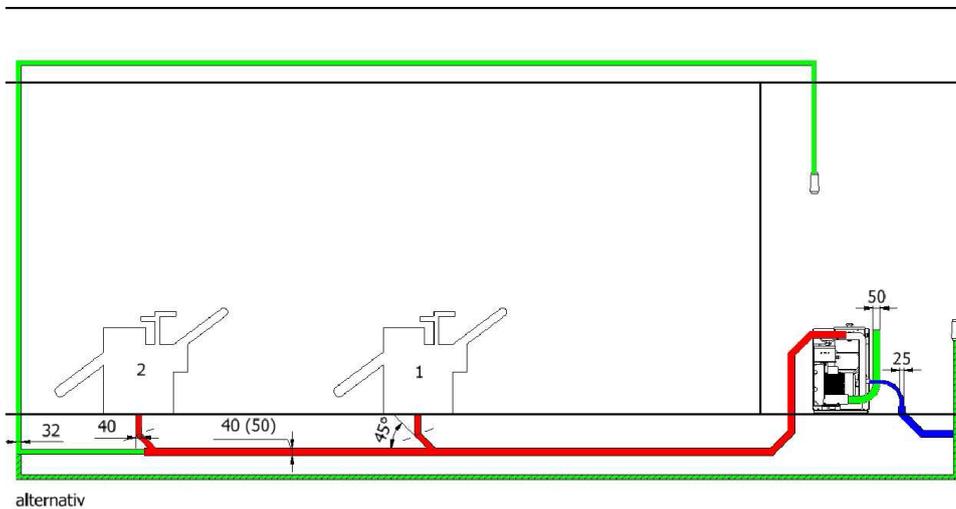


- ✓ The geometry of the piping has a high influence of the performance of the suction as well as on the amalgam separation. Therefore it is necessary to do the planning of the piping with an educated dental partner and not only in the hands of a plumber company. Please find below an example for a piping situation based on a ring solution: TO UT M4

Each branch pipe (DN40) from the dental unit is connected to the main drain pipe (DN50) one after the other. The auxiliary air valve with a vacuum regulator is installed downstream of the last dental unit at the end of the main drain line (at the greatest possible distance to the amalgam separator). Additional air bypass valves installed at the dental chairs are a sensible addition, in particular when the pipes feeding the main drain pipes are long or parts of them are laid horizontally (with no fall).



- ✓ The dimensions selected will depend upon the length of the suction tube: For a short suction tube narrower pipes are sufficient. For a long suction tube broader pipes are required.
- ✓ The size of the suction motor may have a bearing upon the selection of pipe dimensions.



*Example of how to design pipe systems*

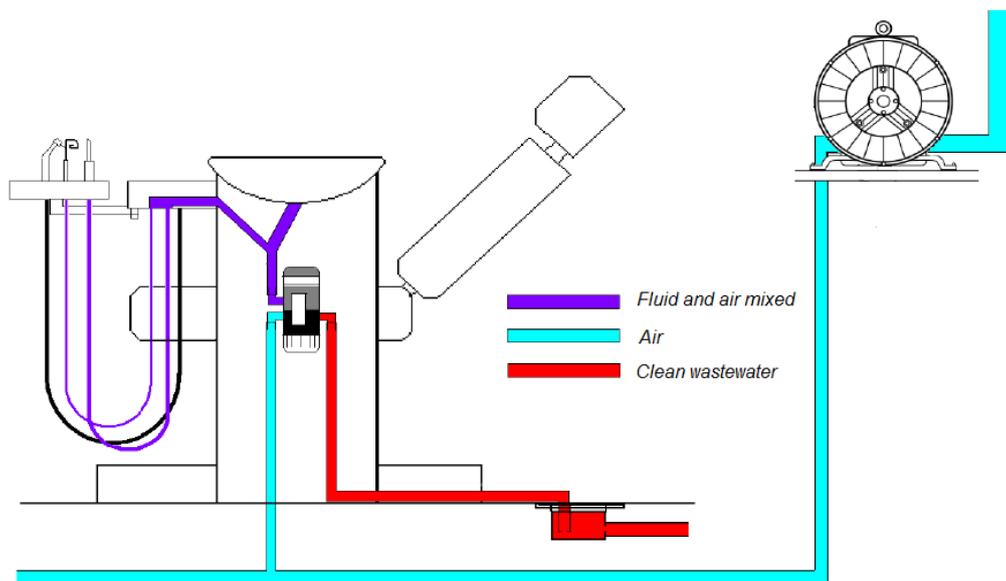
- ✓ Installation of relief valve should be on the end of the piping in a ring system to clean the piping after treatment.
- ✓ All tubes in the suction room must be kept free of folds and sharp bends.
- ✓ The suction system must be airtight. Check that the system is airtight and seal any leaks when the system is taken into use. If the system is not airtight this has the potential to result in breakdown of the suction motor and/or emission of high levels of amalgam.
- ✓ Air expelled from the suction motor may be contaminated by bacteria, recommendation is to install a bacterial filter, or divert air to an area outside the building where people not may come in contact.
- ✓ The suction motor emits a large amount of heat which must be vented in order to prevent the temperature in the suction room becoming too high. The recommended temperature in the suction room is 5–40° C.

- ✓ If the suction room is situated on the same storey as the clinic, it will not be possible to install the entire pipe system such that it is sloped. The final section sucks liquid and amalgam up to the intake of the secretion tank. In order to facilitate this the following measures may be taken: The suction motor is designed to have slightly larger capacity, and the system's pipes slightly less capacity (less dimensions). The relief valve is connected directly in front of the slope.
- ✓ The suction motor is set up such that the suction motor continues to run for several minutes after all of the mouthpieces are no longer in use, before stopping.
- ✓ At large clinics with more than 8-10 dental chairs, multiple suction systems will be installed in parallel. When carrying out such an installation it is important that the flow is even throughout all of the systems. A failure to ensure this may result in some of the amalgam separators being placed under excessive strain. One means of achieving an even balance between two systems is to connect the systems with pipes (see the example in the image below). This construction also includes check valves, enabling operation of one of the systems on the independently in the event of maintenance or breakdown.



## Installation of dry suction system

- ✓ In a dry suction system the separation of liquid and air takes place inside the dental unit. Separation of amalgam likewise takes place in or adjacent to the chair. The suction motor, by contrast, is located centrally and is connected to all of the chairs via suction tubes which solely convey air, and no liquid, hence the name dry suction system.



Example of a dry suction system

- ✓ When installing a dry suction system it is important to take into consideration the following:
- ✓ The connection between the amalgam separator and the drain must have the facility to be taken apart such that a sample may easily be taken for mercury analysis after the waste water has passed through the amalgam separator.
- ✓ The connection to the drain must be at least 32 mm such that the waste water pipe can easily be decontaminated at a point after the amalgam separator.



- ✓ Air expelled from the suction motor may be contaminated by bacteria, and for this reason this air must be expelled outdoors in an area where people are not normally present, e.g. from a rooftop. A bacteria filter is highly recommended.
- ✓ In order to prevent breakdown of a dry suction motor, motor saver should be installed to protect the dry engine against water.
- ✓ The suction motor emits a large amount of heat which must be vented in order to prevent the temperature in the suction room becoming too high. The recommended temperature in the suction room is 5–40° C.

## Suction tubes

- ✓ Suction tubes whose inner surface is smooth and which have no sharp bends or low points accumulate smaller quantities of amalgam.
- ✓ The suction tubes must be as short as possible in order to avoid low points forming.
- ✓ The used suction tubes are classed as hazardous waste and must be collected by a carrier which is authorised to transport hazardous waste.

## Sink amalgam separators (amalgam separators connected to sinks)

- ✓ Dental amalgam separators must be certified pursuant to ISO standard 11 143:2008.
- ✓ Sink amalgam separators must be administered and maintained in accordance with the supplier's instructions.
- ✓ There should be an amalgam separator installed where instruments and other equipment, which come into contact with amalgam, are rinsed before being washed in a washer disinfector, or/and cleaned in an ultrasonic bath and/or sterilized in an autoclave. Employ lockable washers in order to minimize the risk of puncture and laceration injuries when instruments are rinsed in the sink.



*Lockable washers minimize the risk of puncture and laceration injuries.*

- ✓ A sink disinfectant may not be connected to the dental amalgam separator as this would entail the risk of mercury vapour being released and entering the waste water.
- ✓ Check once a week that there is no leakage from the sink amalgam separator or the surge tank. Ensure that the space is kept tidy to allow for visual inspection.

- ✓ The drain associated with the sink amalgam separator must not be used for any other purpose than cleaning of instruments and other equipment which has been in contact with amalgam, such that the separator functions optimally.
- ✓ The use of double basins is recommended in the sterile area. The drain then divides, with one sink being connected to the sink amalgam separator.
- ✓ Any drain associated with a sink amalgam separator must be clearly labelled with an adhesive label.



Label: "This sink is supplied with an amalgam separator"

- ✓ Use the disinfectant recommended by the sink amalgam separator supplier. However, ensure that you check the environmental information in the safety data sheet to ensure that the substance does not have long-term impacts on the environment (guidelines in the form of a danger symbol/pictogram and a printed warning). Contact the supplier in the event that the recommended disinfectant is environmentally harmful according to the safety data sheet or impacts the function of the amalgam separator.
- ✓ Chairside filter/trap both at the suction tube and spittoon/fountain bowl must be emptied every workday into a collection receptacle for amalgam waste and then be rinsed in a sink fitted with a amalgam separator. Failure to do this entails the risk that the separator will jam and cease to function.



- ✓ Use the disinfectant in the drain associated with the sink amalgam separator every workday in accordance with the instruction manual supplied by the supplier of the disinfectant.
- ✓ The sink amalgam separator must be replaced at least once a year by an environmental maintenance service which is authorised to transport hazardous waste.

**Information:**

Cleaning instruments and other amalgam contaminated utensils is a significant source of discharged waste that has a negative effect on the environment. Connecting an amalgam separator to the sink unit prevents mercury and other heavy metals from entering the sewage system.

Dental amalgam separators certified pursuant to ISO standard 11 143:2008 fulfil requirements for best available technology as set out in the environmental code.

In a number of rulings (B77/9, M89-01 and M 4018-16) the Swedish Environmental Court has required that dental clinics must have at least one approved sink amalgam separator. Washing the instrument over the dental unit's spittoon is not a comprehensive solution. Practically-applicable routines for cleaning contaminated equipment must be in place.

Cotton or other fibrous material, plaster moulding compound or residue from composites must not be emptied into a drain associated with a sink amalgam separator, as this may impact the efficiency of the amalgam separator.

Chemicals, except the disinfectant, must not be poured into drains associated with sink amalgam separators, as this impairs the functioning of the amalgam separator. One example of this is highly alkaloid (pH 14) drain cleaners which have the potential to dissolve mercury.

If the space in which the sink amalgam separator is to be installed is limited, it is not necessary to install a surge tank. The surge tank has no effect on the amalgam separation process, but allows for sluicing at a higher flow rate. However, the use of a surge tank makes it possible to avoid water remaining in the sink.



## Disinfectant

- ✓ The supplier's specification of which disinfectant is to be used must be complied with. In the event that the supplier of the dental unit is different to the supplier of the amalgam separator, ensure that a disinfectant approved by both parties is used.
- ✓ However, ensure that you check the environmental information in the safety data sheet to ensure that the substance does not have long-term impacts on the environment (guidelines in the form of a danger symbol/pictogram and a printed warning). Contact the supplier in the event that the recommended disinfectant is environmentally harmful according to the safety data sheet or impacts the function of the amalgam separator.
- ✓ Use disinfectant every workday in the suction system, fountain bowl and in the drain associated with the sink amalgam separator

### **Information:**

Unsuitable disinfectant which is ineffective or which dissolves mercury may do more harm than good.

Apply disinfectant to the suction system and fountain bowl in such a way that it remains on the surfaces overnight in order to prevent bacteria growth and resultant impaired separation. Disinfectant poured into drains associated with sink amalgam separators must **not** be allowed to remain on the surfaces overnight, as this may dissolve mercury.

## Patient treatment routines

- ✓ All waste, including disposable materials containing visible amalgam must be deposited in approved waste containers intended for mercury. Examples of disposable materials are single-use drills, gloves, cotton rolls, saliva extractors, cofferdam sheets and moulds.
- ✓ Suction tubes shall be flushed out with water following treatment
- ✓ Chairside filter/trap both at the suction tube and spittoon/fountain bowl must be emptied every workday into a waste receptacle for amalgam waste and then be rinsed into a drain fitted with a sink amalgam separator. One way filters have to be replaced by the manufacturers recommendation.
- ✓ A spittoon/fountain bowl, or the equivalent, must be present in the dental unit such that the patient is able to spit when seated in the dental chair.
- ✓ Rinse the handle beside the dental unit's spittoon/fountain bowl in order to minimise any residue of amalgam prior to cleaning and lubrication.
- ✓ If an instrument has visible amalgam residue on it there are two options:
  - Option 1: The instrument is rinsed in a sink which is fitted with an amalgam separator. Employ lockable washers in order to minimise the risk of puncture and laceration injuries when instruments are rinsed in the sink.
  - Option 2: Instruments which do not have a sharp point or blade can be dried off in the treatment room. Material used to dry instruments shall be deposited in an approved waste container intended for mercury.

## Labelling

- ✓ Drainage pipes and other elements which may contain mercury must be labelled with adhesive labels (“Hazardous Waste – Handle with care! May contain mercury-in a highly visible manner and such that they can clearly be seen when work is carried out on the drainage system. Labels can be ordered from the company which collects your mercury waste.
  
- ✓ Examples of what must be labelled:
  - pipes from the dental chair
  - suction system pipes in basements (wet system), engage in dialogue with the property owner concerning which pipes must be labelled outside the clinic
  - buffer tank, tubes and pipes inside the clinic
  - sink amalgam separator



*Example of labelling “Hazardous Waste – Handle with care! May contain mercury”*

## Waste water sampling

- ✓ Certain municipalities require samples of waste water from amalgam separators for the purpose of analysis of emitted mercury content. Notify: this is not to be confused with fresh water samples taken in the dental unit for the purpose of measuring bacteria content.

### **Information:**

The waste water analyze will provide information of the amalgam separating performance.

In order to facilitate the taking of water samples it is necessary for the dental chair to be fitted with a coupler (see image below). In the event that action needs to be taken, contact the supplier in order to ensure that you do not assume the supplier's responsibility



*Example of coupler on a dental chair*

## Cleaning and emptying of water locks and floor drains

- ✓ Water locks on washbasins in treatment rooms, sterilization area and patient toilets must be emptied at least once every two years. The contents of the water lock must be emptied into an approved collection vessel intended for mercury waste. Do not empty into the drain associated with a sink amalgam separator, as particles may be too large and cause blockage of the sink amalgam separator. The water lock should then be rinsed in drains fitted with a sink amalgam separator.
- ✓ Floor drains into which a tube from an amalgam separator runs must be emptied and cleaned at least once every two years.



*Cleaning of water lock*

### **Information:**

Prior to the introduction of the prohibition on amalgam in 2009 mercury could be collected in a water lock, e.g. in the patient toilet when patients rinse their mouths following treatment. If the water lock beneath the washbasin in the treatment rooms, sterilization area and patient toilets has not been emptied since the prohibition on amalgam, this must be done at the earliest opportunity. The contents of the water lock must be emptied into an approved collection vessel intended for mercury waste.

Water locks manufactured from cast iron can be difficult to open and clean. It is recommended that such water locks be replaced with plastic water locks.

Environmental maintenance services provide the service of cleaning and emptying water locks and floor drains.

It is recommended that floor drains are used in dry systems, as they collect any amalgam present.



*Cast iron water locks*

## Pipework, new builds and refurbishment

- ✓ Practitioners and property owners have a joint responsibility to ensure that all drainage pipes which may contain mercury are treated as hazardous waste, pursuant to the environmental code.
- ✓ Drainage pipes and other elements which may contain mercury must be labelled with adhesive labels (“Hazardous Waste – Handle with care! May contain mercury” in a highly visible manner and such that they can clearly be seen when work is carried out on the drainage system. Labels can be ordered from the company which collects your mercury waste.
- ✓ Prior to carrying out pipework, plumbers must be informed by the practitioner that the pipes may contain mercury. This is essential in order to avoid unintentional emission of mercury into the sewer network.
- ✓ The practitioner must inform the property owner/lessor that the drainage pipe at the property may contain mercury. A failure to do so entail a risk that the property owner carries out activities which contravene the environmental code.
- ✓ If pipes at the clinic are replaced, or refurbishment is carried out, the practitioner must inform the property owner/lessor that it is essential that care is taken when dismantling the pipes and that they are deposited as hazardous waste. According to Swedish rules a notification must be submitted to the municipal environmental office. The environmental office must issue an authorisation prior to the commencement of the work. The practitioner must ensure that he/she obtains documentation indicating that pipes from the dental practice have been treated as hazardous waste and deposited for destruction at a facility which receives hazardous waste. A waybill and a proof of receipt indicating what has been deposited and where it has been received must likewise be obtained. The party hired to carry out transportation must be authorised by the county administrative board to transport hazardous waste. This documentation must be kept on file for a minimum of three years.



- ✓ The party which carries out replacement of pipes must provide a floor plan indicating which pipes have been replaced.

## Upkeep of amalgam separator at dental practices

### Each and every workday

- ✓ Use disinfectant every workday in the suction system, fountain bowl and in drains fitted with a sink amalgam separator
- ✓ The supplier's specification of which disinfectant is to be used must be complied with. In the event that the supplier of the dental unit is different to the supplier of the amalgam separator, ensure that a disinfectant approved by both parties is used.
- ✓ Chairside filter/trap both at the suction tube and spittoon/fountain bowl must be emptied every workday into a collection receptacle approved for amalgam waste and emptied into a drain fitted with a sink amalgam separator.
- ✓ Dry suction system: Test to ensure that the amalgam separator starts when suction and circular rinsing are used.

### Information:

Certain disinfectants need to be additionally flushed with water in order to reach the amalgam separator, while others do not require flushing and must instead be allowed to remain unflushed overnight. Refer to the safety data sheet for the product.

Note that different concentrations of disinfectant may be required respectively in the suction system, fountain bowl and sink amalgam separator in order for the disinfectant to be effective. Refer to the safety data sheet for the product regarding whether or not the disinfectant must be allowed to remain unflushed overnight and what concentration must be used.

If coarse particles from Chairside filter/trap are emptied directly into a drain fitted with a sink amalgam separator, the system may jam and cease to function.

### **Each and every week**

- ✓ Wet suction system:
  - Carry out a visual inspection of the space in which the amalgam separator and suction system are installed to check for signs of leakage or noise.
  - Inspect the check valve/ separator by unfastening the tube ahead of the drain and checking that suction is present at the outlet.

### **Information:**

Wet suction system: Ensure that the suction room is kept tidy in order to ensure timely detection of signs of leakage.

Leakage is apparent above all when the suction system is switched off.

### **As required:**

- ✓ Contact a maintenance technician on a regular basis in the event of substandard performance or inadequate function.

### **At least once a year**

- ✓ If the particle trap used is the disposable type it must be replaced. Waste shall be deposited in a waste receptacle approved for mercury, and at least once a year be collected by a disposal company-which is authorised to transport dispose hazardous waste.
- ✓ Dry suction system:
  - Collector cups of amalgam separators must be replaced as required, typically several times a year. This waste shall be treated as mercury-contaminated hazardous waste.
  - At least once every three months the filling degree of the amalgam separator must be monitored.
- ✓ Wet suction system:
  - Some amalgam separators feature a filter which requires more frequent replacement. Comply with the supplier's recommendations.

### **Information:**

Dry suction system: Replacement of receptacles can be carried out by staff at the practice.

## Self Inspection

Anyone who carries out any inconvenience or disturbance to mankind or the environment must continuously plan and control activities for preventive purposes. This is called self inspection. Dental Care Clinics have this obligation according to The Swedish Environmental Code.

1. Operational and maintenance instructions for amalgam separators and suction systems must be provided at the practice, and staff who make use of the amalgam separator must be familiar with them. The instructions must be provided in Swedish.
2. Written procedures must be provided for safe handling of amalgam (from drilling to handling of waste) and be familiar to staff who they concern.
3. Each procedure must have an appointed, named person.
4. Deviation from procedure when handling amalgam, e.g. maintenance of amalgam separators and suction systems and handling of hazardous waste, must be documented and remedied.
5. Documentation/invoices from environmental maintenance services and carriers authorised to handle hazardous waste must be kept on file for a minimum of three years, according to Swedish legislation. This also includes records of function checks of amalgam separators and suction systems. Documentation about the following should be saved:
  1. Emptying/replacement of amalgam separators, water locks, floor drains and buffer tanks.
  2. Replacement of suction tubes and, where applicable, particle traps.
  3. Collection of hazardous waste, indicating the type, quantity, carrier and recipient of the hazardous waste.
  4. Where applicable any analysis reports of water samples from amalgam separators measuring emitted mercury content.

## Handling of amalgam waste

- ✓ Amalgam waste contains mercury and is as such hazardous waste. It may not be transported of one's own accord. Such waste may only be transported by a carrier approved by the county administrative board.
- ✓ Amalgam waste must be transported away from the site at least once a year.
- ✓ Amalgam waste must be stored and transported in waste receptacles approved for mercury and amalgam labelled "Hazardous waste" and specifying type of hazardous waste. Such waste must be stored without a risk of dispersion.
- ✓ Examples of waste which may contain amalgam:
  - receptacles in centrifuging amalgam separators
  - discarded suction tubes and pipe elements
  - disposable materials (cotton and cellulose rolls, gloves, saliva extractors, single-use drills, cofferdam sheets, moulds)
  - cellulose dryers, serviettes and suchlike used to dry amalgam-contaminated instruments
  - removed teeth with amalgam fillings
  - solid residue and sediment from drainage systems, water locks, Chairside filter/trap, floor drains, amalgam separators
  - single-use particle traps
  - amalgam waste from strainers containing residue of mercury, e.g. preamalgamated alloy
- ✓ Lamps and fluorescent lamps which contain mercury must likewise be handled as hazardous waste.
- ✓ The party which deposits the waste (the depositor) and the party which receives the waste (the recipient) must ensure that a transport document is issued, according to Swedish legislation. The transport document must contain information concerning the type and quantity of waste, to where it has been transported, who is the depositor and who is the recipient. If the transport document is electronic, signing of the document must take place using the depositor's electronic signature.



- ✓ The transport document must be kept on file at the practice for a minimum of three years such that it can be shown to the regulatory authority when inspections are carried out.
- ✓ Patients must be instructed to bring any fillings or parts of fillings which have fallen out to the practice, where they will be disposed of as hazardous waste.

**Information:**

The party which collects and transports amalgam waste is responsible for ensuring that the transport documents are kept on file for a minimum of ten years.

## Environmental maintenance service

A carrier must be hired which is authorised by the county administrative board to transport hazardous waste.

### At least once a year

- ✓ Wet suction system: Replacement of amalgam separators and sink amalgam separators.
- ✓ Dry suction system: Collection of receptacles for amalgam separators, including where the notification system has not indicated that the receptacle is full.
- ✓ Removal of other amalgam waste besides amalgam separators. Ensure that the amalgam waste is sorted separate from other waste in an approved waste receptacle. Refer to the section “Handling of amalgam waste”.
- ✓ Function checks of amalgam separators (centrifugal separators) and suction systems.
- ✓ Cleaning of the surge tank beneath sink fitted with sink amalgam separators.
- ✓ Sampling of outgoing water from amalgam separators in the dental unit where the municipal environmental office requires this.
- ✓ Replacement of particle traps, where such traps are present.
- ✓ Emptying and cleaning of floor drains into which a tube from an amalgam separator (where present) runs.
- ✓ Replacement of suction tubes.
- ✓ Monitoring of the function of check valves (wet system) to ensure that they are not leaking.

### At least once every two years

- ✓ Emptying of the water lock on a washbasin in a treatment room and in patient toilets.

### At least once every three years

- ✓ Inspection, emptying and cleaning of buffer tanks assuming no system faults have occurred. The buffer tank must be labelled by the environmental maintenance service with the date of inspection and signature.

## Records and transport documents

- ✓ The environmental maintenance service must ensure that the practice receives records of the function check, transport document concerning the amalgam waste and an analysis report concerning the water sample, where such a report has been commissioned. The transport document must contain information concerning the type and quantity of waste, to where it has been transported, who is the depositor and who is the recipient. If the transport document is electronic, signing of the document must take place using an electronic signature.

### Information:

A number of environmental maintenance services offer an environmental package which ensures that the aforementioned services are carried out.

Wet suction system: In periods of high load it may be necessary to replace the amalgam separator more frequently than once a year.

The party which collects and transports amalgam waste is responsible for ensuring that the transport documents are kept on file for a minimum of ten years.

## Decontamination of pipe system

- ✓ Decontamination must always be carried out under the following circumstances:
  - If dental care is no longer to be operated at the premises (Suction tubes must be dismantled. Other pipes must be high pressure flushed, sealed and labelled.)
  
- ✓ Decontamination is recommended under the following circumstances:
  - Dental practices at which amalgam has been handled prior to the prohibition entering into force in 2009 and which have not been decontaminated in the intervening period.
  - Every ten years, with reference to the environmental code's precautionary principle. As amalgam filling decreases in scale, the period for recurrent remediation may need to change in the future.
  
- ✓ Decontamination must be carried out from the dental unit to the vertical conduit stem in dry suction systems. In wet suction systems flushing must be carried out from the dental unit to the suction room.
  
- ✓ Documentation of decontamination carried out (the environmental maintenance service's decontamination report) must be kept on file by the practitioner for a minimum of ten years.
  
- ✓ Prior to decontamination or dismantling of drainage pipes the practitioner must notify the municipal environmental office which will then grant approval (§ 28 of the regulation (SFS 1998:899) on environmentally hazardous activities and protection of public health).
  
- ✓ During the decontamination process, mercury could be mobilised into gas phase. To minimize risk, it is highly recommended to monitor mercury in the air during decontamination with an adequate equipment.

### Information:

Operational decontamination is suitable practice prior to replacement of a suction system or dental unit. Failure to carry this out entails a risk of stoppage and high emission of amalgam.

In the event of change of ownership decontamination may be recommended to ensure that each practitioner assumes responsibility for his/her share of environmental liability.

In order to facilitate decontamination the dental unit must be fitted with a coupler. In the event that action needs to be taken, contact the supplier in order to ensure that you do not assume the supplier's responsibility.

In the case of dry suction systems, consult the maintenance technician to ensure that there is access to pipes prior to carrying out decontamination.

Documentation of decontamination carried out is used to verify that the practitioner has assumed responsibility pursuant to the environmental code (chapter 2, § 8).

### **Requirements on enterprises which carry out decontamination**

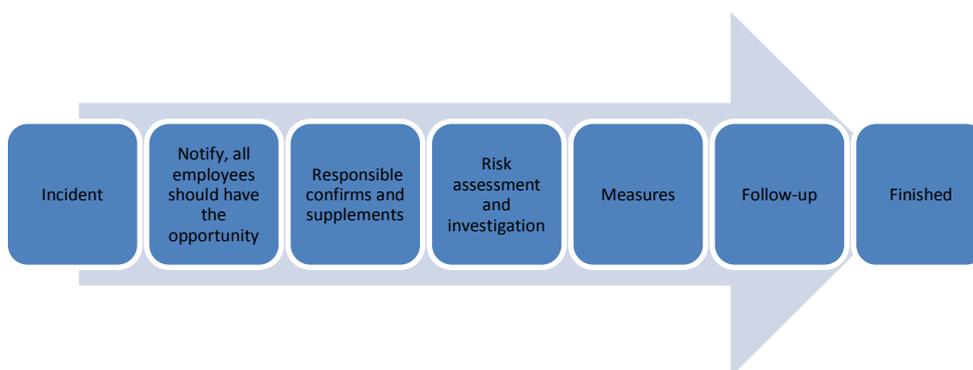
1. Decontamination must be carried out by an environmental maintenance service certified in Sweden. Decontamination must be carried out by specialized equipment or dismantling of pipes.
2. Decontamination must be carried out in such a way that, as a minimum, it encompasses all horizontal and vertical pipes from dental chairs and sinks in the treatment room, the sterilization areas, the washbasin in the patient toilet, water locks and floor drains.
3. All flush water and silt must be disposed of and removed as hazardous waste. The enterprise which carries out transportation and disposal must be authorised to do so
4. In connection with decontamination a blueprint must be produced which plots all pipes, including any which are not currently in use. This blueprint must indicate which pipes have been decontaminated.
5. All pipes which, following decontamination, potentially contain amalgam residue must be labelled with adhesive labels indicating that they may contain mercury. Pipes which have been flushed and which are no longer to be used must be resealed.
6. Quality-assuring of decontamination could be done by filming the inside of the pipeline after work has been done.
7. By at the latest three months after the decontamination has been completed a written report must be submitted to the the municipal environmental office. The report must contain the following:



- ✓ A description of the scope of the decontamination and in what manner it has been finalised.
- ✓ A floor plan of the premises' drainage system indicating which drainage pipes have been flushed.
- ✓ Information concerning how much mercury has been disposed of in connection with the decontamination.
- ✓ A transport document indicating what type and quantity of other hazardous waste has been disposed of and who has transported and carried out final disposal of the waste.

## Incident Management (deviations and improvement proposals)

- ✓ All deviations must be reported in writing and managed in such a way that action is taken and risk is eliminated or minimised.
- ✓ Ensure that a clear process description is provided with which all members of staff are familiar and where everyone has the facility to report incidents such as deviations and improvement proposals and can also propose activities and participate in the outcome.



*Incident management process*

### **Information:**

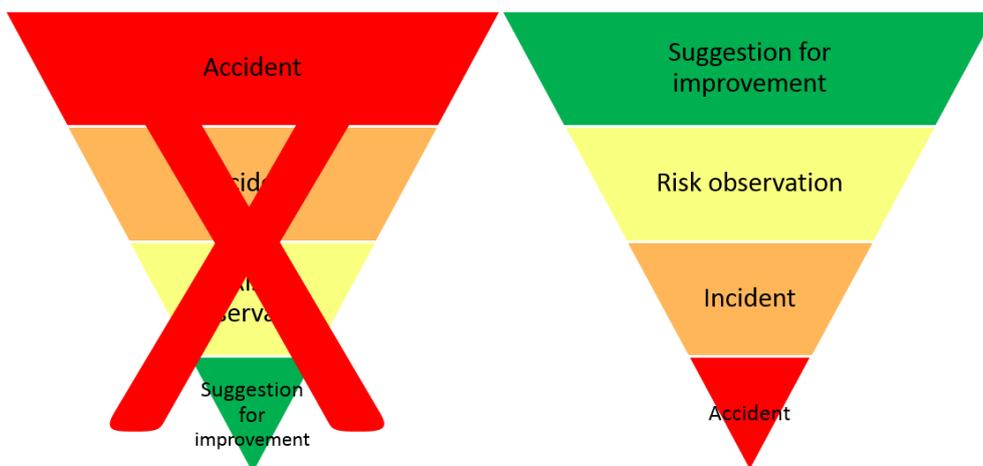
A deviation comprises any incident which does not conform to standard procedure.

Deviation may be divided into three categories:

- negative incident (an incident which resulted in an accident which brought about environmental damage)
- mishap (an incident which could result in environmental damage)
- risk observation which carries with it the potential for a negative incident to occur.

Encourage the reporting of deviations It is important not to look for scapegoats when managing deviations. Proactivity at the practice involving all members of staff is one of the most effective means of reducing risks and establishing a culture in which everyone contributes to an improved modus operandi

A risk which is detected at an early stage must be reported such that a serious risk does not arise. The two are connected. It is the minor, unwanted incidents and mishaps which provide an indication of where risks exist and what scope there is for improvement.



*Proactivity at the practice whereby all members of staff work report risks and make improvement proposals is the most effective means of obviating risks*



## Expertise

- ✓ All occupational groups which manage amalgam must possess expertise concerning the attendant risks and how to safely handle amalgam such that the risk of negative environmental impact and individual illness is minimised.
- ✓ Managers and managerial staff have a responsibility to ensure that persons who handle amalgam have sufficient knowledge to ensure safe handling

### Information:

At [www.praktikertjanst.se/life](http://www.praktikertjanst.se/life) a web-based tool has been launched in five languages (Swedish, English, German, French, Spanish).

You can reach it directly on: [www.hg-rid.eu](http://www.hg-rid.eu).

The web based tool provides basic knowledge on safe handling of amalgam, what the risks are and how to safely handle amalgam such that the risk of negative environmental impact is minimised. The tool is free of charge. It is aimed at various groups which handle amalgam, e.g. dental care teams, maintenance technicians and environmental inspectors. The hope is that the web based tool will increase the potential for consensus which leads to collaboration in the work by establishing interim goals for the project:

- ✓ increase awareness of the environmental impact of mercury
- ✓ increase knowledge of how the environmental impact of mercury from dental care can be minimised through the implementation of guidelines