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Reducing Dental Mercury Emissions: Installing Amalgam Separators and Achieving Compliance

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STAFF REPORT

of the

**Domestic Policy Subcommittee Majority Staff
Oversight and Government Reform Committee
House of Representatives**

Dennis J. Kucinich, Chairman

**Reducing Dental Mercury Emissions:
Installing Amalgam Separators and Achieving Compliance**

**Embargoed until Noon
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I. EXECUTIVE SUMMARY

Elemental mercury and most of its compounds are extremely toxic substances that can cause chronic and acute poisoning in human beings who come into contact with them. Mercury is categorized as an exogenous neurotoxin, because it acts specifically on the brain and nervous system when ingested. The health problems that are most commonly associated with mercury poisoning include oral lesions, birth defects, chronic illnesses, mental disorders, autoimmune disorders, neurodegenerative diseases, erythema, and multiple sclerosis. Young children and unborn fetuses are particularly susceptible to mercury poisoning.

Today, in addition to direct air emissions, the improper disposal of mercury-containing wastes by industries, clinics and others who use it has greatly contributed to dangerously high contamination levels in many of the country's water bodies. Once in wastewater, mercury is further diffused in the environment in several ways: it enters the atmosphere when mercury-laden biosolids are incinerated; it penetrates the land when it is used as fertilizer or deposited in landfills, and it pollutes fresh water bodies when inadequately treated wastewater is discharged into wastewater treatment plant effluent or when untreated wastewater is discharged from combined sewer outfalls during high flow storm events.

The dental industry is by far the largest contributor of mercury found in municipal wastewater. Dental offices nationwide contribute approximately 40 to 50% of mercury in wastewater, nearly three times as much as the next largest contributor. A widely used technology that prevents mercury solids, and in some cases dissolved mercury as well, from entering dental wastewater discharge is an amalgam separator unit. An amalgam separator unit is a device that removes 95 to 99% of the mercury from dental wastewater primarily through filtration or settling. The separator is typically installed into the dental vacuum pump system where it catches the amalgam particles that are disposed of through the suction drains in dental offices. Localities that have required the installation of separators have effectively reduced mercury levels in their municipal wastewaters from 50 to 70%.

State and local governments have several options available to them when considering how to ensure that all dental offices – even those that no longer implant new mercury amalgams – effectively limit their mercury releases to wastewater. These include adopting either a voluntary or a mandatory program to install amalgam separators, or creating a permitting program where dental offices are given the choice to test their discharge periodically for mercury or to install an amalgam separator.

The Domestic Policy Subcommittee Majority Staff conducted a national survey of state and local efforts to reduce dental mercury emissions and found that nine states and at least twelve local governments have taken action. Based on that sample, Subcommittee Majority Staff has found that the mandatory program, or the voluntary program underpinned with the threat of a mandatory provision, is the most effective model for achieving the desired reduction in mercury releases.

Additionally, our findings reveal several helpful lessons for other state and local governments considering programs to limit dental mercury emissions. They include:

- 1) The importance of working with local and state dental societies to help educate dentists about the environmental impacts of waste amalgam and to achieve compliance;
- 2) Authority may already exist for state and local governments considering implementing a mandatory program;
- 3) Mandating that separators meet the ISO 11143 standard;
- 4) Potentially incorporating oversight and certification to ensure the efficacy of the separators;
- 5) Using common clauses and exemptions adopted nationally in statutes, regulations, and ordinances;
- 6) Establishing appropriate compliance deadlines; and
- 7) Addressing common concerns about dental mercury emissions reduction programs.

The report concludes with a list of additional resources.

II. BACKGROUND

A. *Toxicity of Mercury*

Elemental mercury and most of its compounds are extremely toxic substances that can cause chronic and acute poisoning in human beings who are exposed to them. Mercury is categorized as an exogenous neurotoxin, because it acts specifically on the brain and nervous system of those exposed. The health problems that are most commonly associated with mercury poisoning include oral lesions, birth defects, chronic illnesses, mental disorders, autoimmune disorders, neurodegenerative diseases, erythremia, and multiple sclerosis. Young children and unborn fetuses are particularly susceptible to mercury toxicity.¹

B. *Recent Federal Action*

Today, in addition to direct air emissions, the improper disposal of mercury-containing wastes by industries, clinics and others who use it has greatly contributed to dangerously high contamination levels in many of the country's water bodies. The problem has become so widespread that the Environmental Protection Agency (EPA) now recommends that women who are pregnant or plan to become pregnant within one or two years, as well as young children avoid eating more than 6 ounces (one average meal) of fish per week.²

The Food and Drug Administration (FDA) has recently notified the public of the hazardous nature of mercury in dental amalgam. In the aftermath of a hearing, held in November of 2007 by the Domestic Policy Subcommittee of the Oversight and Government Reform Committee as well as a lawsuit filed against the FDA, *Moms Against Mercury et al. v. Von Eschenbach, Acting Commissioner, Food and Drug Administration, et al.* (D.C.C. 2008) the FDA set a deadline to issue a final regulation on the reclassification of dental amalgam and its components from Class I (general controls) to Class II (special controls), which would increase FDA oversight of dental amalgam.³ The FDA also revised its website to include a number of statements about the health effects of dental mercury, including: "Dental amalgams contain mercury, which may have neurotoxic effects on the nervous systems of developing children and fetus," and "Pregnant women and persons who may have a health condition that makes them more sensitive to mercury exposure, including individuals with existing high levels of mercury bioburden, should not avoid seeking dental care, but should discuss options with their health practitioner."⁴

C. *How Mercury Pollutes the Environment*

Mercury finds its way into the environment in a number of different ways. Some is released from naturally occurring phenomena, such as volcanic activity. But the majority of mercury is discharged from anthropogenic sources.

¹ Koral, Stephen M. *The Scientific Case Against Amalgam* (2005) International Academy of Oral Medicine and Toxicology. Available at: <http://www.iaomt.org/articles/files/files193/The%20Case%20Against%20Amalgam.pdf>.

² Environmental Protection Agency, *What You Need to Know about Mercury in Fish and Shellfish* (March 2004) (EPA-823-R-04-005).

³ FDA Proposed Rulemaking, 21 CFR Part 872 (2008) pp. 22877-22879.

⁴ Food and Drug Safety, Center for Devices and Radiological Health. (Available at: <http://www.fda.gov/cdrh/consumer/amalgams.html>).

Once released into the sanitary sewer from an anthropogenic source such as dental amalgam, mercury typically enters a wastewater treatment facility, also known as a Publicly Owned Treatment Works (POTW). Unlike organic materials from domestic waste, toxic metals like mercury do not just go away or get “treated” at POTWs; rather, they end up leaving treatment facilities either in wastewater effluent or in the solids.⁵ The fate of the solids varies with each POTW: they may be incinerated, deposited in a landfill or further processed into a product called biosolids and subsequently applied as fertilizer to forest or agricultural land.⁶ The most economical option is land-application of biosolids. While the majority of POTWs have mercury levels in their solids that are significantly below the Table 3 40 CFR 503.13 pollutant concentration limits for unrestricted land application, their stakeholders expect them to reduce the mercury concentrations to the lowest levels possible, through all available means. If stakeholder resistance to land application prohibits this beneficial use, then the POTWs options for solids disposal are limited to burying the biosolids in a landfill or incineration. The mercury that does not settle into the solids is discharged with the effluent into the environment. POTWs cannot effectively remove mercury from wastewater.⁷

Regardless of how mercury exits POTWs, it eventually finds its way into the air and water, where it may become a serious environmental and public health issue.⁸ In the New England region alone, over 10,000 lakes, ponds, and reservoirs, and over 46,000 miles of river are listed as impaired for fish consumption due to mercury.⁹

Mercury, especially methylmercury, has the property of being both persistent and bio-accumulative, which means that it is synthesized by microbial action at a faster rate than that at which it dissipates. The result of this property is that wildlife in contaminated bodies of water can accrue significant quantities of mercury over time.¹⁰

D. Dental Mercury in Wastewater

It is currently estimated that the dental industry uses about 40 tons of mercury every year.¹¹ The mercury is used in the formation of dental amalgams. Of these 40 tons, it is estimated that approximately 6.5 tons per year are disposed of by simply washing it down the drain.¹² A study

⁵ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Patricia Magnuson, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Magnuson Testimony”).

⁶ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Michael T. Bender, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Bender Testimony”).

⁷ Magnuson Testimony.

⁸ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Dr. Richard D. Fischer, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Fischer Testimony”).

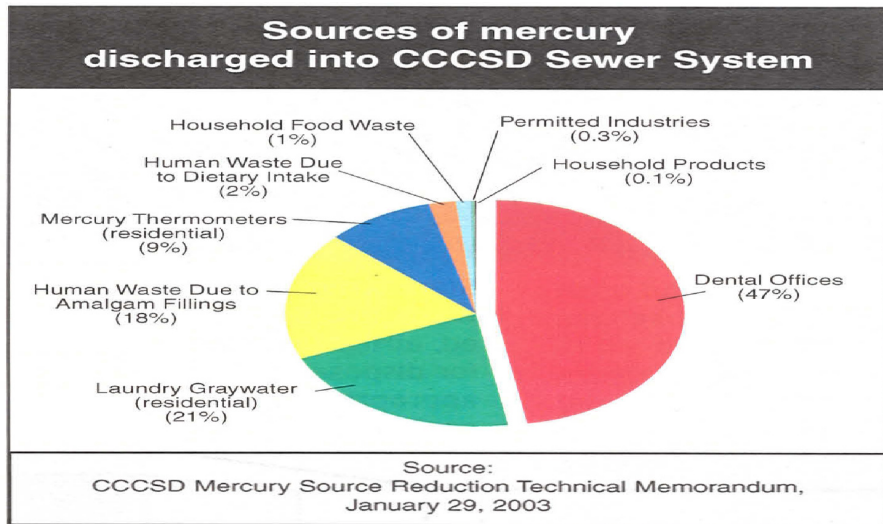
⁹ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Dr. C. Mark Smith, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Smith Testimony”).

¹⁰ Bender Testimony.

¹¹ Fischer Testimony.

¹² Vandeven, J. and McGinnis, S.L., “An Assessment of Mercury in the Form of Amalgam in Dental Wastewater in the United States”, *Water, Air, and Soil Pollution*, (2005) 164, pp. 349-366.

conducted by the World Health Organization (WHO) in 2005 concluded that mercury from amalgam and laboratory devices accounts for 53% of total mercury emissions to water worldwide, and that one-third of the mercury in the sewage system comes from dental amalgam flushed down the drain.¹³ Another study conducted by the Association of Metropolitan Sewerage Agencies (AMSA) in 2002 found that dental uses were “by far” the greatest contributors of mercury load to municipal wastewater, on average contributing 40%, over 3 times the next greatest contributor.¹⁴ The Central Contra Costa County Sanitary District estimates that each dental practice contributes 0.4 to 0.5 ounces of mercury per year totaling approximately 50% of the mercury in its wastewater, as shown in the following figure.¹⁵



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¹³ World Health Organization, *Mercury in Health Care* (Aug. 2005). (Available at: http://www.who.int/water_sanitation_health/medicalwaste/mercurypolpaper.pdf).

¹⁴ Association of Metropolitan Sewerage Agencies, “Household Mercury Poses National Clean Water Compliance Concerns”, *Evaluation of Domestic Sources of Mercury* (Aug. 2002).

¹⁵ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Ann Farrell, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Farrell Testimony”).

¹⁶ *Id.*

III. SOLUTIONS

A. National Survey

In light of dentistry's significant contribution of mercury into wastewaters, the Domestic Policy Subcommittee decided to take a closer look at state and local government efforts aimed at reducing them. The Subcommittee held a hearing in July 2007 entitled, "Assessing State and Local Regulations to Reduce Dental Mercury Emissions." The hearing featured environmental experts, dental professionals and organizations, as well as local and state officials who have led efforts to reduce dental mercury emissions. This report is based primarily on the testimony from the July 2007 hearing. In preparation for the hearing, the Subcommittee Majority Staff conducted a national survey of efforts to reduce dental mercury emissions and found that nine states and at least twelve local governments have taken action.

State	Local Government
Connecticut	Madison Metropolitan Sewerage District (Madison, Wisconsin)
Maine	Western Lake Superior Sanitary District (Duluth, MN)
Massachusetts	Central Contra Costa County Sanitary District (Martinez, CA)
Washington	King County (Seattle, WA)
New York	Wichita, KS
New Jersey	Solon, OH
Rhode Island	Milwaukee, WI
Vermont	Narragansett Bay Commission Area of Rhode Island
New Hampshire	Cleveland, OH (Northeast Ohio Regional Sewer District)
	San Francisco, CA
	Richmond, CA
	Fort Collins, CO

The Subcommittee found that states and local governments have existing water quality standards that set a limit for the acceptable level of mercury in their effluent discharge concentrations. For example, in Madison, Wisconsin that level is 1.3 nanograms per liter (ng/L) (also referred to as parts per trillion [ppt]).¹⁷ To meet that limit, state and local governments must either treat the wastewater before discharging it or prevent the mercury from entering the discharge in the first place.

The Subcommittee's survey revealed that deciding whether to treat the discharge or alternatively to prevent mercury from entering the discharge is ultimately a matter of technological capability and funding. State and local governments report that the cost of removing mercury from the publicly owned treatment works (POTWs) far exceeds the cost of preventing mercury entering

¹⁷ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of David Taylor, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter "Taylor Testimony").

dental discharge.¹⁸ According to the International Academy on Oral Medicine and Toxicology (IAOMT), the technology to remove the mercury is difficult because “wastewater treatment facilities are not designed to process or handle heavy metals.”¹⁹ Moreover, the removal of mercury that does take place at wastewater plants is often not complete and “to the extent that POTWs treatment processes remove mercury, much of that mercury is concentrated in the POTWs’ sludge...” a large part of which is incinerated resulting in the atmospheric release of mercury or beneficially reused resulting in mercury releases to land, air, and ultimately water.²⁰

Given the high costs needed, and limited technology available, to remove mercury from POTW effluent, all the states and local governments we surveyed have decided it is more cost effective overall to prevent the dental mercury from entering their wastewater in the first place.

B. Amalgam Separators: The most effective solution

The most widely used, and best known, technology to prevent mercury solids from entering dental wastewater discharge is known as an amalgam separator unit. An amalgam separator is a wastewater treatment device installed at the source, rather than the POTW, that removes 95 to 99% of the mercury from dental wastewater.²¹ The separator is typically installed into the dental vacuum pump system where it catches the amalgam mercury particulates drained from dental offices. The chart below demonstrates the substantial reduction in overall mercury contamination levels achievable by the installation of amalgam separators in dental offices:

CHART 1: REDUCTION OF MERCURY LEVELS IN WASTEWATER AFTER THE INSTALLATION OF SEPARATORS

Name of State, County, or City Installed	Dental Offices With Separators	Reduction in Mercury Contamination Levels
Massachusetts, greater Boston metropolitan area	≈ 95%	47.6%
King County, WA	≈ 97%	51.1% to 57.0%
Central Contra Costa County, CA	≈ 98%	69.8%

¹⁸ Magnuson Testimony (“[Treating mercury at a plant] is prohibitive, and it runs in the millions of dollars, like tens of millions of dollars, if it exists you know, if the technology would be viable”).

¹⁹ The International Academy of Oral Medicine and Toxicology, *Status Report on Dentistry and the Environment*, (Revised July 2006).

²⁰ New Jersey Department of Environmental Protection Proposed Rule N.J.A.C. 7:14A-21.12 (2006). *See also* Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Maria Peeler, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008). (“...Even though a wastewater treatment plant could separate mercury to a certain extent, the results were not low enough. Additionally, biosolids from the treatment plants contained rather high levels of mercury, documenting that treatment prior to intake was not effective.”)

²¹ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Owen Boyd, *Hearing on Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008). (hereinafter “Boyd Testimony”); *See* Fischer Testimony.

Narragansett Bay Commission Area of Rhode Island	≈ 100%	32.0%
Milwaukee, WI	≈ 91%	72.6%
Wichita, KS	≈ 98%	42.6%
Solon, OH	≈ 100%	52.7% to 73.2%

i. Achieving Compliance

Once a state or local government has identified amalgam separators as the appropriate solution to reducing dental mercury emissions, it must then determine how to achieve the greatest compliance by dental offices located in their jurisdiction.

State and local governments have considered three options:

1. Implement a **voluntary program** where dentists are asked, but not required, to install amalgam separators and follow Best Management Practices (BMPs) for management of amalgam waste;²²
2. Implement a **permit driven program** wherein dental clinics are required to meet a local limit for mercury, as verified through routine testing; alternatively, clinics installing amalgam separators are deemed to be compliant with the local limit; or
3. Implement a **mandatory program** wherein dental clinics are required to install amalgam separators and follow BMPs for management of amalgam waste.

Our survey indicates that where state and local governments have opted for a permit driven program, no dental clinic has chosen to acquire an annual permit in lieu of installing a separator. In all cases where option two has been implemented, dental clinics have demonstrated compliance by installing an amalgam separator unit.²³

Most state and local governments have adopted either a voluntary or a mandatory approach. Our findings indicate that successful voluntary programs were underpinned with the threat of a mandatory program, and/or included other incentives, such as the waiver of future permit fees, to spur early participation prior to the implementation of mandatory regulations. This was the case in Massachusetts where the Massachusetts Department of Environmental Protection (MassDEP)

²² According to the American Dental Association, Best Management Practices are a series of amalgam waste handling and disposal practices that include, but are not limited to, initiating bulk mercury collection programs, using chair side traps, amalgam separators compliant with ISO 11143 and vacuum collection, inspecting and cleaning traps, and recycling or using a commercial waste disposal service to dispose of the amalgam collected. *See ADA's Best Management Practices for Amalgam Waste.*

²³ Taylor Testimony; *See also* Farrell Testimony.

the Massachusetts Water Resources Authority (MWRA), and the Massachusetts Dental Society (MDS) signed a Memorandum of Understanding (MOU) to formalize outreach to the dental community and encourage its members to install amalgam separators.²⁴ Between 2001, when the MOU was signed, and 2004, the percentage of dentists that had installed separators was estimated to be 10% or less. In light of the disappointing compliance rate, MassDEP initiated an incentive-based program to install separators underpinned with the threat of a mandatory regulation to be adopted in 2006. The incentive-based early-compliance program transformed rates of dentist compliance. Approximately 75% of the states' 3800 dentists participated in the first year of the program. Regulations mandating the installation of separators were adopted in April 2006. By late 2007, 95% of Massachusetts' dentists were in regulatory compliance.²⁵

Like Massachusetts, most of the state or local governments that the Subcommittee staff surveyed initiated a voluntary program before enacting mandatory provisions in the form of regulations, ordinances, or statutes mandating the installation of amalgam separators and a recycling program. The voluntary programs helped to raise awareness about the issue but typically did not achieve their desired compliance goals. As result these governments ultimately switched to a mandatory program. This was the case in King County Seattle as well as Washington State. In King County, the King County Wastewater Treatment Division, in collaboration with the Seattle-King County Dental Society, entered into a memorandum of understanding (MOU) to promote compliance with best management practices, including the installation of amalgam separator units in 1995.²⁶ Six years after the MOU, only 24 dental offices, out of approximately 900, had installed amalgam separators, for a compliance rate of 2.7%.²⁷ In response, in 2001 King County, in consultation with the local dental society, decided that the voluntary program had failed and they gave dentists the option of either installing amalgam separators or applying for a permit and proving that they met the discharge limit without a separator. Dentists were given two years to come into compliance.²⁸ The majority of the local dentists did little to resist the requirement. By the compliance date, approximately 774 additional dental offices (more than 85 percent) had installed separator units, and the remaining offices quickly followed suit by the end of 2003.²⁹ As of 2004, 97% of all the dental offices in the County were in compliance with all regulations.³⁰

Similarly in Washington State, Washington State Department of Ecology (WSDE) and the Washington State Dental Association (WSDA) signed a Memorandum of Understanding (MOU) regarding their mutual desire to protect the environment by incorporating BMPs into dental offices.³¹ The MOU stipulated that the WSDA would educate the state dental community about aforementioned BMPs, including the use of amalgam separators and the proper disposal of amalgam. By the end of the two-year MOU period, approximately 34% of the 2,340 dentists in

²⁴ Smith Testimony.

²⁵ Phone conversation between Noura Erakat and C. Mark Smith, Deputy Director, Office of Research and Standards, Massachusetts Department of Environmental Protection. (June 8, 2008).

²⁶ Magnuson Testimony.

²⁷ *Id.*

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ Washington State Department of Ecology, *Memorandum of Understanding Dental Compliance Follow-Up Report* (July 1, 2006) (online at <http://www.ecy.wa.gov/pubs/0604011.pdf>).

Washington, outside King and Snohomish County area, had installed a separator. As a result, WSDE notified the WSDA that the MOU would not be extended and that all state dentists would be required to install a separator unit as of September 2005.³² By April 2006, field visits and phone surveys documented about a 95% installation rate of separators.³³ According to WSDE, “voluntary agreements do not seem to give dental offices clear directions, even if the list of BMPs is clear.”³⁴

The experience in Massachusetts, Washington, and King County has been echoed by other states and local governments including Central Contra Costa County, Milwaukee, and Wichita where purely voluntary programs to install separators did not achieve high compliance rates among their dental offices. The Subcommittee found that the exception to this rule was Duluth, Minnesota, where a purely voluntary program succeeded to achieve compliance. Duluth’s success was a function of its small number of dentists and dental offices which allowed the Western Lake Superior Sanitary District (WLSSD) to have a very hands-on approach not possible in larger cities.³⁵ Duluth is home to only 108 dentists and 55 dental offices.³⁶ Of those dental offices, not a single one had to purchase its own separator. Instead, the Western Lake Superior Sanitary District (WLSSD) and the local dental society applied for a grant that covered the cost of all the separators initially installed.³⁷ Additionally, the WLSSD worked to remove any reason for not installing an amalgam separator including: testing them in an office setting, installing them at no cost, personally training staff and personnel in the operation of the separator. According to the WLSSD chemist, “in a larger city, such a hands-on approach may not have worked.”³⁸ The WLSSD’s voluntary program may prove to be successful under similar circumstances in another city or municipality; however that is probably not the case for any state, where the large number of dental offices will prohibit the state’s ability to offer free separators and very discrete attention.

The disparity in compliance achieved between voluntary and mandatory programs is demonstrated in the chart below.

CHART 2. EFFICACY OF VOLUNTARY VERSUS MANDATORY PROGRAMS

Name of State, County, or Installed	Voluntary Program: Offices with Separators Installed	Mandatory Program: Offices with Separators Installed
Massachusetts	< 10%	≈ >95%

³² Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Maria Peeler, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter “Peeler Testimony”).

³³ *Id.*

³⁴ *Id.* at 4.

³⁵ Phone conversation between Noura Erakat and Tim Tuominen, Lead Chemist, Western Lake Superior Sanitary District. (June 2, 2008).

³⁶ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Questions and answers of Tim Tuominen, *Hearing on Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) at page 3 (hereinafter “Tuominen Testimony”).

³⁷ *Id.*

³⁸ *Id.* at question number 3.

King County, WA	≈ 3%	≈ 97%
Central Contra Costa County, CA	≈ 15%	≈ 98%
Narragansett Bay Commission Area of Rhode Island	≈ 0%	≈ 100%
Milwaukee, WI	≈ 1%	≈ 91%
Wichita, KS	≈ 2%	≈ 98%
Solon, OH	≈ 0%	≈ 100%

In October 2007, the American Dental Society (ADA) amended their BMPs to reflect its endorsement of amalgam separators as an effective tool to reducing dental mercury emissions. The ADA writes that it will include “the use of separators, collection devices installed in dental office plumbing to capture and remove at least 95% of solid waste particles before they enter the sewer system. The use of separators will allow greater recycling and reduce the amount of amalgam which contains mercury, entering wastewater treatments plants.”³⁹

Below are a number of case studies that illustrate the options discussed above.

³⁹ ADA, Press Release, “ADA Updates Environmental Recommendations for Handling Waste,” (October 2, 2007) (Available at http://www.ada.org/public/media/releases/0710_release01.asp).

IV. CASE STUDIES FOR ACHIEVING COMPLIANCE

A. VOLUNTARY PROGRAM FOLLOWED BY AN INCENTIVE-BASED VOLUNTARY PROGRAM AND A MANDATORY REGULATION: *Massachusetts*

Efforts to reduce dental mercury in Massachusetts began in the late 1990s when its regulatory agencies, including the Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Water Resources Authority (MWRA), began a collaborative process with the Massachusetts Dental Society (MDS).⁴⁰ The process involved conducting outreach to the Massachusetts dental community encouraging it to increase its use of Best Management Practices (BMPs), which included installing amalgam separators and recycling all amalgam waste. In 2001, state regulatory agencies and the MDS formalized this process by signing a Memorandum of Understanding (MOU) to conduct outreach efforts to the dental community.⁴¹ Between 2001, when the MOU was signed, and 2004, the percentage of dentists that had installed separators was estimated to be 10% or less. In light of the disappointing compliance rate, MassDEP initiated a follow-up two-phase program.

The first phase was an incentive-based voluntary early compliance program and the second was a mandatory regulation. At the start of the program, MassDEP made clear to the dental community that it would develop and adopt regulations requiring the installation of separators by 2006.⁴² Between 2004 and the enactment of the regulation, MassDEP initiated its incentive-based early compliance program.⁴³ State regulatory agencies collaborated with MDS to create this early compliance program. The incentives included the following terms:

- Dentists participating before March 1, 2005 were exempted from permit fees, and amalgam separator systems achieving 95% amalgam removal efficiency were grandfathered until February 1, 2010.
- Dentists who certified participation after February 28, 2005, but before February 1, 2006, were exempted from permit fees and grandfathered for a shorter period, until February 1, 2007.⁴⁴

The incentive-based early-compliance program transformed rates of dentist compliance. Approximately 75% of the states' 3800 dentists participated in the first year of the program. Regulations mandating the installation of separators were adopted in April 2006. By late 2007, 95% of Massachusetts' dentists were in regulatory compliance.⁴⁵

B. VOLUNTARY PROGRAM FOLLOWED BY A MANDATORY REGULATION: *King County, Washington & Washington, State*

⁴⁰ Smith Testimony.

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.*

⁴⁵ Phone conversation between Noura Erakat and C. Mark Smith, Deputy Director, Office of Research and Standards, Massachusetts Department of Environmental Protection. (June 8, 2008).

i. King County

From 1995 through 2000, the King County Wastewater Treatment Division, in collaboration with the Seattle-King County Dental Society, entered into a memorandum of understanding (MOU) to promote compliance with best management practices, including the installation of amalgam separator units.⁴⁶ Six years after the MOU, only 24 dental offices, out of approximately 900, had installed amalgam separators, for a compliance rate of 2.7%.⁴⁷ In response, in 2001 King County, in consultation with the local dental society, decided that the voluntary program had failed and they notified local dentists that they would be required to meet the local discharge limit of 0.2 parts per million (ppm) total mercury. The dentists were given the option of either installing amalgam separators or applying for a permit and proving that they met the discharge limit without a separator. Dentists were given two years to come into compliance.⁴⁸

During this two year compliance period, the County provided extensive outreach to the dental offices throughout the County, including technical assistance site visits by staff from Public Health-Seattle & King County. They offered monetary incentives via vouchers reimbursed at 50% of costs up to \$500. Working in close contact with the local dental society, the County held trade fairs and technical workshops to improve education about mercury, separators, and best management practices.⁴⁹

The majority of the local dentists did little to resist the requirement. By the compliance date, approximately 774 additional dental offices (more than 85 percent) had installed separator units, and the remaining offices quickly followed suit by the end of 2003.⁵⁰ As of 2004, 97% of all the dental offices in the County were in compliance with all regulations.⁵¹

ii. Washington State

After determining that mercury amalgam waste from dental practices could not be adequately treated by POTWs, as wastewater effluent, the Washington State Department of Ecology (WSDE) and the Washington State Dental Association (WSDA) signed a Memorandum of Understanding (MOU) regarding their mutual desire to protect the environment by incorporating BMPs into dental offices.⁵² The MOU stipulated that the WSDA would educate the state dental community about aforementioned BMPs, including the use of amalgam separators and the proper disposal of amalgam. In return, the WSDE agreed to exercise ‘enforcement discretion’ and deal with the dental community on a technical assistance basis until the MOU expired in August 2005.⁵³

⁴⁶ Magnuson Testimony.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Washington State Department of Ecology, *Memorandum of Understanding Dental Compliance Follow-Up Report* (July 1, 2006) (online at <http://www.ecy.wa.gov/pubs/0604011.pdf>).

⁵³ *Id.*

By the end of the MOU period, approximately 34% of the 2,340 dentists in Washington, outside King and Snohomish County area, had installed a separator. As a result, WSDE notified the WSDA that the MOU would not be extended and that all state dentists would be required to install a separator unit as of September 2005.⁵⁴ By April 2006, field visits and phone surveys documented about a 95% installation rate of separators.⁵⁵

The WSDA, which represents only 60% of dentists in Washington, tried very hard to keep the implementation of the BMPs voluntary. In the process they developed a very constructive relationship with the state and environmental organizations but were unable to demonstrate high compliance with the voluntary provisions.⁵⁶ According to WSDE, “voluntary agreements do not seem to give dental offices clear directions, even if the list of BMPs is clear.”⁵⁷

C. MANDATORY REGULATION: *Madison & Milwaukee, Wisconsin and New Jersey*

i. Madison

In 2002, the Wisconsin Department of Natural Resources (WDNR) determined that substantial mercury source reduction activities were needed in order to ensure compliance with Wisconsin Administrative Code Chapter NR 106, which establishes a surface water quality standard for mercury at 1.3 parts per trillion (ppt).⁵⁸ The Provisions in NR 106 allow WDNR to establish alternative mercury effluent limitations for a permittee, conditioned in part on the permittee agreeing to develop and implement a mercury pollutant minimization program (PMP).⁵⁹ These PMPs are then subjected to review and approval by the WDNR.

The Madison Metropolitan Sewerage District’s state permit contains a variance to the 1.3 ppt water quality standard, contingent on the development and implementation of a mercury PMP.⁶⁰ The District developed such a PMP in 2006 and it was subsequently approved by the WDNR in 2007.⁶¹ The PMP draws heavily on a guidance manual that was developed by the WDNR to assist agencies with PMP development, including their suggestion that PMPs should address mercury waste produced by the dental sector.⁶² After extensive consideration of the alternatives, the District decided to implement a mandatory program for the dental industry as a part of the PMP. Among other things, the program requires dental clinics that use or remove dental amalgam to install and maintain amalgam separators and to adhere to Wisconsin Dental Association (WDA) best management practices.⁶³

⁵⁴ Peeler Testimony.

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ *Id.* at 4.

⁵⁸ Taylor Testimony.

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² *Id.*

⁶³ *Id.*

The regulation was officially adopted in February of 2007, and it gave clinics until December 31, 2008 to comply.⁶⁴ The District has worked closely with representatives from the Dane County Dental Society (DCDS) and individual dental clinics throughout the implementation process, and because of this they were able to achieve quick compliance. As of July 1, 2008 approximately 70% of the 100 applicable dental clinics in the District have met with requirements, and the remaining clinics are on target to meet the compliance date.⁶⁵

ii. Milwaukee

The greater metropolitan area of Milwaukee, Wisconsin is subject to the same WDNR administrative regulations as is the city of Madison. Despite its mercury discharge limit which has existed since 1992, the District had no rules specifically targeting dental offices prior to the implementation of a mandatory program in January 2004.⁶⁶ Between 1992 and 2004, only five of the 305 dental offices in Milwaukee had installed separators.⁶⁷ In 2004, the Milwaukee Sanitary District adopted rules requiring dental offices that use or remove mercury to implement WDA best management practices immediately and to install amalgam separators before February 1, 2008.⁶⁸ At present, the WDA estimates that 91% of Milwaukee dentists are in compliance with all regulations.⁶⁹

iii. New Jersey

In January of 2002, the New Jersey Mercury Task Force released a report containing the results of their investigation of mercury sources and the impact of mercury on the environment.⁷⁰ This report also made a number of recommendations in regard to reducing the amount of mercury released into the environment, including reducing the amount of dental amalgam waste. Based on data provided by the ADA, the New Jersey Department of Environmental Protection (NJDEP) estimated that dental facilities statewide discharge approximately 2,580 pounds of mercury every year.⁷¹ Therefore, pursuant to the Task Force's recommendations, the NJDEP decided that regulatory action needed to be taken.

The NJDEP considered and evaluated a number of different forms of regulations; attempting to find the one that could be most easily implemented, that would be the most cost effective for the dental community, and that would be the most effective in achieving statewide compliance.⁷²

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ Email from Steve Jacquart, Intergovernmental Coordinator, Milwaukee Metropolitan Sewerage District, to Majority Staff, Domestic Policy Subcommittee, Oversight and Government Reform Committee (June 12, 2008).

⁶⁷ Phone conversation between Peter Gorman and Mara Brooks, Director of Government Services, Wisconsin Dental Association (June 9, 2008).

⁶⁸ Milwaukee Metropolitan Sewerage District, *Amalgam Management for Dental Offices* (September 1, 2004) (online at <http://v2.mmsd.com/Assets/Documents/rules/DentalAmalgam04.pdf>).

⁶⁹ *Id.*

⁷⁰ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Statement for the record submitted by Michael Aucott, New Jersey Department of Environmental Protection, *Hearing on Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) (hereinafter "Aucott Testimony").

⁷¹ *Id.*

⁷² *Id.*

They concluded that a program in which the installation of amalgam separators was voluntary would not produce the desired results. Instead, they decided to adopt a regulation which made implementation of BMPs, including the installation of amalgam separators, mandatory for dental offices that use or remove amalgam. In addition to the regulation, the NJDEP is requiring larger wastewater treatment plants in New Jersey to monitor their effluent for mercury, using EPA method 1631E, both before and after the regulation is implemented to help the NJDEP determine the extent of the program's efficacy.⁷³ This regulation officially came into effect on October 1, 2007 and it stipulates that all of the state's approximately 3,400 dental offices must be in compliance by October 1, 2009.⁷⁴

Since the NJDEP is still in the middle of the implementation period, data on current rates of amalgam separator installations are not currently available; however the state is expected to achieve virtually complete compliance by the end of 2009.

As part of its research prior to proposing the regulation, the NJDEP engaged in frequent communication with the New Jersey Dental Association (NJDA), and hosted several meetings with representatives of the dental community that were assembled by the NJDA to discuss the issue of mercury discharges.⁷⁵ Although the NJDA was initially opposed to the regulatory requirement to install an amalgam separator, it never actively opposed the adoption of the regulation, and it has continued to work with the NJDEP throughout the implementation process.⁷⁶

⁷³ *Id.*

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ *Id.* (For the last two years, the NJDEP has, at the request of the NJDA, attended the NJDA annual conference, once as a presenter, and once to disseminate information to its members. Through its own outreach, the NJDA has communicated the regulatory mandates in an effort to help foster compliance with the pending regulations.)

V. LESSONS LEARNED

In addition to lessons learned about compliance and the value of mandatory programs, the Subcommittee's national survey also revealed several lessons that can benefit state and local government considering programs to limit dental mercury emissions.

A. Work with local and state dental societies

One of the most valuable lessons learned in the effort to achieve compliance is the participation and cooperation of the local and state dental societies. Almost without exception, the most successful programs have included an educational and outreach component to local and state dental societies. Ann Farrell, Director of Engineering at the Central Contra Costa County Sanitary District (CCSD), explains that the decision to implement its mandatory amalgam separator program was the result of a discussion involving the Contra Costa Board of Supervisors, the staff of the Sanitary District, as well as the local and state dental societies in California. In addition to including the dental societies in their decision-making process, the Sanitary District also conducted outreach meetings to dentists and provided them with educational materials on the detrimental effects of dental mercury emissions.⁷⁷ CCSD found that at each of its meetings, the majority of dentists were supportive. Farrell reports,

They acknowledged that it was relatively inexpensive for them to install equipment that would significantly reduce their mercury discharges to the environment. They further suggested that many dentists would likely not make the investment unless a mandatory program was implemented. In a cost competitive environment, it is unlikely that any but the most serious environmentalist would disadvantage themselves by incurring the costs that their neighboring dentist did not.⁷⁸

In contrast to CCSD where collaboration with local dental societies led to a successful mandatory program, in EPA Region 8, the lack of collaboration resulted in hostility and an ineffective program. Between 2004 and 2005, EPA's Regional Pretreatment Coordinator in the Region 8 (the Denver Regional office) developed a two-pronged strategy for controlling mercury:

- 1) where a mercury problem exists, action by the POTW was mandatory; and
- 2) the dental office can either comply with specific limits or comply with BMPs.⁷⁹

The draft Strategy endorsed the implementation of voluntary programs before mercury problems occurred and required mercury control programs where mercury was a problem.⁸⁰ EPA Region 8 developed the mandatory program without prior collaboration with the local and state dental societies, and in turn they, along with the ADA, strongly opposed the initiative. The ADA went

⁷⁷ Farrell Testimony.

⁷⁸ *Id.* at 2.

⁷⁹ Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Curt McCormick, *Hearing on Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008).

⁸⁰ *Id.*

directly to the EPA's Office of Water to submit complaints about the mandatory program. Additionally, they supported the Laramie Dental Society's opposition by submitting written comments on its behalf and arguing against the initiative in Laramie City Council's public meeting.⁸¹ Ultimately, the EPA decided that the document would be issued but that it would not be considered "final."⁸² Instead, a draft version of the document would be made available on the EPA Region 8 website.

EPA Region 8's experience demonstrates the importance of working with local and state dental associations when considering a mandatory program. While collaboration may not eliminate possible dental society opposition to a mandatory program, in light of the experiences described by various government agencies, it will certainly mitigate that opposition. Illustrative examples of successful government-dental society mandatory programs include Washington State, King County, Central Contra Costa County, Massachusetts, and Madison.

B. States can use pre-existing authority to initiate a mandatory provision

State and local governments often have the authority to implement a mandatory program to limit dental mercury emissions. This authority is conferred by federal regulations found at 40 C.F.R. 403 which are the "General Pretreatment Regulations for Existing and New Sources of Pollution."⁸³ The purpose of general pretreatment regulations is three-fold:

- 1) *to prevent the introduction of pollutants into POTWs which will interfere with the operation of a POTW including interference with its use or disposal of municipal sludge;*
- 2) *to prevent the introduction of pollutants into POTWs which will pass through the treatment works or otherwise be incompatible with such works; and*
- 3) *to improve opportunities to recycle and reclaim municipal and industrial wastewaters and sludges.*⁸⁴

Section 403.5 defines prohibitive discharges as "any pollutant which cause Pass Through or Interference"⁸⁵ in addition to eight specific prohibitions.⁸⁶

⁸¹ *Id.* (The Laramie City Council rejected the ADA's arguments and approved the pretreatment mercury control program.)

⁸² *Id.*

⁸³ U.S. Environmental Protection Agency, *EPA Local Limits Development Guidance* ("1.2 LOCAL LIMITS STATUTORY AUTHORITY A component of the National Pollutant Discharge Elimination System (NPDES) Program, the National Pretreatment Program was developed by EPA to control the discharge of pollutants from POTWs. The statutory authority for the National Pretreatment Program lies in the Federal Water Pollution Control Act of 1972, which was amended by Congress in 1977 and renamed the Clean Water Act (CWA). Under Section 307(b), EPA must develop Pretreatment Standards that prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with POTWs. The 1977 amendments to the CWA required POTWs to ensure compliance with the pretreatment standards by each significant local source introducing pollutants subject to pretreatment standards into a POTW. To meet the requirements of the 1977 amendments, EPA developed the General Pretreatment Regulations for Existing and New Sources of Pollution [40 Code of Federal Regulations (CFR) Part 403]"). (July 2004) (online at http://www.epa.gov/npdes/pubs/final_local_limits_guidance.pdf).

⁸⁴ 40 C.F.R. § 403.1.

⁸⁵ Pass Through is defined as a discharge which exits the POTW into U.S. waters in quantities which, alone or in conjunction with other discharges, exceed the POTWs National Pollutant Discharge Elimination System (NPDES) permit. Interference is defined as a discharge which both exceeds the POTWs NPDES limits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal.

In particular §403.8 defines which POTWs are required to establish a pretreatment program.⁸⁷ It reads:

(a) ... Any POTW (or combination of POTWs operated by the same authority) with a total design flow greater than 5 million gallons per day (mgd) and receiving from Industrial User pollutants which Pass Through or Interfere with the operations of the POTW or are otherwise subject to Pretreatment standards will be required to establish a POTW Pretreatment Program unless the NPDES States exercises its option to assume local responsibilities as provided for in §403.10(e)....⁸⁸

King County of Seattle, Washington derived its authority from this regulation to establish its mandatory program. The Wastewater Treatment Division of the Industrial Waste Program in King County wanted to meet its local discharge limit of 0.2 milligrams per liter (ppm). After failing to achieve this goal through a voluntary program, King County used its existing authority to switch to a mandatory program and gave its dentists the choice of installing a separator or applying for a permit and proving that they meet the limit without one.⁸⁹ Similarly, other local governments interested in implementing a mandatory program can derive the authority to do so from 40 C.F.R 403.

While federal regulations can provide the legal authority to implement a mandatory program, they do not suffice to establish the best compliance model. As mentioned in section II and illustrated in section III, the best way to achieve compliance is to work in collaboration with local and state dental societies.

C. Use ISO 11143 as the standard for amalgam separators

The Subcommittee found that while each state and/or local government made different recommendations about the type of separators to be installed in their localities and states, they all recommend that the separator meet the ISO 11143 standard. The ISO (International Organization for Standardization) is the world's largest developer and publisher of international standards. The ISO 11143 standard provides specific requirements and test methods "for amalgam separators used in connection with dental equipment in the dental treatment centre. It specifies the efficiency of the amalgam separators in terms of the level of retention of amalgam based on a laboratory test and the test procedure for determining this efficiency. It also includes requirements for the safe functioning of the amalgam separator, for marking, instructions for use, operation and maintenance."⁹⁰

⁸⁶ 40 C.F.R. § 403.5.

⁸⁷ Pretreatment is defined as the reduction in the amount of pollutants, the elimination of pollutants, or the alteration of the nature of the pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW.

⁸⁸ 40 C.F.R. § 403.8(a).

⁸⁹ Magnuson Testimony.

⁹⁰ International Organization of Standardization, *Dentistry—Amalgam Separators*, (2008) (online at http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42288).

All of the nine states that have passed statutes or regulations mandating the installation of amalgam separators have specified that the separator meet ISO 11143 standards.

D. Oversight & Certification

In addition to meeting the ISO 11143 standards, states and local governments can also consider verification and certification of their separators. The ISO 11143 standard has a loophole in it since it does not specify a maximum or minimum flow rate at which the test should be conducted. For example, in St. Paul and Minneapolis, Minnesota, there were incidents where separator manufacturers tested the separator at lower flow rates to achieve a higher removal efficiency in order to get their separator models listed for use in the service area.⁹¹ Similarly in Maine, its Department of Environmental Protection (DEP) learned that the separators were not all tested at the same flow rate and that instead, they varied dramatically.⁹²

To overcome this problem states and local governments can require certification of the separator unit. Certification is a quality control procedure set up between a certification body and the manufacturer for ongoing conformity assessment.

In St. Paul and Minneapolis, regulators required that all separator models be certified and that manufacturers bear the costs of testing and certification. The only burden left upon the local government is identifying proper certification bodies. After careful consideration, they chose SP Technical Research Institute of Sweden and TUV Nord in Germany.

Another US-based certification body is NSF International (NSF). NSF, formerly known as National Sanitation Foundation, is a not-for profit standards development, testing, and certification organization headquartered in Ann Arbor, Michigan and with offices throughout Europe, Asia, North and South America.⁹³ Still another is Underwriters Laboratory (UL). Headquartered in Illinois, UL has been testing products and writing standards for safety for over a century for a global customer base.⁹⁴ Both UL and NSF include a test “mark” that confirms that the separator has been certified.

E. Template clauses and exemptions for your statute, regulation, or ordinance

The Subcommittee found several common clauses and exemptions among the nation’s statutes, regulations, and ordinances requiring the installation of amalgam separators. Often, the statute recommended that the installation of amalgam separators be included in the Department of Environmental Protection’s Best Management Practice (BMPs). Those clauses and exemptions are extracted below:

Standard clauses

[From Rhode Island, LCO2475/SUB A/2 (2006)]

⁹¹ Quicksilver Caucus, *Case Studies of Five Dental Mercury Amalgam Separator Programs*, (May 2008).

⁹² *Id.*

⁹³ See <http://www.nsf.org/>.

⁹⁴ See <http://www.ul.com/>.

23-24.9-9.2. Best management practices. -- Rhode Island dental offices and vocational dental education programs shall use and instruct on the use of best management practices to minimize the presence of elemental mercury, unused amalgam, and waste amalgam in their wastewater discharge and in their solid waste. The department shall develop best management practices that include a requirement for amalgam removal efficiency of at least ninety-nine %(99%). The department shall define the required best management practices by January 1, 2007. DEM shall consult with the Narragansett Bay Commission, the Rhode Island Dental Association and other interested parties during the development of the best management practices. Dental offices shall comply with the best management practices.

[From New Hampshire Code of Administrative Rules, Part Env-Ws 905 *Standards for Management of Mercury-Containing Amalgam*]

Env-Ws 905.04 Amalgam Separator.

(a) Before any dental practice discharges wastewater containing mercury-containing amalgam residues into a sewer system or to a subsurface disposal system, the owner of the practice shall ensure that such wastewaters are treated by an amalgam separator that:

(1) Is certified by the manufacturer as meeting International Organization for Standardization (ISO) 11143:1999(E) standards; and

(2) Is designed and constructed for the expected volume and flow rate of discharge from the dental practice it serves.

(b) The owner of the practice shall ensure that the amalgam separator is installed, operated, and maintained at the dental practice in accordance with the manufacturer's requirements.

(c) Waste amalgam collected by an amalgam separator or by any other filter, trap, or other method, shall be managed as hazardous wastes in accordance with the hazardous waste rules.

Standard Exemptions

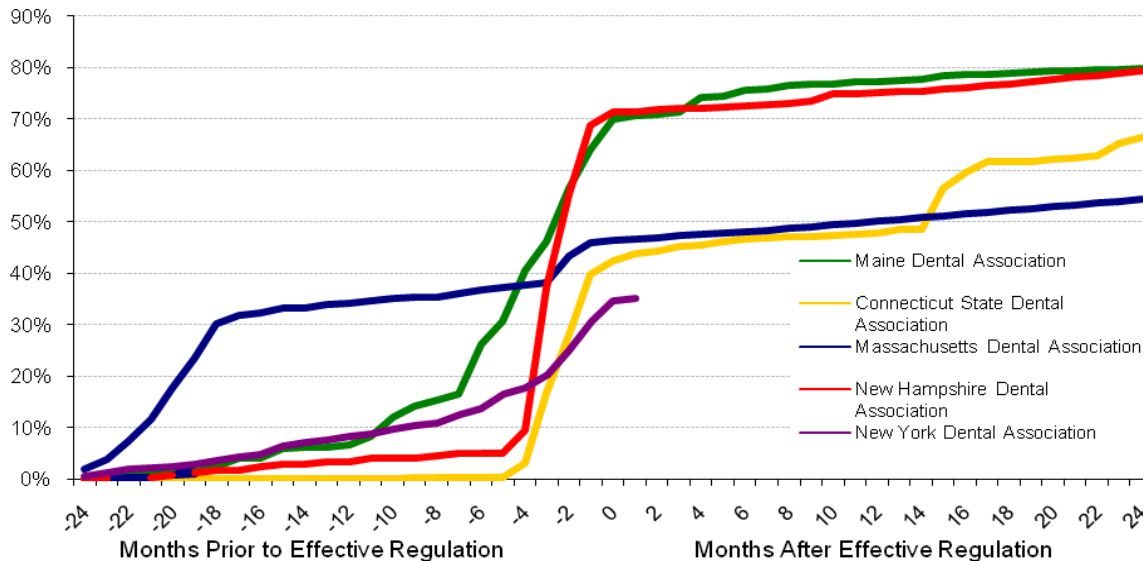
Since some dental offices do not place or remove amalgam, several states and local governments have exempted them from the programs mandating the installation of amalgam separators. These dental categories include:

- Orthodontists
- Periodontists
- Endodontists
- Oral and maxillofacial surgeons
- Oral and maxillofacial radiologist
- Oral and maxillofacial pathologists; and
- A dental office that is scheduled to no longer be used after the date of implementation specified by the statute, ordinance, or regulation.

F. Implementation timeline to consider

While drafting an ordinance, regulation, or statute, state and local governments will have to consider a deadline to meet the mandatory provision. The Subcommittee found that whether local dental offices had six months to meet the provision or four years, most practices rushed to be compliant in the last two months before the compliance deadline.

CHART 3: DEADLINE DATE AND COMPLIANCE⁹⁵



As the chart above demonstrates, an additional year to implement a mandatory provision does not increase compliance although it may delay the beneficial impact of installing separators. Based on this finding, the Subcommittee encourages state and local governments to develop an implementation deadline that would both ensure optimal compliance and serve to reduce dental mercury emissions immediately.

G. Common Concerns & Responses

1) Why are dentists being asked to install separators when the dental industry is clearly not the most substantial contributor to the total amount of mercury released into the environment?

While it is true that the dental industry does not discharge as much mercury into the environment as, say, coal-fired power plants do, the dental industry, which discharges approximately 40-50% of the total mercury found in wastewater, is “by far” the largest contributor to mercury

⁹⁵ Boyd Testimony (The chart is actual sales data for five regulated States in which SolmeteX Hg5 products were sold. The “Y” axis is %of sales within each represented State and as such is an excellent indicator of what %of our total sales within that State occurred near a deadline.”)

discharges into wastewater.⁹⁶ In fact, the ADA testified that they support the use of separators and have incorporated them into their prescribed BMPs, specifically because they “prevent a significant amount of waste amalgam from being deposited in wastewater treatment plants biosolids”.⁹⁷ The ADA added that “despite the small share of mercury in surface waters from dental amalgam, America’s dentists want to do the right thing and minimize even further their impact on the environment.”⁹⁸ Local and state governments have determined that although dental mercury in wastewater is only one source of mercury contamination, it is worthwhile to limit because: 1) the installation of separators is simple and cost-effective; and 2) reducing the level of mercury in biosolids increases their value as fertilizer and reduces mercury releases.⁹⁹

2) Why should dentists be expected to incur the cost of installing and maintaining separators when it is the EPA/government’s mandate to ensure water and air quality?

The dental industry is not the first, and certainly not the last, industry asked to take responsibility for its mercury emissions. Other industries responsible for mercury pollution have been required to control their releases including the largest contributor: coal-fired power plants.¹⁰⁰ Since the Clean Air Act was amended in 1990, the EPA has directly addressed mercury pollution from coal-fired power plants and in 2005, it issued the Clear Air Mercury Rule which seeks to limit mercury emissions from such plants. Also, throughout the 1990s, Congress limited the use of mercury in batteries and paint which reduced mercury releases to the atmosphere by way of waste combustion.¹⁰¹ Similarly, the EPA is also concerned with dental mercury emissions and been in conversation with the ADA about reducing them. The ADA supports initiatives to reduce dental mercury emissions including the use of separators and has incorporated them into their prescribed BMPs. The ADA commented that “...America’s dentists want to do the right thing and minimize even further their impact on the environment.”¹⁰² As acknowledged by the ADA, it is the responsibility of the dental industry and not just the government, to reduce dental mercury emissions.

3) Instead of having dentists install separators, couldn’t waste treatment facilities be made responsible for removing mercury from wastewater? That way mercury would be removed from all wastewater, not just the wastewater that is produced by dental offices.

Ideally, treatment plants could remove mercury from wastewater before releasing it into the effluent, before selling the biosolids to be used as fertilizer, before incinerating the biosolids or before burying it in landfills. However, the technology necessary to adequately treat the wastewater is not available. Several witnesses confirmed this finding at the Subcommittee’s July 2008 hearing. These witnesses included representatives of King County’s Wastewater Treatment

⁹⁶ Bender Testimony.

⁹⁷ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of William J. Walsh, *Hearing on Assessing State and Local Regulation to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008).

⁹⁸ *Id.*

⁹⁹ Magnuson Testimony.

¹⁰⁰ EPA, *U.S. Emissions of Human-Caused Mercury*, (Available at http://www.epa.gov/mercury/control_emissions/emissions.htm).

¹⁰¹ *Id.*

¹⁰² *Id.*

Division,¹⁰³ of Washington State's Department of Ecology,¹⁰⁴ the Massachusetts Department of Environmental Protection,¹⁰⁵ and the International Academy of Oral Medicine and Toxicology.¹⁰⁶

Additionally, even the inadequate technology is cost prohibitive for local and state governments. The New Jersey Department of Environmental Protection estimated that the cost of installing a separator would be between \$700 and \$1,000 per year and the cost of complying with best management practices would increase the operating costs for a dental facility by 54 to 81 cents per patient per year. Alternatively, the annual cost for treatment at a POTW would range from \$1, 280,000 per million gallons per day (MGD) for larger POTWs with flows greater than 100 MGD, to \$1,980,000 per MGD for smaller POTWs with flows less than 0.5 MGD.¹⁰⁷

Finally, although mercury found in wastewater is not solely produced by dental offices, their contribution is by far the greatest amounting to approximately 40 to 50% of the total mercury found in wastewater. For this reason, it is worthwhile to limit dental mercury emissions to the greatest extent possible.

4) Why are you trying to curb mercury contamination by installing separators? Wouldn't it make more sense for dentists to simply stop using mercury amalgam in the first place?

The argument about source reduction is very valid and worth considering. In fact there are several alternatives to mercury amalgam including resin composite, resin ionomer, porcelain, and gold alloys. However, the choice of restorative material is not just about personal preference but based on numerous factors including strength, durability, location of cavity, and aesthetics.¹⁰⁸ Moreover, mercury amalgam has been favored for use because historically it has been less expensive to patients than other restorative materials.¹⁰⁹ In addition, while the use of mercury amalgam is presently a decreasing trend, the problem of dental mercury will persist because of the number of mercury fillings that will be removed from patients' mouths for decades to come.¹¹⁰ Therefore, even if dentists stopped using mercury amalgam fillings, there would still be a need to deal with an enormous reservoir of dental mercury.

¹⁰³ Magnuson Testimony. ("Toxic metals, including mercury, don't go away or get magically 'treated' in wastewater treatment plants, rather, they either settle out into the solids or are discharged into the water effluent.")

¹⁰⁴ Domestic Policy Subcommittee, Oversight and Government Reform Committee, Testimony of Maria Peeler, *Hearing on Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, 110th Cong. (July 8, 2008) ("In April 2003, Ecology determined that mercury amalgam waste from dental practices could be treated as a wastewater effluent. Rather, due to its characteristics, the waste needed to be tested and determined to be compliant with both hazardous waste and water quality standards, or contained prior to entering the combined wastewater from the facility (not at the point of discharge to the sewer).")

¹⁰⁵ Smith Testimony. ("Direct releases of dental mercury from sewers to waterways may also occur via combined sewer overflows during storm events that exceed the system's capacity.")

¹⁰⁶ Fischer Testimony. ("...wastewater treatment facilities are not designed to process or handle heavy metals, most of the mercury settles out into the sludge, or 'biosolids' as wastewater is treated. These biosolids are usually incinerated or used as fertilizer, the mercury content goes directly into the environment.")

¹⁰⁷ Aucott Testimony.

¹⁰⁸ Quicksilver Caucus, *Dental Mercury Amalgam Waste Management White Paper*, (April 2008).

¹⁰⁹ *Id.*

¹¹⁰ Fischer Testimony. (Mercury fillings have a 10-15 year average durability in people's mouths before they need to be replaced.)

5) Why are states/municipalities being asked to regulate dental amalgam? If the same problem exists for every dental market in the country, why doesn't the federal government step in to regulate it?

At this time, the federal government has not regulated mercury discharges from the dental sector. It is therefore up to the states and municipalities to take appropriate action to reduce this source of mercury pollution.

6) Why are you advocating regulatory action when high separator installation rates have been achieved in places like Duluth, Minnesota under conditions where no regulations were in place?

Duluth is an exception among those local governments that wanted to install separators given its small number of dental offices and the resources provided to the dentists by the Western Lake Superior Sanitary District (WLSSD). Unlike neighboring Madison where there exist nearly 1,200 practicing dentists, in Duluth there are only 108 dentists and 55 dental offices.¹¹¹ Of those dental offices, not a single one had to purchase its own separator. Instead, the WLSSD and the local dental society applied for a grant that covered the cost of all the separators initially installed.¹¹² Additionally, the WLSSD worked to remove any reason for not installing an amalgam separator including: testing them in an office setting, installing them at no cost, personally training staff and personnel in the operation of the separator. According to the WLSSD chemist, "in a larger city, such a hands-on approach may not have worked."¹¹³ The WLSSD's voluntary program may prove to be successful under similar circumstances in another city or municipality; however that is probably not the case for any state.

Unlike cities and municipalities which may have few dental offices, states will not have such a small number of dental offices to which it can offer free separators and very discrete attention. Even the states claiming to have successful voluntary program models, Massachusetts and Washington, are in fact not voluntary at all. Both Massachusetts and Washington had a voluntary program that was underpinned by the threat of a mandatory program. Please see section III: "Case Studies" for more details on these two examples.

¹¹¹ Tuominen Testimony at page 3.

¹¹² *Id.*

¹¹³ *Id.* at question number 3.

VI. ADDITIONAL RESOURCES

A. Organizations Working on Mercury Policy

- Quicksilver Caucus of the Environmental Council of the States
http://www.ecos.org/section/committees/cross_media/quick_silver
- National Association of Clean Water Agencies
<http://www.nacwa.org/>
- Clean Water Act Consulting Services, LLC
<http://www.cwaconsultingservices.com/>
- Mercury Policy Project
<http://www.mercurypolicy.org/>

B. Additional Readings

- NACWA, *Controlling Mercury in Wastewater Discharges from Dental Clinics White Paper*, available at:
http://www.dentalmercury.com/pdf/papers/NACWA%20White%20Paper%20on%20Controlling%20Mercury%20Discharges%20Jan%202006_1.pdf
- Quicksilver Caucus, *Dental Mercury Amalgam Waste Management White Paper*, available at:
http://www.ecos.org/files/3260_file_Final_Twice_Corrected_Dental_Amalgam_White_Paper_April_2008.pdf
- Quicksilver Caucus, *Case Studies of Five Dental Mercury Amalgam Separator Programs*, available at:
http://www.ecos.org/files/3193_file_case_studies_dental_amalgam_paper_05_2808.pdf
- Subcommittee on Domestic Policy of the Committee on Oversight and Government Reform, Hearing: *Assessing State and Local Regulations to Reduce Dental Mercury Emissions*, available at:
<http://domesticpolicy.oversight.house.gov/story.asp?ID=2066>

C. Short List of ISO 11143 Amalgam Separators and Companies

ISO 11134 Tested Amalgam Separators
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BRAND NAME	MANUFACTURER	EFFICIENCY	TECHNOLOGY
A1000	Air Techniques	> 95%	sedimentation

Durr 7800/7801	1-800-AIRTECH 70 Cantiague Rock Rd. Hicksville, NY 11801 www.airtechniques.com		
Amalgam Collector Models	R&D Services 1-800-816-4995 1-206-525-4995 8120 Green Lake Drive N Seattle, WA 98103 www.theamalgamcollector.com	> 95%	sedimentation
BullfroHg	Dental Recycling North America 1-800-360-1001 PO Box 1069 Hackensack, NJ 07601 www.drna.com	98.3%-99.6%	sedimentation
ECO II (Economy System Type II)	Metasys 1-877-638-2797 1-305-663-2989 5001 S.W. 74 th Ct., Suite 206 Miami, FL 33155 www.ecotwo.com	> 95%	sedimentation
RME2000	Rebec Simple Solutions 1-800-569-1088 18921 Dellwood Dr. Edmonds, WA 98026 www.rebecsolutions.com	96.90%	sedimentation
Avprox AS-9	American Dental Accessories 1-800-331-7993 www.amerdental.com	95%-99%	sedimentation/filtration
MSS 1000 MSS 2000	Maximum Separation Systems 1-800-799-7147 5549 Forest Hill Rd. Victoria, B.C. V8M 3X1 Canada www.amalgamseparators.com	> 95%	sedimentation/filtration
ARU-10	Hygenitek 1-866-494-3648 7370 Woodbine Ave., Unit 28 Markham, Ontario L3R 1A5 Canada www.hygenitek.com	99.99%	sedimentation/filtration/ ion exchange
Hg5	Solmetex 1-508-393-5115 50 Bearfoot Rd., Suite 2 Northborough, MA 01532 www.solmetex.com	> 98%	sedimentation/filtration/ ion exchange
Merc II	Bio-Sym Medical	>95%	sedimentation/filtration/

	1-800-947-7550		ion exchange
Mercury Recovery Unit (MRU)	Dental Recycling North America 1-800-360-1001 PO Box 1069 Hackensack, NJ 07601 www.drna.com	> 95%	sedimentation/filtration/ ion exchange
Rasch 890-4000	AB Dental Trends 1-360-354-4722 211 Grover St. Lynden, WA 98264 www.amalgamseparation.com	> 95%	sedimentation/filtration/ ion exchange
Asdex	Avprox Inc. 1-800-300-1249 2201 Fourth St. N., Suite C St. Petersburg, FL 33704	97.50%	filtration
Hg10	SolmeteX 1-508-393-5115 50 Bearfoot Rd., Suite 2 Northborough, MA 01532 www.solmetex.com	99.99%	sedimentation/filtration/ ion exchange
ISOSEP	Dental Recycling Services Industrieweg 4 9636 DB Zuidbroek The Netherlands drs@drs.nl	98%	

D. Sample Amalgam Separator Statute



Subpart 374-4: Standards For The Management Of Elemental Mercury and Dental Amalgam Wastes At Dental Facilities

(Statutory authority: Environmental Conservation Law Section 27-0926)

§374-4.1 - General Requirements

(a) Purpose

This Subpart establishes requirements for dental facilities concerning the use and possession of elemental mercury and for the proper management of dental amalgam waste and elemental mercury waste through recycling.

(b) Applicability

This Subpart shall apply to any dental facility where dental amalgam is applied, altered, maintained, removed or disposed; where dental amalgam waste is generated; or where elemental mercury has been used or is possessed by dentists licensed or otherwise authorized to practice dentistry under Article 133 of the New York State Education Law.

(c) Definitions

(1) "Amalgam separator" means a type of dental equipment designed to remove dental amalgam particles from the wastewater of a dental facility and meeting the standards specified in subdivision 374-4.2(a) of this Subpart.

(2) "Dental amalgam" means an alloy which contains mercury and other metals used in the practice of dentistry.

(3) "Dental facility" means any institution, clinic, office or other location where the practice of dentistry is performed.

(4) "Dental amalgam waste" means waste from a dental facility containing:

(i) Dental amalgam that has been in contact with the patient including, but not limited to: extracted teeth with dental amalgam restorations, carving scrap collected at chair-side, dental amalgam captured by chair-side traps, vacuum pump filters, amalgam separators or other dental amalgam capture devices;

(ii) Dental amalgam that has not been in contact with the patient including, but not limited to: excess dental amalgam mix and the used pre-encapsulated dental amalgam capsules remaining at the end of a dental procedure; and

(iii) Dental amalgam that may have accumulated in the plumbing system of a dental facility.

(5) "Elemental mercury" means a heavy, silvery-white metal that is liquid at room temperature and is represented by the chemical symbol "Hg" with an atomic number of 80 and an atomic mass of 200.59.

(6) "Large dental facility" means an institution which houses fifty (50) or more dental chairs.

(7) "Practice of dentistry" means the practice of dentistry as defined in Section 6601 of the New York State Education Law.

§374-4.2 - Requirements for the Management of Elemental Mercury and Dental Amalgam Waste at Dental Facilities

(a) Amalgam Separators

(1) All dental facility waters likely to come into contact with dental amalgam waste must be treated prior to discharge by an amalgam separator which is certified to ISO 11143 Standards

(Dental equipment - Amalgam separators) as incorporated by reference in subdivision 370.1(e) of this Title. The amalgam separator must achieve a minimum of 99 %removal efficiency of dental amalgam, by weight, in accordance with ISO 11143 test procedures.

(2) Amalgam separators in service at dental facilities prior to the effective date of this Subpart, must be certified, but only need to achieve a minimum 95 %removal efficiency of dental amalgam, by weight, in accordance with ISO 11143 test procedures.

(3) For large dental facilities, the amalgam separator must meet or exceed the applicable ISO 11143 Standards set forth in paragraph (1) or (2) above, but is not required to be ISO certified. If such a separator is not ISO certified, then the minimum removal efficiency certification must be made by a person or firm licensed to practice professional engineering in the State of New York.

(4) All amalgam separators must be properly sized for the volume and flow of the dental facility amalgam wastewater in accordance with the manufacturer's specifications and recommendations. The maximum allowable flow rate through the amalgam separator at the dental facility may not exceed the maximum flow rate capacity that the separator was tested at and passed in meeting the ISO standards.

(5) The amalgam separator must be installed, operated, and maintained in accordance with the manufacturer's specifications and recommendations. Amalgam separators must also be installed in accordance with any applicable state and local building code requirements.

(6) The amalgam separator must be placed in service in accordance with the requirements of this Subpart as follows:

(i) for dental facilities that begin operations after the effective date of this Subpart, the amalgam separator must be placed in service prior to beginning operation; or

(ii) for dental facilities operating on the effective date of this Subpart, the amalgam separator must be placed in service no later than two years after the effective date of this Subpart.

(7) Dental facilities where dental amalgam is not placed or removed, including facilities where the specialties of orthodontics, periodontics, prosthodontics and oral and maxillofacial surgery are exclusively performed, are exempt from the requirements to install an amalgam separator.

(b) Dental Amalgam Waste Storage

(1) All dental amalgam wastes must be collected and stored in air-tight, leak-proof and structurally sound containers.

(2) The containers holding the dental amalgam waste must have a label that includes, at a minimum, the type of the dental amalgam waste contained therein and the date waste was initially placed in the container.

(3) The containers holding the dental amalgam waste must be tightly closed except when adding or removing dental amalgam waste.

(4) Length of storage of dental amalgam waste within the dental facility must not exceed one year from the date waste was initially placed in the container.

(c) Recycling of Dental Amalgam Waste and Elemental Mercury

(1) All dental amalgam waste and elemental mercury generated by the dental facility must be sent for mercury recycling.

(2) Written or electronic certification from the collection service or recycler must be obtained by the dental facility, documenting:

(i) the name and address of the collection service;

(ii) the amount, by weight, of dental amalgam waste and elemental mercury collected and the date it was collected; and

(iii) the name and address of the facility where the dental amalgam waste and elemental mercury will ultimately be recycled, and certification that the mercury contained in the waste was destined for recycling.

(d) Record Keeping and Inspection

(1) Records must be maintained at the dental facility documenting:

(i) the type of amalgam separator(s) installed, manufacturer's model number, unit specifications, date the unit was placed in service and number of chair units serviced by the separator;

(ii) a description of all maintenance performed on the amalgam separator(s) and the date of completion of such maintenance;

(iii) the amount, by weight, of dental amalgam waste sent for recycling of mercury, on an annual basis; and

(iv) copies of the correspondence required by paragraph 374-4.2(c)(2) of this section.

(2) The records required under subparagraph 374-4.2(d)(1)(i) of this subdivision must be maintained as long as the amalgam separator is in use at the dental facility. The records required under subparagraphs 374-4.2(d)(1)(ii through iv) of this subdivision must be maintained for a minimum of three years.

(3) Written notification when an amalgam separator is installed must be provided to the sewage treatment works or sewer authority that the wastewater discharge is tributary to, if applicable. Such notification must be submitted no later than 30 days following the applicable deadline

specified under paragraph 374-4.2(a)(6) of this section and must contain the dental facility name; facility location including street address and municipal subdivision, i.e. city, town, or village; telephone number; and the information specified in subparagraph 374-4.2(d)(1)(i) of this subdivision.

(4) The records specified in paragraph 374-4.2(d)(1) of this subdivision, the amalgam separator(s) and any related equipment must be readily available for inspection by the department, or its authorized representative, upon written or verbal request.

(e) Prohibitions

(1) The use or possession of elemental mercury in the practice of dentistry is prohibited in a dental facility unless such elemental mercury is contained in appropriate pre-encapsulated capsules specifically designed for the mixing of dental amalgam.

(2) Elemental mercury must not be rinsed down the drain, disposed with municipal solid waste or disposed as regulated medical waste as defined in Section 1389-aa of Public Health Law and Section 27-1501 of Environmental Conservation Law.

(3) Chair-side traps, screens, vacuum pump filters or other amalgam collection devices containing dental amalgam must not be rinsed over drains or sinks that are not equipped with an amalgam separator as required under subdivision 374-4.2(a) of this section.

(4) Dental amalgam waste must not be managed as a regulated medical waste as defined in Section 1389-aa of Public Health Law and Section 27-1501 of Environmental Conservation Law and must not be disposed of in containers destined for treatment or disposal as regulated medical waste.

(5) Dental amalgam waste and collection equipment must not be disinfected by any method that utilizes heat.

(6) Dental amalgam waste must not be disposed of as municipal solid waste.