

Comments of the AFL-CIO on OSHA's Request for Information on Chemical Management and Permissible Exposure Limits

(Docket No. OSHA 2012-0023)

October 9, 2015

The AFL-CIO welcomes the opportunity to provide these comments on Chemical Management and Permissible Exposure Limits. Many of our members are exposed to toxic chemicals in the workplace, putting them at increased risk for illness, disability and death. OSHA's past efforts to regulate and control workplace chemicals have protected our members and other workers from unnecessary illnesses. But in recent years efforts to address chemical exposures have faltered. We appreciate the agency's renewed attention to improve the processes, approaches and measures to control chemical exposures, and hope that this renewed attention will lead to action to protect workers.

Background

Forty-five years after the passage of the Occupational Safety and Health Act, protecting workers from the harm caused by exposure to toxic chemicals remains a daunting challenge. Each year an estimated 50,000 workers die from occupational diseases, ten times the number that die from occupational injuries.¹ Hundreds of thousands of workers suffer diseases, many of them disabling. The cost of these diseases is enormous, estimated at more than \$20 billion a year, with much of the cost being borne by workers and their families.²

Under the OSH Act, OSHA has the responsibility to set standards on toxic chemicals to protect workers from significant risk of harm to the extent that it is feasible to do so. And during the first 20 years of its history OSHA made significant progress, setting standards to reduce exposures to many well-recognized hazards such as asbestos, coke oven emissions, lead, arsenic and benzene. In OSHA's earlier years, addressing health hazards was a high priority for the agency. Standard setting was a relatively straight forward, simple process that produced effective protective standards in a relatively short time span of one to two years. The agency was able to respond to newly recognized hazards like vinyl chloride and DBCP, putting standards in place quickly after the hazards were identified. All of the standards issued by the agency have been shown to be effective, significantly lowering exposures to chemical hazards, often at a cost much lower than estimated by the agency or by industry opponents.

¹ Steenland, K, Burnett, C, Lalich, N, Ward, E, and Hurrell, J., "Dying for Work: The Magnitude of U.S. Mortality from selected Causes of Death Associated with Occupation," *American Journal of Industrial Medicine*, Vol. 43:461- 482 (2003).

² Leigh J.P., "Economic Burden of Occupational Injury and Illness in the United States," *The Milbank Quarterly*, Vol. 89, No. 4, 2011.

Over the years, the OSHA standard-setting process has become much more complex and lengthy as new evidentiary requirements have been added due to court decisions along with new requirements for regulatory analysis, risk assessment, peer review, OMB review and more added by legislation and executive orders. As a result, it now takes 8 to 10 years, or in some cases even decades, to produce an OSHA standard on a major hazard. The current OSHA rulemaking on silica was initiated in 1997 – 18 years ago – and the final standard still has not been issued.

Due to the length and complexity of the process, standards under development are often abandoned as administrations and priorities change. The last chemical standard OSHA issued – hexavalent chromium – was in 2006 and that was in response to a court order. (See Appendix A for a timeline of major OSHA health standards).

Since the OSH Act was passed in 1970, OSHA has issued comprehensive standards on fewer than 30 chemical hazards. Approximately 450 other chemicals are regulated under the permissible exposure limits (PELs) adopted in 1971, which are based on the 1968 AGCIH TLVs and science from the 1950's and 1960's. Attempts to update the PELs in 1989 were unsuccessful, with a reviewing court overturning the PEL update rule. The 1983 Hazard Communication standard and its subsequent updates have provided important chemical hazard information on a broad range of chemicals that has helped to identify hazardous chemicals and support efforts to limit use and exposures. But for the vast majority of toxic chemical exposures, regulations are non-existent or inadequate, leaving workers exposed to chemicals resulting in illnesses, disability and death.

Clearly, past and current initiatives to protect workers from chemical exposures have been insufficient. The AFL-CIO offers its comments and recommendations on how OSHA can and should move forward to improve the management and control of workplace chemicals.

OSHA Must Make Control of Chemicals and Reducing Occupational Disease a Higher Priority and Take Action

Despite the huge burden of occupational disease in this country, and growing number of chemicals in commerce and use, over the years, the focus and attention devoted to addressing chemical exposures has dwindled. Just as far fewer standards are being developed and issued to address health hazards, enforcement efforts on health hazards also have eroded. In 1980, at the highpoint of its focus on health hazards, federal OSHA had 570 health compliance officers.³ In 2015 the number of industrial hygiene

³ U.S. Department of Labor, Office of the Assistant Secretary of Policy. (2002). Twentieth Century OSHA Enforcement Data: A Review and Explanation of Major Trends.

compliance officers was only 297.⁴ Similarly, in 1980, there were 11,920 federal OSHA health inspections, with only 6,824 health inspections conducted in FY 2014.^{5,6}

As the agency's efforts and attention devoted to chemicals and health hazards has lessened so have the efforts of many employers to address these exposures. Numerous large corporations have downsized their in-house safety and health staffs, relying instead on outside consultants. In the absence of new regulatory requirements, fewer resources are being devoted to worksite efforts to assess exposures and control them.

In order to make any significant progress towards reducing exposures and occupational disease, OSHA must make control of chemicals a much higher priority. Just as it did in the 1970's and 1980's, the agency must take a leadership role highlighting the scope of the problem, identifying chemicals and exposures that need attention, and most importantly, taking action to address them.

This will require both a change in attitude and approach. Unfortunately, as the process of setting standards has become more difficult, the agency has become defeatist in its attitude. Agency representatives routinely state that the process is so difficult that it is impossible to act. Years are spent analyzing problems, writing documents that end up on a shelf. There is no major action or lasting widespread change in workplace conditions or exposures. As OSHA charts a path forward on addressing chemical hazards, it is imperative that the guideposts for the course are **actions** that will reduce exposures, not simply a set of new processes or approaches that may be interesting in theory, but have no real world effect.

The AFL-CIO believes that a key goal of any new or renewed effort on chemicals must be to expedite action to control exposures. The largest problem with the current process is that it is simply too slow and cumbersome to bring about change in a timely manner. Expediting the process is a prerequisite for future efforts. Second, the chemical exposure problem is simply too big and varied to be addressed by a single approach. There need to be multiple approaches that are employed. OSHA must continue to set chemical-specific standards for major hazards as the agency is doing for silica and beryllium. Comprehensive chemical standards have made a huge difference in significantly reducing exposure to a wide range of hazards, changing workplace practices and saving lives. At the same time, OSHA should look to additional approaches such as establishing task-based control measures, addressing chemicals by groups and updating PELs. Different chemicals and exposure situations can be addressed by different approaches.

⁴ Data on Federal OSHA CSHOs 2015 provided by the OSHA Directorate of Enforcement to the AFL-CIO, January 2015.

⁵ U.S. Department of Labor (2002).

⁶ FY 2014 Federal OSHA enforcement data provided by the OSHA Directorate of Enforcement to the AFL-CIO, January 2015.

Our specific comments and recommendations on improving the control of workplace chemicals are set forth below.

OSHA Should Identify Priority Chemicals and Exposures that Need Attention and Develop a Plan for Action

The problem of unregulated and uncontrolled chemicals is massive, even overwhelming. OSHA has fallen so far behind in addressing hazards that it is difficult to know where to start. In an ideal world, it might be useful to establish a priority planning process similar to that which was undertaken by OSHA in the 1990's. However, in our view the development of such a process at this point in time would be a diversion from actually taking action on chemicals. There are numerous chemicals and exposures that OSHA has identified as needing attention including styrene, isocyanates, toluene, welding fumes and 1-bromopropane. The agency has conducted extensive analyses on these chemicals. But currently, the only chemicals identified by OSHA for regulatory action are silica and beryllium. There are no announced future plans for acting on chemical hazards.

Our experience with the agency, which is decades long, is that the only time that OSHA acts to regulate hazards is when there are clear publicly identified priorities and a leadership commitment to act. The AFL-CIO urges OSHA to use the information it currently has available to identify the chemicals and exposures that are priorities for action. The agency should announce these priorities to the public and interested parties, place them on the regulatory agenda, develop a plan and timetable for moving forward, and most critically, take action.

OSHA Should Utilize a Combination of Approaches to Regulate and Control Chemical Hazards

There is no magic bullet to solve the problem of unregulated and uncontrolled chemicals. Moving forward, it is necessary for OSHA to employ a combination of approaches including setting comprehensive 6(b)(5) standards on single substances or groups of substances, updating PELs, task-based control measures and different banding measures.

Comprehensive 6(b)(5) health standards

Setting comprehensive OSHA health standards has been a highly effective method over the years to reduce exposure to major chemical hazards. It is imperative that OSHA continue to set such standards. In particular, comprehensive standards are important to address chemicals that have a broad reach across different types of industries and workplaces and significant changes in control measures are needed to protect workers. Chemicals that have certain toxicity characteristics (e.g., when the route of exposure or

chemical properties requires it, such as high skin toxicity, sensitizer, synergism) may also be better addressed by comprehensive chemical standards, as opposed to simply a PEL.

The top priority for setting comprehensive health standards must be issuing the final standard on respirable crystalline silica in early 2016. This standard when implemented, will significantly reduce exposure to silica and prevent thousands of worker deaths and diseases each year. OSHA also must finalize the beryllium standard, a standard where industry and labor reached many agreements, but still has taken 40 years for OSHA to issue a second proposal.

Other high priorities for comprehensive health standards should include:

- 1-Bromopropane
- Carbon monoxide
- Diesel exhaust
- Gluteraldehyde
- Isocyanates
- Manganese
- Mercury
- Metalworking fluids
- n-Hexane
- Perchloroethylene
- Styrene
- Toluene
- Welding fumes

When regulating a single substance, OSHA should consider substitutes that may be similar in form and function, and regulate both. Comprehensive standards should promote informed substitution. Regulating an individual chemical that allows replacement with a major substitute that is nearly as toxic, or more toxic, than the regulated chemical, does little to reduce the hazard.

The risk of unintended consequences of regulating one chemical at a time was clearly revealed when methylene chloride was regulated by OSHA. Some employers responded to the methylene chloride standard by switching to 1-bromopropane, an unregulated chemical that may be four times more potent in causing cancer than methylene chloride. In a separate example, NIOSH's criteria document for diacetyl also

included 2,3-pentanedione because these chemicals are very similar in structure, behavior and use in the workplace as flavorings.

OSHA must approach rulemaking in a way that is effective and be reminded of its goal to control the hazard and protect workers.

Updating and Lowering OSHA's PELs

In addition to setting comprehensive health standards, OSHA also should renew efforts to update PELs. It is simply not possible to set comprehensive health standards for all chemical hazards. For many chemicals and groups of chemicals, lowering the PEL is the most efficient way to reduce occupational exposure to hazardous chemicals.

OSHA should devote resources to updating PELs because PELs are necessary and important. PELs reduce worker exposure. PELs set a target for employers, government, industrial hygiene professionals and workers. PELs let us know if control measures really work. PELs also set a standard for new analysis methods and technology to achieve.

OSHA should expeditiously update PELs for chemicals and should focus on PELs that matter – that is chemicals for which there is significant workplace exposures and current limits clearly fail to protect workers. OSHA should start by addressing chemicals where a lower OEL exists at the state level or has been recommended/adopted by more than a single standards-producing organization. These limits often already have used a consensus process, stakeholder input and other mechanisms that would allow OSHA's work to move more expeditiously. OSHA should use these limits, and enforcement of these limits, to help establish significant risk and feasibility in its rulemaking process. OSHA should propose a set of updated PELs based on existing adopted or recommended limits. There should be a presumption that these limits address a significant risk of harm and are feasible to achieve. The agency should seek comments and evidence on whether the proposed limit should be lowered or raised and base the final rule on the evidence that is received during the rulemaking.

If this process for updating PELs is successful, in the future, OSHA may consider a more formalized regular process for updating PELs. Such a process could include the establishment of a formal advisory committee as has been established in California. NIOSH, the agency tasked with developing and establishing recommended occupational safety and health standards, integrally should be involved. If a consensus on a particular PEL is not reached, or if a designated committee recommends, that chemical may be revised and issued through normal OSH Act section 6(b)(5) standard-setting procedures. However, this should not halt the remaining PELs from being adopted. When issued, the PELs update should strongly emphasize the hierarchy of controls for controlling to these limits.

OSHA also should reexamine inconsistent limits for the same toxic chemical in different industries. In some cases, achievable limits are not always feasible due to the nature of an industry or process. But industries, technology and feasibility capabilities all have changed over the last few decades, and should be reevaluated. For example, OSHA's general industry PEL for benzene is 1 ppm, but for oil and gas well sites, it is 10 ppm (the NIOSH REL is 0.1 ppm). This lapse in protection exists despite NIOSH recommendations of methods to reduce the potential for occupational exposure to acute health and flammable hazards at well sites, including: Alternative tank gauging procedures, dedicated sampling ports, worker training, limiting time spent in proximity to hydrocarbon sources, monitoring workers for benzene and other contaminants and the use of portable flammable gas monitors with alarms. Benzene is a known carcinogen and highly toxic chemical to all exposed workers so once it is feasible to control, it should be required.

Task-based control measures

As part of the effort to address chemical exposures, in some cases, it makes sense for OSHA to assess exposures as it relates to the task the worker is performing, require controls on high-exposure tasks, and where exposures cannot be controlled adequately through controls, require use of personal protective equipment.

Task-based control measures do not have to be tied to a particular chemical or OEL, and for certain tasks, reducing exposure to one chemical often reduces exposure to other chemicals. Task-based approaches can help OSHA enforce updated control processes, rather than outdated limits with no adaptability. OSHA could integrate these approaches into chemical standards through task-based enforcement options; and could issue guidelines and voluntary appendices to aid employers.

A task-based approach is utilized in the ANSI A10.49 standard for the Control of Chemical Hazards in Construction, which requires employers to identify hazardous tasks and create a hazard communication inventory, then determine the hazard and exposure level and develop a control plan based on the hierarchy of controls. This kind of approach is particularly useful, where the work is short-term, the workforce is mobile and jobs may be finished before the results of sampling are even available.

Banding approaches

Banding methods are useful supplementary tools that both OSHA and employers can use to group, prioritize and control chemicals.

Control banding is a process that builds upon the task-based control approach, and groups chemicals based on control methods needed to reduce exposure. It relies on a combination of toxicity information and exposure information, but allows the user to be

more protective in its assessment when limited information is known. This method can help OSHA and employers identify control measures for certain tasks that expose workers to chemicals with limited toxicity information and where PELs are absent. Control banding is particularly useful for industries where hazardous work is intermittent or mobile (e.g., construction, firefighting).

For many chemicals, toxicity data is not always available in enough quantity or specificity to determine a specific exposure limit that protects against risk. For these chemicals health hazard banding, or occupational exposure banding, is a useful approach that groups chemicals in bands of similar toxicity or risk characteristics, and can be tethered to the amount of toxicity data available. More data will allow more specificity, but large amounts of data analysis is not always required to identify extremely toxic chemicals.

NIOSH has been doing extensive work developing an occupational exposure banding system, utilizing hazard codes and categories from the existing Globalized Harmonized System (GHS) for Classification and Labelling of Chemicals. While formal banding methods are still being validated, OSHA should work with NIOSH to determine if and how hazard banding can be utilized and applied in the assessment and management of chemicals. Particular attention should be paid to chemicals in hazard bands D and E since these are chemicals that have the potential to cause irreversible health effects at relatively low doses.

In addition to hazard banding, OSHA could explore grouping chemicals by functional group, chemical class, constant constituents, or metabolic pathway (e.g. organic solvents, isocyanates, metalworking fluids) as an approach in the assessment of chemicals. Grouped approaches would allow available toxicity and hazard data for chemicals to be applied and utilized in the assessment of other similar chemicals, and help identify potential toxic or safer substitutes.

Sampling and Analysis Methods

As OSHA looks to improve chemical management in the workplace, the agency also should incorporate strategies on enhancing and updating chemical sampling methods for regulated and unregulated chemicals. Once again, this is not an effort that should be taken alone. OSHA should coordinate with NIOSH, EPA, and other agencies that perform frequent sampling. Continually establishing and updating OSHA's chemical sampling and analysis methods would greatly enhance the ability to assess exposures; and ensure consistent sampling techniques use by employers, industrial hygiene professionals and unions. Developing sensitive and validated sampling and analyses methods at very low levels can aid the agency's technological feasibility requirements when developing chemical standards and allow for better enforcement of PELs.

Development and updating of these technologies must be a continuous process in order to be effective. Areas for improvement should also include the assessment of exposures to chemical mixtures (i.e., isocyanates). OSHA should consider changing world of sensor technologies could play a role in employer and OSHA sampling of chemicals and dust particles, as well as temporal zones for identifying peak and dangerous exposures.

In some cases where occupational diseases are abundant, employer testing and union testing produce different results, and there are often discrepancies between sampling for a single chemical versus a chemical mixture. This is even true when other employers have developed voluntary regulations for sampling of the same chemical. Uniformity and updated sampling and analysis requirements where feasible will greatly improve these discrepancies and presents OSHA with another approach to better management of chemical exposures in the workplace.

OSHA Must Expedite its Rulemaking Process by Increasing its Reliance on Existing Information from Other Local, Federal and International Agencies and Organizations

The chemical regulatory system in the U.S. is fragmented and overlapping. At present, the United States has roughly 15 federal agencies and many more state agencies responsible for chemicals management. OSHA must rely on the work and supporting data already produced and compiled by other organizations and agencies. Many analyses produced by these entities are extensive and include stakeholder input. And many states and countries have set more stringent chemical standards than OSHA.

Reliance on other standards

OSHA should increase its reliance on existing standards from other local, federal, and international agencies and organizations. Many have more protective OELs that reflect updated toxicity, risk and feasibility information. Many of these agencies already have conducted extensive analyses with stakeholder input. Reputable occupational exposure limits include NIOSH RELs, state PELs, ACGIH TLVs, German MAKs, UK WELs, and EU DNELs.

Where there already exists a consensus between various standard setting agencies, these OELs should be released by OSHA for public comment. For example, the OSHA PEL for n-hexane is 500 ppm; however the California PEL, NIOSH REL, ACGIH TLV, and German MAK limits are each set at 50 ppm -- a 90% reduction from the current federal limit.

In addition to relying on OELs established by other agencies, countries and organizations, OSHA should also look to other health standards that have been developed by these and other entities, the development of its rules. For example, the

state of Washington has adopted standards on protecting workers from hazardous chemotherapeutic drugs, which pose a serious problem in health care settings. (WAC 296-62-500 Hazardous Drugs). OSHA could use the work already done by Washington in developing a federal rule on these hazardous substances.

Reliance on other data, analyses and experience

OSHA's current approach to establishing and demonstrating significant risk and feasibility adds years of delay to the development and issuance of new rules. When there is not a standard consensus, OSHA must increase its reliance on existing analyses from other agencies and organizations. Duplicative or similar analyses are costly and a waste of valuable agency resources, especially for an agency with such limited resources.

Reputable government agencies that conduct rigorous chemical risk assessments using peer-reviewed data include NIOSH, EPA, NTP, ATSDR, and others. Where analyses are not specific to workers, OSHA can alter assumptions made in a risk assessment to reflect its target population. Relying on existing analyses instead of creating an independent risk assessment will expedite the analysis process, reduce the risk assessment burden, and help the agency set more timely chemical standards.

In California, one way for a chemical to be added to the Prop 65 list is if either of two committees declare the chemical to clearly cause cancer or birth defects, or other reproductive harm: the Carcinogen Identification Committee and the Developmental and Reproductive Toxicant Identification Committee. Not only does California use designations from these committees because they recognize their use of the most current, rigorous, scientific information available to base their decisions, but also their public stakeholder commenting process. A chemical can also be added to the Prop 65 list if the EPA, FDA, NIOSH, NTP, or IARC label a chemical as causing cancer or birth defects, or other reproductive harm. This process builds upon the work of others, creating a mechanism to flag chemicals and trigger action. Prop 65 has been effective in creating incentives for manufacturers to remove listed chemicals from their products (e.g., trichloroethylene, methylene chloride, toluene, lead), and spurred significant reduction in California of air emissions of listed chemicals (e.g., ethylene oxide, hexavalent chromium, chloroform), all of which affects workplaces.

State PELs, industry standards, and international standards (e.g. German MAK, UK WELs, EU DNELs) are examples of occupational exposure limits, but also can be a useful tool for OSHA's economic and technological feasibility determinations. Nine states have adopted the 1989 PELs from the overturned federal update. Two states, California and Oregon, have many PELs with more protective limits than either the 1989 vacated PELs or current federal PELs. OSHA should use the compliance experience in these states to help establish feasibility for the adoption of similar limits nationwide.

In some cases, proactive employers have voluntarily adhered to ACGIH TLVs or NIOSH RELs for known toxic chemicals, providing a source of sampling and feasibility data that could be used by OSHA to help satisfy its rulemaking requirements. Some businesses already must comply with more stringent international standards (e.g., German MAK, EU REACH, UK COSHH). OSHA should rely on the experience of these countries in their process to expedite the lengthy risk and feasibility assessment process.

The European Regulation on Registration Evaluation and Control of Chemicals (REACH) is enforced throughout the European Union. The industry must provide REACH with a Chemical Safety Assessment (CSA) for each chemical produced at quantities greater than 10 tons per year. The CSA requires industries to investigate and report human health hazards, physicochemical hazards, environmental hazards, persistence, bioaccumulative properties, risk assessment, and exposure control methods. The industry is required to calculate a Derived No-Effect Level (DNEL), or the level of exposure where no health effect is seen. The CSA is reviewed by the European Chemicals Agency (ECHA) and the agency either approves or disproves the DNEL and other hazard information. The REACH process shifts the burden of proof onto the industry to determine if the chemical is safe for occupational use and a no-effect exposure level. Since current OSHA mandate holds the government responsible for determining adverse health effects and setting exposure limits, OSHA should use public REACH data in their risk and feasibility analyses.

Reliance on other agency expertise and efforts

Overall, OSHA must strengthen its relationship with other agencies whose valuable work OSHA can rely on. In previous years, OSHA and NIOSH worked together to create a list of priority chemicals, along with MSHA, DOL, and EPA. However, the collaboration stopped after priorities were set and no new standards were developed from this effort. While partnership in creating these priorities is vital, the process cannot stop there. OSHA and NIOSH must continue to use combined expertise to complete risk assessment and feasibility analysis in an efficient manner.

Among NIOSH's roles set forth in the OSH Act, the agency was created to:

“...develop specific plans for such research, demonstrations, and experiments as are necessary to produce criteria, including criteria identifying toxic substances, enabling the Secretary to meet his responsibility for the formulation of safety and health standards under this Act”

and to

“...develop criteria dealing with toxic materials and harmful physical agents and substances which will describe exposure levels that are safe for various periods of employment, including but not limited to the exposure levels at which no

employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience.”

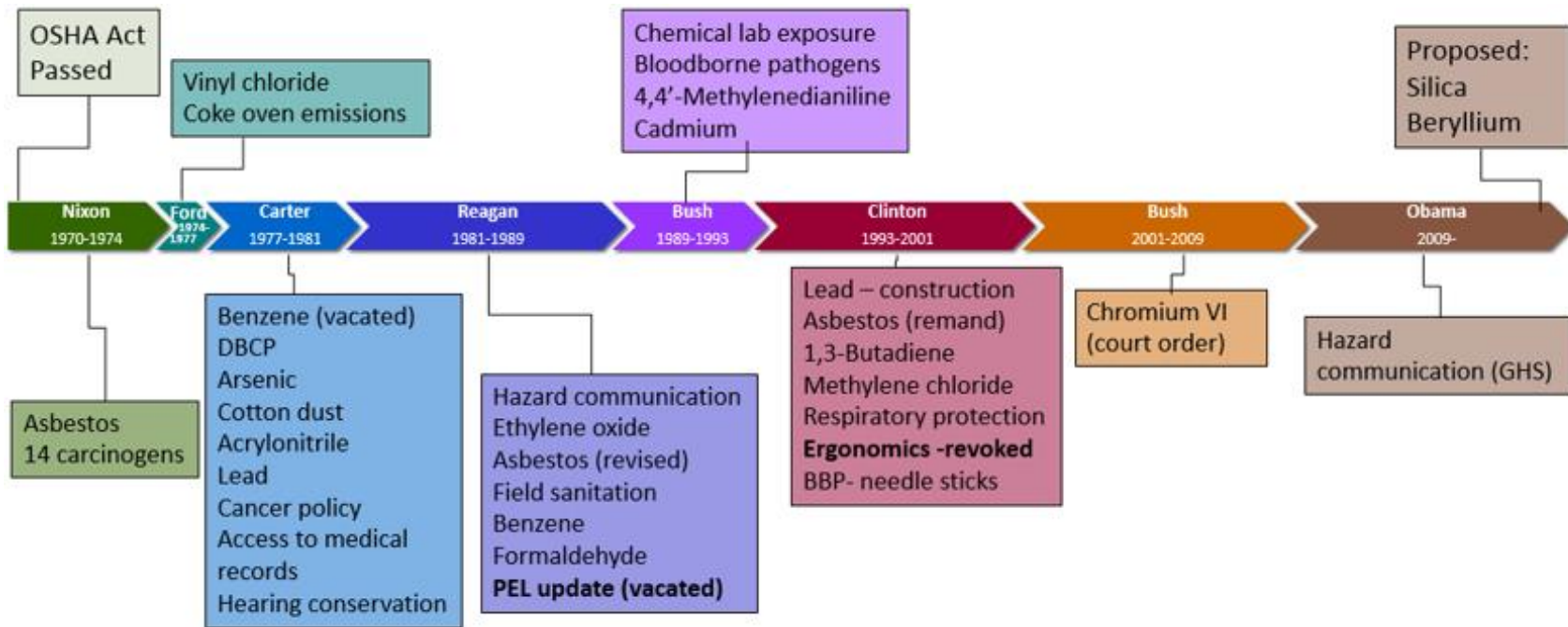
However, the cooperative relationship between OSHA and NIOSH has eroded over time. The ability of OSHA to set sound, effective, and timely chemical standards would be greatly enhanced by implementing a direct working relationship between agencies. As NIOSH updates its RELs to reflect the most current recommendations based on risk assessment data, OSHA should stay vigilant to use this information for both comprehensive standards and PEL updates.

OSHA should continue to maintain and strengthen relationships with other agencies, especially when opportunities arise for collaboration. For example, the potential TSCA reform could be an avenue for OSHA and the EPA to cooperate in determining risk for priority chemicals that impact both workers and the environment, and taking coordinated action to limit exposures.

Conclusion

Chemical standards issued by OSHA have been effective at reducing chemical hazard exposures and reducing occupational disease, when they have been finalized. Even though OSHA’s standard-setting process is much more complex and lengthy than in previous years, progress can still be made to develop and enact new comprehensive standards, update and lower PELs, and manage chemicals in a more expeditious and effective way. OSHA must make controlling chemical exposures and reducing occupational disease a higher priority, and make better use of existing information. Other approaches can be considered for prioritizing and assessing chemicals such as task-based controls, banding methods, and sampling and analysis methods. OSHA should not get bogged down exploring new approaches, but should focus on actions that reduce worker exposure and occupational disease.

Appendix A
 OSHA Regulation Timeline
 1970 – 2015



Appendix B

Table of OELs for Priority Chemicals

CHEMICAL	OSHA PEL (2015)	1989 PEL (VACATED)	CALIFORNIA PEL (2013)	ACGIH TLV (2015)	NIOSH REL (2013)	GERMAN MAK (2012)	EPA (2015)	IARC (2015)
ANESTHETIC GASES	NONE	NONE	NONE		NONE	NONE	NONE	NONE
1-BROMOPROPANE	NONE	NONE	5 ppm		NONE	NONE	NONE	NONE
CARBON MONOXIDE	50 ppm	35 ppm (C) 200 ppm	25 ppm (C) 200 ppm	25 ppm	35 ppm (C) 200 ppm	30 ppm	NONE	NONE
CHEMOTHERAPUTIC AGENTS	NONE	NONE	NONE		NONE	NONE	NONE	Class 1 carcinogen
DIESEL EXHAUST	NONE	NONE	NONE		Carcinogen, recommend exposure be as low as feasibly achievable	Class 2 Carcinogen	Likely carcinogen	Class 1 carcinogen
DUST, NOT OTHERWISE CHARACTERIZED								
TOTAL	15 mg/m ³	15 mg/m ³	10 mg/m ³		10 mg/m ³	4 mg/m ³	NONE	NONE
RESPIRABLE	5 mg/m ³	5 mg/m ³	5 mg/m ³		5 mg/m ³	0.3 mg/m ³	NONE	NONE
GLUTERALDEHYDE	NONE	(C) 0.2 ppm	(C) 0.05 ppm		(C) 0.2 ppm	0.05 ppm	NONE	NONE
ISOCYANATES								
HDI	NONE	NONE	0.005 ppm		0.005 ppm (C) 0.02 ppm [10-min]	0.005 ppm	NONE	NONE
IPDI	NONE	NONE	0.005 ppm (ST) 0.02 ppm		0.005 ppm (ST) 0.02 ppm	0.005 ppm	NONE	NONE
MDI	(C) 0.2 ppm	NONE	0.005 ppm	0.005 ppm	0.005 ppm (C) 0.02 ppm [10-min]	0.05 mg/m ³	NONE	Class 3 Not classifiable as carcinogen

NDI	NONE	NONE	(C) 0.01 ppm		0.005 ppm (C) 0.02 ppm [10-min]	NONE	NONE	Class 3 Not classifiable as carcinogen
TDI	(C) 0.2 ppm	NONE	0.005 ppm (ST) 0.02 ppm (C) 0.02 ppm	0.005 ppm (ST) 0.02 ppm	Carcinogen, recommend exposure be as low as feasibly achievable	NONE	NONE	Class 2B Possible carcinogen
MANGANESE	(C) 5 mg/m3	(C) 5 mg/m3 Fume: 1 mg/m3 (ST) 3 mg/m3	0.2 mg/m3	0.02 mg/m ³ (R) 0.1 mg/m ³ (IHL) (elemental and inorganic compounds)	1 mg/m3 (ST) 3 mg/m3	0.02 mg/m3	NONE	NONE
MERCURY								Class 3 Not classifiable as carcinogen
ALKYLS	0.01 mg/m3 (C) 0.04 mg/m3		0.01 mg/m3 (C) 0.04 mg/m3 (ST) 0.03 mg/m3	0.01 mg/m3 (ST) 0.03 mg/m3	0.01 mg/m3 (ST) 0.03 mg/m3	NONE	NONE	
INORGANIC	(C) 0.1 mg/m3	(C) 0.1 mg/m3	0.025 mg/m3 (C) 0.1 mg/m3	0.025 mg/m3	0.05 mg/m3	0.02 mg/m3	NONE	
ARYL	0.1 mg/m3	0.1 mg/m3	(C) 0.01 mg/m3	NONE	0.05 mg/m3	NONE	NONE	
VAPOR	0.1 mg/m3	0.5 mg/m3		NONE	0.05 mg/m3	NONE	NONE	
METALWORKING FLUIDS						Substance dependent		
N-HEXANE	500 ppm	50 ppm	50 ppm	50 ppm	50 ppm	50 ppm	NONE	NONE

PERCHLOROETHYLENE	100 ppm (C) 200 ppm [5- min in 3-hrs] (ST) 300 ppm	25 ppm	25 ppm (C) 300 ppm (ST) 100 ppm	25 ppm (ST) 100	Carcinogen, recommend exposure be as low as feasibly achievable	NONE	Likely carcinogen	Class 2A Probable carcinogen
STYRENE	100 ppm (C) 200 ppm (ST) 600 ppm	50 ppm (ST) 100 ppm	50 ppm (ST) 100 ppm (C) 500 ppm	20 ppm (ST) 40 ppm	50 ppm (ST) 100 ppm	20 ppm	NONE	Class 2B Possible carcinogen
TOLUENE	200 ppm (C) 300 ppm (ST) 500 ppm	100 ppm (ST) 150 ppm	10 ppm (C) 500 ppm (ST) 150 ppm	20 ppm	100 ppm (ST) 150 ppm	50 ppm	NONE	Class 3 Not classifiable as carcinogen
WELDING FUMES	NONE	NONE	5 mg/m3		Carcinogen, recommend exposure be as low as feasibly achievable	NONE	NONE	Class 2B Possible carcinogen