

**OCCUPATIONAL SAFETY
AND HEALTH STANDARDS BOARD**

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Title 8: Division 1, Chapter 4, Subchapter 7, Article 107, Section 5155
of the General Industry Safety Orders

Airborne Contaminants**SUMMARY**

Labor Code, Section 144.6 requires that the Occupational Safety and Health Standards Board (Standards Board), when dealing with standards for toxic materials and harmful physical agents, adopt standards which most adequately assure, to the extent feasible, that no employee suffer material impairment of health or functional capacity even if such employee has regular exposure to the hazard for the period of their working lifetime. This section also requires that the Standards Board base standards on research, demonstrations, experiments and other information as may be appropriate. Labor Code, Section 144.6 also lists other considerations such as the latest scientific literature, the reasonableness of the standards, and experience gained under this and other health and safety laws.

Existing Section 5155 establishes minimum requirements for controlling employee exposure to specific airborne contaminants. This section specifies several types of airborne exposure limits, along with requirements for control of short term exposures generally to prevent harmful effects such as narcosis, significant irritation of the eyes, the skin, or the respiratory tract, as well as chronic or irreversible tissue changes. Section 5155 also requires that, for specified substances that may be absorbed into the bloodstream through the skin, mucous membranes or the eye, appropriate clothing be provided for and used by employees as necessary to prevent skin absorption. Section 5155 also contains requirements for measurement of workplace airborne exposures and, in certain situations, medical surveillance.

On an ongoing basis with the assistance of an advisory committee, the Division of Occupational Safety and Health (Division) develops proposals to amend these airborne exposure limits known as Permissible Exposure Limits (PELs). This ongoing review is necessary to take into account changes in the information available to assess the health effects of exposures to airborne substances that can be present in the workplace.

SPECIFIC PURPOSE AND FACTUAL BASIS OF THE PROPOSED ACTION

This proposal was developed by the Division pursuant to its mandate in Labor Code Section 147.1 to maintain surveillance and propose standards to the Standards Board. The Division relies in part on changes made to the Threshold Limit Values (TLVs) published by the American Conference of Governmental Industrial Hygienists (ACGIH) to indicate substances to be considered for change; the changes date from after 2001. The changes to ACGIH TLVs have been the most important source used by the Division to produce the base list for consideration for new and revised PELs for several reasons. The ACGIH TLVs are the most comprehensive single source of exposure limits available, the ACGIH TLVs are substantiated by available documentation, and there are ongoing reviews of the TLVs by the ACGIH with annual revisions.

The Division, in developing this and past proposals for amendments to Section 5155, has convened advisory committees to consider and make recommendations on the substances in the base list. These advisory committees assist the Division in evaluating and interpreting the studies and other scientific information listed in the Documents Relied Upon section that form the factual basis of proposals for revisions to Section 5155. The advisory committees for PELs also provide an additional avenue for involvement in the rulemaking process by employers and worker representatives, and by other communities that can be affected by revisions to Section 5155.

The substances with amended PELs in this proposal were first considered by the Division's Health Expert Advisory Committee (HEAC) in meetings between November 2007 and March 2009. The HEAC independently evaluated the health basis of the changes made to TLVs using the ACGIH documentation, presentations and additional documentation provided by interested parties, documents referred to in the ACGIH documentation, and other documents provided by the members of the Committee. As in the last round of work on PELs by the Division's advisory committee from 2001 to 2004, technical assistance was provided to the HEAC by staff of the Office of Environmental Health Hazard Assessment (OEHHA) and the Hazard Evaluation System and Information Service (HESIS) in the California Department of Public Health. In addition, informal public comment was invited on the PELs recommended by the HEAC for potential feasibility and cost issues at a meeting of the Division's Feasibility Advisory Committee (FAC) on May 28, 2009.

All meetings of both the HEAC and FAC were open to the public. The discussion below refers to meetings of the HEAC as well as "health assessment" documents initially developed by individual HEAC members and then modified in response to the discussion at HEAC meetings. The technical information in these documents is intended to provide support to the HEAC discussion as it is ongoing. As a result, they also serve as a supplement to the minutes for each meeting by providing background information for the HEAC discussion. In some cases, the document for a substance may be revised after the end of the discussion to reflect the HEAC recommendation but that is not a central purpose of the documents and is not done in all cases.

The HEAC health assessment documents for the individual substances for which revised PELs are being proposed in this rulemaking, as well as minutes for HEAC and FAC meetings, can be viewed at the Division's PEL project websites:

For HEAC meetings held in 2007 and 2008:
<http://www.dir.ca.gov/dosh/DoshReg/5155Meetings.htm>
For HEAC and FAC meetings held in 2009:
http://www.dir.ca.gov/dosh/DoshReg/5155Meetings_2009.htm

The last versions of the HEAC health assessment documents referred to in this rulemaking are those posted for the FAC meeting of May 28, 2009.

In this rulemaking, the four PELs being proposed were general consensus recommendations of the HEAC with respect to their health basis. While in individual instances one or more HEAC members may have expressed a preference for a higher or lower PEL recommendation based on health effects, no objections were expressed by HEAC members present at the committee meetings at which discussion concluded, and no objections were expressed after the meeting by members who were unable to attend. With respect to feasibility and cost, a meeting of the FAC was held primarily to receive comments from interested parties on such issues. For the FAC meeting, direct contact was made with at least one industry organization for each substance that it was believed might be affected by the proposed PEL amendment and with a group representing workers (WorkSafe) which is an active participant in the PEL advisory committee. In addition, a wide range of representatives of employers, employees, and the chemical industry were informed of the FAC meeting through the usual meeting notice process. As noted in the minutes for the FAC meeting of May 28, 2009, no industry or worker representatives with a special interest in the substances discussed which are the subject of this proposal raised issues at the meeting with respect to cost or feasibility of the PELs being proposed. However, written comments were submitted by the American Chemistry Council and Honeywell Corporation with regard to hydrogen fluoride as discussed below, and these comments were discussed in the FAC meeting.

The following is a discussion of the specific amendments proposed to Table AC-1 in Section 5155 in the order that they occur in the proposal.

Carbon disulfide

The PEL for carbon disulfide is proposed to be lowered from 4 ppm 8-hour time-weighted average (TWA) to 1 ppm 8-hour TWA. The existing 15-minute Short Term Exposure Limit (STEL) of 12 ppm and the 30 ppm Ceiling value are retained for the added level of worker protection they can help to provide and so that the California PEL continues to be at least as effective as that of federal OSHA. The proposed amendments to the 8-hour TWA for carbon disulfide would make it the same as the ACGIH TLV published in 2006. Carbon disulfide is

present as a contaminant in the sulfur production process in petroleum refining, and can be found in California chemical production and analytical laboratory operations.

As detailed in the HEAC health assessment document, studies of exposed workers and animals have identified the nervous system as the most sensitive target for the toxic effects of exposure to carbon disulfide in the workplace. Other health effects possibly associated with exposure to carbon disulfide have been suggested by occupational and/or toxicological studies including reproductive and developmental toxicity and cardiovascular disease. In the current risk assessments of the U.S. Agency for Toxic Substances and Disease Registry (ATSDR), the U.S. Environmental Protection Agency (EPA), and OEHHA, nervous system effects appear to be the most sensitive health endpoint for exposure to carbon disulfide. All three agencies noted above, as well as ACGIH, based their recommendations primarily on the workplace study of Johnson et al. (1983) and its findings of small but statistically significant reductions in sural sensory nerve conduction velocity and peroneal motor nerve conduction velocity. In addition to these risk assessments, the HEAC considered the study of Godderis et al. (2006) published subsequent to the agency assessments noted. This study identified what appeared to be slight effects on the nervous system from worker exposure to carbon disulfide at levels possibly as low as 3 ppm. The HEAC at its December 16, 2009 meeting discussed a PEL of 0.3 ppm based on the Godderis et al. findings, derived by application of a total uncertainty factor of 10 to the lowest exposure level at which possible health effects were detected. This uncertainty factor consisted of a factor of 3 for Lowest Observed Adverse Effect Level (LOAEL) to No Observed Adverse Effect Level (NOAEL) adjustment since a no-effect level was not seen in the Godderis et al. study, and 3 for intraspecies variability in susceptibility in humans. However, recognizing the convergence around the level of 1 ppm of possible PELs derived from the existing recommendations of a number of government agencies based primarily upon the Johnson et al. (1983) study, as well as the ACGIH TLV and NIOSH Recommended Exposure Level (REL) of 1 ppm 8-hour TWA, amendment of the existing PEL (8-hour TWA) to 1 ppm for carbon disulfide exposure in the workplace is proposed to prevent significant decrements in peripheral motor nerve conduction.

During and after the HEAC deliberations on the PEL for carbon disulfide, correspondence was sent to the Division by the Carbon Disulfide Coalition, members of which include producers and users of carbon disulfide. The Coalition's August 29, 2008 letter focused primarily on limitations in the exposure assessments of the Johnson et al. (1983) study which is the basis for the PEL proposed, and others studies which, along with the Johnson et al. (1983) study are the basis for the TLV and the government agency risk assessments discussed above. The letter suggested that the studies claiming to find neurotoxicity from exposure to carbon disulfide are based upon inaccurately low levels of exposure reportedly being associated with effects on the nervous system. Workplace exposure measurement limitations in the Johnson et al. (1983) study were acknowledged in the government risk assessments noted above, but they were not deemed to be disqualifying of the study.

ACGIH also noted limitations in the exposure measurements of Johnson et al. (1983) and other studies cited in support of its TLV, but did not believe these precluded the setting of the TLV (8-

hour TWA) at 1 ppm. In its March 23, 2009 letter, the Coalition raised a number of questions about the Godderis et al. (2006) study discussed by the HEAC. However, while the findings of this workplace study were cited in the HEAC health assessment document as possibly suggesting a lower PEL than that recommended by the committee, it did not form the basis of the PEL ultimately recommended by the HEAC.

Hydrogen fluoride

The PEL for hydrogen fluoride is proposed to be lowered from 3 ppm 8-hour time-weighted average (TWA) to 0.4 ppm 8-hour TWA, and from the current PEL STEL of 6 ppm to 1 ppm, both measured in air as fluoride. The TLV for hydrogen fluoride, published by ACGIH in 2005, is 0.5 ppm 8-hour TWA and 2 ppm Ceiling, also as fluoride. Consistent with the revised TLV, it is also proposed to add a "Skin" designation to the PEL for hydrogen fluoride. The EPA's 2007 Toxic Release Inventory (TRI) database for California includes inventory and release reports from a variety of California industries using or storing hydrogen fluoride including electronics manufacture and research, metal package manufacturing, power generation, and petroleum refining. The TRI database can be accessed on the Internet at <http://www.epa.gov/triexplorer/>.

As discussed in detail in the HEAC health assessment document developed in the HEAC for hydrogen fluoride, the committee's recommendation of 0.4 ppm 8-hour TWA was based primarily on the findings of Lund et al. (1999), supported by the findings of Lund et al. (1997). These studies were also cited in the ACGIH Documentation as the basis for the revised TLV. Lund et al. (1999) found a dose-related inflammatory response in the lower respiratory tract as measured by changes in bronchoalveolar lavage fluid in 19 healthy non-smoking male volunteers exposed for 1-hour to levels of hydrogen fluoride as low as 0.7 mg/M³ (0.86 ppm HF). Lund et al. (1997) found upper airway irritation, lasting up to 4 hours after exposure, among 23 male volunteers exposed to hydrogen fluoride levels ranging from 0.2 to 5.2 mg/M³ (0.24 to 6.4 ppm HF) but the results did not reflect a clear dose-response relationship. As discussed in the HEAC assessment document, a PEL of 0.4 ppm as was recommended by the HEAC is also supported by the findings of the study of Derryberry et al. 1963 with respect to slight increases in bone density (skeletal fluorosis) in 74 workers in a phosphate fertilizer plant.

The revised ACGIH TLV includes a Ceiling value of 2 ppm to protect against the corrosive effect of hydrogen fluoride. Instead of a Ceiling value, the HEAC recommended a STEL of 1 ppm based upon the general approach of the STEL for acute irritant effects being set at roughly 3 times the 8-hour TWA, in this case that recommended by the HEAC being 0.4 ppm. As recommended by the HEAC, and consistent with discussion at the FAC meeting of May 28, 2009, the Standards Board is proposing a STEL, rather than a Ceiling value, as in the TLV in recognition of the difficulty of making instantaneous measurements of airborne concentrations of hydrogen fluoride in the workplace given currently available technology.

In response to the notice for the FAC meeting of May 28, 2009, a letter dated May 14, 2009 was received by the Division from the Manager of the Hydrogen Fluoride Panel of the American

Chemistry Council (ACC). A similar letter was received from the Director of Toxicology and Risk Assessment at Honeywell Corporation, also dated May 14, 2009. The letters discussed the health data on which the HEAC recommended PEL revision for hydrogen fluoride was based and recommended that the ACGIH TLV was adequately protective. These letters arrived well after the conclusion of the discussion of the health basis for the PEL by HEAC at its meeting on September 5, 2008; however, they both focused on the apparent change in the HEAC-recommended PEL, as originally suggested at its November 7, 2007 meeting, from the TLV to the lower values for the TWA and STEL noted above. It is noted that this change was made in response to concerns that a STEL of 2 was unacceptably close to LOAEL values that had been identified for irritation, for example that of Lund et al. (1997), with a LOAEL range of 2.5 to 5.2 mg/M³ (3 to 6.2 ppm) determined by OEHHA as indicated in its Acute Reference Exposure Level document (2008).

The ACC and Honeywell letters refer to a number of the same studies discussed in the HEAC health assessment document for hydrogen fluoride. Most centrally, they both suggest that the study of Lund et al. (1997) established a NOAEL value of 0.7 mg/M³ (0.86 ppm). However, the HEAC did not base its PEL recommendation on this study, but instead, as detailed in the HEAC health assessment document, on the findings of exposed volunteers in Lund et al. (1999) with a LOAEL of 0.7 mg/M³ for changes in bronchoalveolar lavage fluid suggesting occurrence of an inflammatory response with this level of exposure. While the HEAC document and meeting discussion noted that this response by itself is of uncertain direct clinical significance, the HEAC generally felt that it could indicate occurrence of clinically significant effect and so felt that the PEL should be set based on preventing this effect. It was decided by the HEAC, and is proposed by the Board, that a PEL (8-hour TWA) of 0.4 ppm is appropriate, given the LOAEL value identified in the Lund et al. (1999) study.

The comment in the Honeywell letter, specifically with respect to the benefit of the PEL being consistent with the ACGIH TLV in the interest of a consistent nationwide standard, generated considerable discussion in the May 28, 2009 FAC meeting on the possible cost implications of a relatively minor deviation of the PEL from the TLV, especially for entities doing business throughout the United States. The Honeywell letter suggested a consistent national standard would reduce confusion and contribute to more uniform application of the standard. FAC members noted that for hydrogen fluoride, a PEL deviating from the TLV could necessitate the production of California-specific training programs and exposure monitoring records, and it might be difficult to establish that the additional possible protection provided by a PEL somewhat lower than the TLV would justify such potential costs to employers. The FAC members' expression of concern on this point concluded with general agreement that, with regard to PELs for individual substances such as HF, this is a policy matter that would need to be decided by the Division and the Standards Board.

The Standards Board agrees that consideration needs to be given to the potential costs and benefits of minor deviations of PELs from ACGIH TLVs or other widely recognized exposure standards. In the case of hydrogen fluoride, the Standards Board believes that there are

particularly compelling reasons for the factor of two difference between the STEL value recommended by the HEAC, and the Ceiling value of the ACGIH TLV. The Standards Board believes that concerns with measurement feasibility warrant proposal of a STEL rather than a Ceiling value. A STEL value being assessed over a 15-minute period is inherently less protective than a Ceiling value assessed instantaneously, and so a lower value for the STEL is warranted.

While the health significance of a full shift PEL of 0.4 ppm recommended by the HEAC as compared to the TLV of 0.5 ppm can be debated, the Standards Board is inclined generally, and in this instance specifically, to rely on the expertise of the HEAC on such a matter. If the STEL value is adopted by the Standards Board as recommended by the HEAC and proposed in this rulemaking, the costs of inconsistency discussed in the FAC meeting of May 28, 2009 will be largely the same whether or not the 8-hour TWA value of the PEL is made consistent with the ACGIH TLV. In light of these several related considerations, the Board is proposing both the full-shift and STEL values recommended by the HEAC in recognition of its expertise and the discussion of hydrogen fluoride that took place over a span of several of its meetings.

Sulfuric acid

The PEL for sulfuric acid is proposed to be lowered from 1 mg/M³ to 0.1 mg/M³ as an 8-hour TWA with no change to the particulate fraction used for measurement of employee exposure. The existing 15-minute STEL of 3 mg/M³ is proposed to be deleted, because one 15-minute period at this level will almost exceed the proposed PEL for an entire 8-hour work shift. The ACGIH TLV for sulfuric acid is 0.2 mg/M³ collected with a thoracic particulate fraction size selection device. This TLV was first published in 2004. Through the 2009 TLVs, sulfuric acid is the only TLV that is based on the thoracic particulate fraction. The EPA's 2007 Toxic Release Inventory database for California includes inventory and release reports from a variety of California industries using or storing sulfuric acid, including metal container manufacturing, power generation, petroleum refining, and printed circuit board manufacture. Sulfuric acid is also widely used for metal cleaning and treatment, as in electroplating operations, and can be present in workplaces handling, servicing, and manufacturing vehicle batteries.

The PEL of 0.1 mg/M³ being proposed is not based on use of a thoracic particulate fraction size selection device for measurement. As discussed in detail in the HEAC health assessment document for this substance, the PEL being proposed is intended to protect against pathological effects on the upper and lower respiratory tract caused by chronic exposure to sulfuric acid. The primary basis for this assessment is the primate exposure study of Alarie et al. (1973). The HEAC believed that this PEL would also serve to protect against irritation caused by acute exposure to sulfuric acid. As detailed in the assessment document, a wide range of human and experimental animal studies were reviewed in its preparation. The ACGIH TLV Documentation also cites the Alarie et al. (1973) study as being central in deriving the TLV based on non-cancer effects on the respiratory system. While ACGIH assigns sulfuric acid an A2 designation, Suspected Human Carcinogen (when contained in strong inorganic acid mists), neither the TLV nor the PEL

recommended by the HEAC directly address this risk, due to limitations in the available health risk data that make it problematic to estimate a value appropriately protective for the cancer risk possibly posed by sulfuric acid. The thoracic particulate fraction used by the ACGIH is not proposed as the measurement basis for the PEL as it was not the basis of the studies used to assess the health effects of sulfuric acid.

Some comments on the sulfuric acid PEL were presented at the September 8, 2008 HEAC meeting were as follows:

- The ACGIH TLV of 0.2 mg/M³ is adequate and appropriate as a PEL, rather than the value suggested in the current draft assessment document of 0.1 mg/M³.
- In the interest of technological progress and consistency with ACGIH, the standard should be expressed in terms of “thoracic” particulate, consistent with the TLV, rather than “total” particulate as suggested in the current draft assessment document.
- The current draft recommendation is based at least in part on data from human adolescent asthmatics; the PELs should instead be based on adult data, and would not generally be expected to protect against asthma.
- Sulfuric acid by itself should not be designated as a cancer-causing agent in the PEL.

As noted above, the PEL proposed for sulfuric acid could not be based on prevention of cancer. Also, as noted above, the TLV is not proposed to be based on the “thoracic” particulate fraction used by ACGIH in the TLV for sulfuric acid, as this was not the basis for the studies used to assess the hazard of sulfuric acid upon which the PEL is proposed to be based. With regard to proposing a value of 0.1 or 0.2 mg/M³ for the PEL, the HEAC discussed extensively over the course of several meetings the appropriate level for a revised PEL. Committee members’ judgment was that a balancing of factors in the Alarie et al. (1973) study supported a PEL value of 0.1 mg/M³ to effectively protect against pathological effects on the upper and lower respiratory tract caused by chronic exposure to sulfuric acid.

The question of protecting sensitive individuals was discussed in detail in the HEAC meeting of April 29, 2009, with the benefit of the presence of two occupational medicine physicians. It was noted that the population of “sensitive” individuals being discussed for protection from the effects of sulfuric acid could amount to 20% of the working population and so did not constitute derivation of a PEL to protect only a small fraction of workers. For all of these reasons, the recommendation for a PEL for sulfuric acid identical to the ACGIH TLV was not accepted by the HEAC and is not being proposed by the Board.

Toluene

The PEL for toluene is proposed to be lowered from 50 ppm 8-hour TWA to 10 ppm 8-hour TWA with retention of the existing Skin notation, Ceiling and STEL values. The ACGIH TLV for toluene, published in 2007, is 20 ppm 8-hour TWA with a Skin notation. The TLV was set to protect against effects on color vision found in studies of exposed workers, as well as to increase protection from risk of spontaneous abortion in exposed female workers. The EPA's 2007 Toxic Release Inventory database for California includes inventory and release reports from a variety of California industries using or storing toluene including specialty chemical manufacture, coatings manufacture, electronics, petroleum refining and storage, and general manufacturing. Toluene is also a widely used solvent in a range of smaller manufacturing and service operations that would not store or release sufficiently large quantities to report to the TRI database.

As detailed in the HEAC Health-Based Assessment and Toluene PEL Recommendation section of the HEAC health assessment document, the PEL of 10 ppm being proposed as an 8-hour TWA (rounded from the 11 ppm value derived in the HEAC document) is recommended to protect workers from toluene-induced neurologic effects (i.e., impaired color vision, impaired hearing, decreased performance in neurobehavioral analysis, changes in motor and sensory nerve conduction velocity, headache, and dizziness). The PEL recommendation is based on the average NOAEL of 34 ppm identified by US EPA from ten occupational studies of neurotoxicity (US EPA, 2005). The HEAC assessment, consistent with EPA's evaluation, was based on the conclusion that neurologic effects are the most sensitive endpoint of occupational exposure to toluene, and that no single study stood out as the best study upon which to specify a single critical neurological effect. An intraspecies uncertainty factor of 3 was applied to the NOAEL identified in the EPA (2005) document based on differences in worker susceptibility to toluene exposure due to the inability of certain populations to metabolize toluene as detailed by a number of studies reviewed in the EPA evaluation.

At its December 16, 2008 meeting, the HEAC discussed a PEL of 3 ppm for toluene based on the findings of the workplace study of Ng et al.(1992) of female workers in an audio speaker factory exposed to toluene. That study identified a possible increased risk of spontaneous abortion from workplace exposure to toluene. The findings of this study were discussed in the HEAC health assessment document for toluene. Comments were submitted supporting a PEL of 3 ppm based on the Ng et al. study. Although a PEL of 3 ppm was not recommended by the HEAC due to limitations of the Ng et al. study discussed in the December 16, 2008 meeting, it is believed that the PEL of 10 ppm being proposed will help reduce the risk of spontaneous abortion that toluene may pose.

DOCUMENTS RELIED UPON

American Conference of Governmental Industrial Hygienists (ACGIH) Documentation for TLVs for the following substances:

- a. Carbon Disulfide (ACGIH 2006, CAS No: 75-15-0)
- b. Hydrogen Fluoride (ACGIH 2005, CAS No: 7664-39-3)
- c. Sulfuric Acid (ACGIH 2004, CAS No: 7664-93-9)
- d. Toluene (ACGIH 2007, CAS No: 108-88-3)

CARBON DISULFIDE

1. U.S. Agency for Toxic Substances and Disease Registry (ATSDR), ATSDR Carbon Disulfide Risk Assessment, August 1996.
<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=474&tid=84>
2. U.S. Environmental Protection Agency (EPA), Integrated Risk Information System (IRIS), Carbon Disulfide Reference Concentration, CASRN 75-15-0, August 1, 1995.
<http://www.epa.gov/iris/subst/0217.htm>
3. California Office of Environmental Health Hazard Assessment (OEHHA), Chronic Toxicity Summary, Carbon Disulfide, CAS Register Number: 75-15-0.
http://www.oehha.ca.gov/air/chronic_rels/pdf/sum111401.pdf
4. Johnson, B.L., et al. Effects on the Peripheral Nervous System of Workers' Exposure to Carbon Disulfide. *NeuroToxicology*, 4(1):53-66, 1983.
5. Godderis, L., et al. Neurobehavioral and Clinical Effects in Workers Exposed to Carbon Disulphide (CS₂). *International Journal of Hygiene and Environmental Health*, 209 (2006) 139-150.
6. National Institute for Occupational Safety and Health (NIOSH), Criteria for a Recommended Standard: Occupational Exposure to Carbon Disulfide, Publication No. 77-156. May 1977.
<http://www.cdc.gov/niosh/77-156.html>

HYDROGEN FLUORIDE

7. Lund, K., MD, et al. Increased CD3 positive cells in bronchoalveolar lavage fluid after hydrogen fluoride inhalation. *Scand J Work Environ Health* 1999; 25(4):326-334.
8. Lund, K., et al. 1997. Exposure to hydrogen fluoride: an experimental study in humans of concentrations of fluoride in plasma, symptoms, and lung function. *Occupational and Environmental Medicine* 1997; 54:32-37.
9. Derryberry, O.M., MD, et al. April 1963. Fluoride Exposure and Worker Health. *Archives of Environmental Health* 6:503-514.

10. Office of Environmental Health Hazard Assessment, Cal-EPA, Technical Support Document for Noncancer RELs, Acute Toxicity Summary for Hydrogen Fluoride, June 2008, page 131-137.

http://www.oehha.org/air/hot_spots/2008/AppendixD2_final.pdf#page=131

SULFURIC ACID

11. Alarie, Y., PhD, et al. Long-Term Continuous Exposure to Sulfuric Acid Mist in Cynomolgus Monkeys and Guinea Pigs. Archives of Environmental Health Vol. 27:16-24. July 1973.

TOLUENE

12. U.S. Environmental Protection Agency. Toxicological review of toluene (CAS No. 108-88-3): In support of summary information on the integrated risk information system (IRIS).

[EPA/635/R-05/004](http://www.epa.gov/IRIS/toxreviews/0118tr.pdf). EPA, Washington, D.C. August 23, 2005.

<http://www.epa.gov/IRIS/toxreviews/0118tr.pdf>

13. Ng, T.P., et al. Risk of spontaneous abortion in workers exposed to toluene. British Journal of Industrial Medicine, 1992; 49:804-808.

These documents are available for review Monday through Friday from 8:00 a.m. to 4:30 p.m. at the Standards Board Office located at 2520 Venture Oaks, Suite 350, Sacramento, California. For those documents that are available on the internet, the website links to these documents are listed for your convenience.

DOCUMENTS INCORPORATED BY REFERENCE

None.

REASONABLE ALTERNATIVES THAT WOULD LESSEN ADVERSE ECONOMIC IMPACT ON SMALL BUSINESSES

No reasonable alternatives were identified by the Standards Board and no reasonable alternatives identified by the Standards Board or otherwise brought to its attention would lessen the impact on small businesses.

SPECIFIC TECHNOLOGY OR EQUIPMENT

This proposal will not mandate the use of specific technologies and equipment.

COST ESTIMATES OF PROPOSED ACTION

This rulemaking proposal contains proposed revisions of PELs for four substances. The primary users of those substances are the private industrial and chemical sectors. The exposure limits proposed are consistent with recommendations of the ACGIH or with scientific findings, of which the professional health and safety staffs and consultants of those entities should be aware. Many of those entities already seek to control employee exposures to these levels in the interest of business continuity and minimization of tort and workers compensation liability. Therefore, the additional expenditures by these entities to comply with the revised standard are estimated to be insignificant to none.

Informal comments on potential cost impacts were actively sought in the course of development of this proposal and a FAC public meeting was held specifically to receive such comments verbally and to provide an opportunity for commenter discussion. The only potentially cost-related comment received in this process was from Honeywell with regard to hydrogen fluoride. This comment suggested that a PEL consistent with the ACGIH TLV would reduce confusion and contribute to more uniform application of the standard. This comment was discussed at some length in the meeting of the FAC which concluded that with respect to individual substances this was a matter of policy that the committee could not decide. The commenter did not suggest the specific costs that could be associated with the inconsistency that was their stated concern and it was concluded that the potential costs noted in their comment with respect to hydrogen fluoride are not significant.

Costs or Savings to State Agencies

No costs or savings to state agencies will result as a consequence of the proposed action.

Impact on Housing Costs

The Standards Board has made an initial determination that this proposal will not significantly affect housing costs.

Impact on Businesses

The Standards Board has made a determination that this proposal will not result in a significant, statewide adverse economic impact directly affecting businesses, including the ability of California businesses to compete with businesses in other states.

This determination of no significant adverse economic impact directly affecting businesses was made using the advice provided by affected stakeholders during the Division's feasibility advisory committee held on May 28, 2009. See also the section under "Cost Estimates of Proposed Action."

Cost Impact on Private Persons or Businesses

The Standards Board is not aware of any cost impact that a representative private person or business would necessarily incur in reasonable compliance with the proposed action.

Costs or Savings in Federal Funding to the State

The proposal will not result in costs or savings in federal funding to the state.

Costs or Savings to Local Agencies or School Districts Required to be Reimbursed

No costs to local agencies or school districts are required to be reimbursed. See explanation under "Determination of Mandate."

Other Nondiscretionary Costs or Savings Imposed on Local Agencies

This proposal does not impose nondiscretionary costs or savings on local agencies.

DETERMINATION OF MANDATE

The Occupational Safety and Health Standards Board has determined that the proposed standard does not impose a local mandate. Therefore, reimbursement by the state is not required pursuant to Part 7 (commencing with Section 17500) of Division 4 of the Government Code because the proposed amendments will not require local agencies or school districts to incur additional costs in complying with the proposal. Furthermore, the standard does not constitute a "new program or higher level of service of an existing program within the meaning of Section 6 of Article XIII B of the California Constitution."

The California Supreme Court has established that a "program" within the meaning of Section 6 of Article XIII B of the California Constitution is one which carries out the governmental function of providing services to the public, or which, to implement a state policy, imposes unique requirements on local governments and does not apply generally to all residents and entities in the state. (County of Los Angeles v. State of California (1987) 43 Cal.3d 46.)

The proposed standard does not require local agencies to carry out the governmental function of providing services to the public. Rather, the standard requires local agencies to take certain steps to ensure the safety and health of their own employees only. Moreover, the proposed standard does not in any way require local agencies to administer the California Occupational Safety and Health program. (See City of Anaheim v. State of California (1987) 189 Cal.App.3d 1478.)

The proposed standard does not impose unique requirements on local governments. All state, local and private employers will be required to comply with the prescribed standards.

EFFECT ON SMALL BUSINESS

The Standards Board has determined that the proposed amendments may affect small businesses. However, no adverse economic impact is anticipated.

ASSESSMENT

The adoption of the proposed amendments to the standard will neither create nor eliminate jobs in the State of California nor result in the elimination of existing businesses or create or expand businesses in the State of California.

ALTERNATIVES THAT WOULD AFFECT PRIVATE PERSONS

No reasonable alternatives have been identified by the Standards Board or have otherwise been identified and brought to its attention that would be more effective in carrying out the purpose for which the action is proposed or would be as effective and less burdensome to affected private persons than the proposed action.