

**OCCUPATIONAL SAFETY  
AND HEALTH STANDARDS BOARD**

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**FINAL STATEMENT OF REASONS**

## CALIFORNIA CODE OF REGULATIONS

TITLE 8, Section 5155 of the General Industry Safety Orders

**Airborne Contaminants: Hydrogen Chloride****MODIFICATIONS AND RESPONSES TO COMMENTS  
RESULTING FROM THE 45-DAY PUBLIC COMMENT PERIOD**

There are no modifications to the information contained in the Initial Statement of Reasons.

**SUMMARY OF AND RESPONSES TO ORAL AND WRITTEN COMMENTS****I. Written Comments:****David Y. Shiraishi, MPH, Area Director, U.S. Department of Labor, Occupational Safety and Health Administration, by letter dated March 19, 2014.**

Comment: Mr. Shiraishi's letter indicated that the proposal to amend Section 5155 by adding a revised PEL for Hydrogen Chloride (HCl) appears to be commensurate with the counterpart federal standard.

Response: The Board thanks Mr. Shiraishi for participating in this rulemaking process.

**James Unmack, CIH, Unmack Corporation, by letter dated March 11, 2014.**

Comment: The proposed standard for HCl should be rejected and sent back to the Health Experts Advisory Committee (HEAC). HCl is not irritating to humans at concentrations less than 2 ppm according to scientific studies. The proposed Permissible Exposure Limit (PEL) of 0.3 ppm time-weighted-average (TWA) is less than one half the odor threshold. HCl is not a carcinogen, and some scientists suggest the occupational exposure limit should be between 3 ppm and 9 ppm based upon the RD<sub>50</sub>. The proposed TWA would dramatically impact the electroplating and metal finishing industry. A 12% HCl open surface tank with good ventilation and without agitation would have HCl concentrations above the tank between 0.1 and 0.5 ppm, so the industry would be immediately out of compliance if this proposal is adopted. HCl is produced by many natural processes including chemical reactions on ocean salt spray; HCl concentration in sea breeze could be a significant fraction of the proposed TWA PEL. Since there is no record of morbidity among seafarers or beach goers, the proposed TWA PEL should be rejected and sent back to HEAC instead of being rushed to adoption.

Response: The Board appreciates Mr. Unmack's participation in the HEAC advisory process and this rulemaking process. The Board notes, however, that the proposed TWA PEL is not based on fifty percent animal death rates, human cancer, odor, or irritation health endpoints. Hyperplasia of laryngeal and other upper airway tissue is the endpoint addressed by the proposal. Hyperplasia, or the abnormal increase in the number of non-cancerous cells, would not rise to the level of people's every day awareness, in contrast to irritation. Hyperplasia is a chronic, not an acute effect, which means repeated exposure over time is necessary for the effect to arise. Irritation is an acute effect. Concentration of HCl over open surface tanks cannot be used to directly estimate the TWA exposures of plating shop employees. Workers in plating shops typically are mobile within the shop, and would not stand in front of the same tank for eight hours. When the work does require them to be near the HCl tanks for a few minutes, workers are "up-wind" of the flow of air generated by the tank ventilation system. HCl exposures should be at a lower value at the edge of the tanks where workers stand as compared to the atmosphere directly above the tank. The Board believes that the relatively low concentrations achievable above tanks, plus short durations of work at each tank, speak for the feasibility of the proposed PEL for the plating and metal finishing industries. No data or studies were discovered or submitted to the advisory committee to suggest that available engineering controls are insufficient to achieve the proposed TWA and Ceiling PELs. Finally, not much can be concluded about the potential health effects from the highly fluctuating, fleeting weather-related formation of gaseous HCl from sea spray. The average HCl concentration from this source and duration of occupational exposures is not known.

**Dr. Gulzar Ahmad, Ph.D., DABT, CIH, CHMM, CSAC, President/Senior Toxicologist, and Dr. Dildar Ahmad, M.D., ERT, Managing Director, Information Toxicology International, Inc., by letter March 13, 2014.**

Comment: According to Toxnet, HCl rapidly disassociates and its effects are the result of pH effect on mucous membranes rather than a specific toxicity of the chemical. There have been few detailed studies of human exposure. According to OEEHA, immediate irritation is experienced by people exposed to 5 ppm HCl, but a study of asthmatics found no irritation after 45 minutes of exposure to only 1.8 ppm. So, even in a sensitive population, exposures greater than 1.8 ppm are necessary to evoke an irritation response, and the proposed PEL of 0.3 ppm TWA is far too low. The proposal should be rejected and sent back to HEAC.

Response: The Board thanks Dr. Gulzar Ahmad and Dr. Dildar Ahmad and Information Toxicologist International, Inc. for their comments and participation in the rulemaking process. The Board notes that the proposed TWA PEL for HCl is based upon the health effect of hyperplasia, not irritation. Also, please see the responses to the similar comments of Mr. Unmack.

**Howard Spielman, CIH, CSP, PE, REHS, Principal, Health Science Associates, by letter dated March 14, 2014.**

Comment: As a HEAC member during the time the proposed HCl PEL was discussed, I'm concerned the HEAC process was not utilized properly. Several drafts of the assessment for a health based PEL were discussed with the major issue seeming to focus on whether all the years of human exposure to HCl should be given more or less weight than the results of a particular animal study. A final draft assessment, which is attached, was never discussed at a HEAC meeting. The authors of this draft recommended a STEL of 2 ppm and a ceiling of 5 ppm—very different from the 0.3 ppm 8-hour TWA proposed by DOSH. This lower value is based solely on the results of one animal study and the application of questionable uncertainty factors. This proposed PEL of 0.3 ppm TWA was not a consensus of HEAC, so adoption by the Board would be premature and the matter should be remanded to HEAC.

Response: The Board thanks Mr. Spielman for his comments and participation in the advisory and rulemaking processes. The Board does not agree that the HEAC process was not utilized properly. Mr. Spielman is mistaken in suggesting that the HEAC process was designed to achieve consensus. In fact, the HEAC was constituted so as to obtain the broadest possible input of medical and toxicological knowledge and opinion on complicated, complex issues so as to give the Division the information to make final decisions on what measures to recommend to the Board. The HEAC and FAC minutes and documents relied upon for the proposed HCl PEL of 0.3 ppm TWA show that a thorough discussion of differing opinions did indeed take place, and the Division did consider the recommendations Mr. Spielman mentions, even though the assessment document attached to Mr. Spielman's comments was submitted well after the second FAC meeting discussing HCl. Though reviewed by the Division, the document did not have any material likely to alter either the HEAC or FAC deliberations. The Board concurs with the Division's conclusion to use the hyperplasia chronic health endpoint rather than the acute irritation endpoint as the basis for the TWA. This choice is the better route to fulfill the Board's statutory mandate to protect worker health. The Board also concurs with the Division's conclusion that the calculation of the 0.3 ppm TWA proposed PEL was consistent with the modern practice of toxicology, as well as consistent with the derivation of other PELs that have recently come before the Board. Also, please see the responses to the comments of Mr. Unmack.

**Dr. Julia Quint, PhD, by email dated March 20, 2014.**

Comment: Dr. Quint commends the Board for proposing to amend the HCl PEL and supports the proposed PELs of 0.3 ppm TWA and 2 ppm Ceiling. Dr. Quint served on HEAC during all its deliberations on HCl, where she provided written comments recommending a PEL based on chronic toxicity, the most sensitive health endpoint. The proposed TWA and Ceiling PELs will protect against pathological changes (hyperplasia) to the larynx and thorax from repeated exposures to HCl as well as protecting against sensory irritation. Adoption of these changes is consistent with the Board's mandate to assure workers do not suffer material health impairment. The proposal is based on strong science consistent with the Cal/EPA chronic Reference Exposure

Level for HCl and based on quantitative risk analyses required by a US Circuit Court of Appeals decision. At neither the HEAC nor the FAC meetings was infeasibility of the proposed PEL discussed.

Response: The Board thanks Dr. Quint for her participation in the advisory process and for her comments on the scientific basis for and support of the proposed lowering of the TWA and Ceiling for HCl to 0.3 ppm and 2 ppm, respectively. The comments provided were considered during the HEAC process and by the Division in developing the proposal. As stated in the Initial Statement of Reasons (ISOR), the Board does consider the proposed PEL feasible.

**Dorothy Wigmore, MS, Occupational Health Specialist, Worksafe, by letter dated March 20, 2014.**

Comment: Worksafe supports the TWA and Ceiling recommendations for HCl and notes it has taken seven years to reach the Board. Worksafe also supports the clarifying deletion of “muriatic acid” from Table AC-1. Both federal EPA and California OEHHA have recognized the importance of the study showing hyperplasia in the rat larynx which, as indicated in the ISOR and the minutes of HEAC and FAC meetings, was the basis of the proposal. Hyperplasia is abnormal cell growth which could lead to cancer. Whether or not the laryngeal hyperplasia observed in this study does progress to cancer, Worksafe takes the study seriously, and urges the Board to do so as well so as to follow its mandate to ensure workers do not “suffer material impairment of health or functional capacity.” The Board should also note that Japan lists HCl as a respiratory sensitizer while in the US the Association of Occupational and Environmental Clinics lists it as an asthmagen. Once someone is sensitized, asthmagens can cause reactions at very low levels. The PEL advisory committee guidelines worked well in regard to the HEAC and FAC committees reaching agreement on the 0.3 ppm 8 hour TWA and 2 ppm Ceiling. PELs protect workers, so they need to be issued in a timely fashion. Calls to refer the proposal back to what is today a non-existent advisory committee are inconsistent with Board and Cal/OSHA mandates to protect workers’ health.

Response: The Board thanks Worksafe for its participation in the advisory process and for these comments supporting the proposed changes, including the PELs of 0.3 ppm TWA, Ceiling of 2 ppm for HCl and deletion of the term “muriatic acid”.

**Stephen Derman, AIHA Fellow, Principal, MediSHARE Environmental Health and Services, by letter dated March 20, 2014.**

Comment: As a member of the FAC and participant at nearly all HEAC meetings since 2007, there are several concerns with the proposal before the Board that make it appropriate for the proposal to be remanded to HEAC for additional review. The most recent draft document submitted by Unmack and Kleinman reviewing the scientific evidence on HCl was never discussed or considered by HEAC or FAC; nor was the OEHHA document. Worldwide credible conventions on occupational exposure level (OEL) research and standards setting include:

1. **Scientific derivation utilizing the “weight of evidence” approach with precedence of human over animal data.** The plethora of studies of human exposure to HCl examined by HEAC principal investigators Unmack and Kleinman included nearly 200 papers, so their conclusions must be considered. Although OEHHA’s reference level has been available for a number of years, no national or international organization has come to the same conclusion.
2. **Set the OEL at a risk level relative to protect worker’s health.** A lower PEL may make compliance harder without making the environment safer for workers. Over-regulation may cause employers to select more toxic chemical substitutes not yet as heavily regulated, or it may cause employers to move out of California.
3. **Compliance with an OEL must be achievable** with readily available analytical methods.
4. **The standard setting process must be open and transparent.** While HEAC and FAC processes have in general been open, not allowing discussion of the latest documentation submitted by Unmack and Kleinman sidestepped that transparency. The proposed PEL and the OEHHA reference level upon which it is based do not appear to be based on or derived from any human study. Instead, it is a derived number from an unsubstantiated and unrelated paper discussing rodent carcinogenicity, of which none was found. Many respected organizations utilize “weight of evidence” in their establishment OELs, and Cal/OSHA, to be deserving of equal respect, should do the same.

The HEAC/FAC process, absent for two years, should be reignited. The current lack of this expert, peer-reviewed process has resulted in this current proposal to the Board which makes HCl appear more toxic than hydrofluoric acid, equates overexposure to a sunny day at the beach and ignores all of the relevant evidence-based human studies. These deficiencies would have been pointed out if HEAC and FAC had reviewed the last Unmack/Kleinman paper submitted. I urge the Board to strongly consider the remarks submitted by Unmack and Spielman and reconvene the HEAC and FAC evaluation process to allow the OEL for HCl to be established by a thorough, objective and transparent process.

Response: The Board thanks Mr. Derman for his participation in the advisory process and for these comments. In the Board’s judgment, the HEAC/FAC process followed sound principles of occupational exposure level setting in evaluating HCl, and the proposed TWA and Ceiling PELs are appropriate. As the OEHHA concluded, the rat study documenting hyperplasia must be considered significant. The many other studies mentioned by the commenter do not controvert the significance of the study being relied upon. Human studies that looked for irritation effects but did not conceive of looking for hyperplasia cannot counterbalance the single animal study without standing modern toxicology on its head. When, as here, a validated single positive study exists that looks at different health parameters from other negative studies, the positive findings of harm should be viewed with great seriousness in setting exposure levels. On the second point, no substantive evidence of lack of feasibility of the new PELs has been presented, so there is no

pressure for chemical substitution or business relocation. In regard to the third point, the existing OSHA analytical method has a detection limit approximately a factor of ten lower than the proposed TWA PEL. In regard to the fourth point, the Board does not agree with the characterization of the underlying study as unsubstantiated and unrelated. Please also see the response to Mr. Spielman concerning the late submittal documents. The Board agrees that the PEL advisory process should be revitalized and has been informed by the Division that steps to make that happen are being discussed and planned. However, the Board declines to recommend that the HCL PEL be sent back to the reconstituted HEAC for reconsideration.

**BFK Solutions, Barbara Kanegsberg, President, and Ed Kanegsberg, Vice President, BFK Solutions, by letter dated March 12, 2014.**

Comment: BFK Solutions applauds Cal/OSHA's efforts to set appropriate worker exposure limits but opposes the proposed PEL of 0.3 ppm TWA for HCl because the HEAC/FAC process has been derailed. The issue should be returned to HEAC for prompt consideration. HEAC members did not accept the proposed level but it was presented to the FAC anyway. While a concentration of 0.3 ppm may be feasible to measure, workers are poorly served by a PEL not based upon good science or actual experience and which is in fact lower than the PEL for highly-toxic hydrogen fluoride. In its newsletter this month, BFK Solutions published an article titled "Toxic Baby Burp," which points out that HCl is released when babies burp and is present in ocean air at levels near the proposed PEL. The proposed PEL is symptomatic of an overarching regulatory approach that may stifle manufacturing nationwide because federal OSHA encourages use of the California PELs by listing them alongside the federal PELs. Through HEAC/FAC, Cal/OSHA was making progress toward an open transparent evaluation process. In an inexplicable step backwards, Cal/OSHA elected not to use the careful extensive scientific evaluation of HCl associated risks produced by their own HEAC group, choosing instead to substitute the input of OEHHA. This agency considers the impact of chemicals on communities 24 hours a day for a lifetime, including effects on sensitive populations. Lower PELs are not inherently more protective. Setting chemical hazard regulated levels as low as possible regardless of recognized risks may encourage chemical substitution, but the substituted chemicals in turn ironically immediately comes under regulatory scrutiny. HEAC and FAC, which have been inactive for almost two years, should be reinstated.

Response: The Board thanks Mr. and Mrs. Kanegsberg and BFK Solutions for their comments on the proposed new TWA PEL and for their participation in the advisory committee process. As stated in its replies to Mr. Unmack, Mr. Spielman and Mr. Derman, the Board believes the proposed PEL has a solid scientific grounding that was amply and openly discussed during the HEAC and FAC processes. BFK is mistaken in concluding that the proposed PEL is based upon assumed 24 hours per day exposure; though OEHHA utilizes a 24 hour per day exposure baseline, the proposed PEL was calculated using a correction factor to normalize it to exposure during a working week. The Board agrees that at high concentrations, hydrofluoric acid has more severe acute health effects when either absorbed through the skin or inhaled than HCl at similar concentrations. However, for the chronic respiratory-related effects occurring at low

concentrations—especially below 1 ppm as proposed for the new HCl PELTWA--the health risk posed by hydrogen fluoride is not significantly greater than that of hydrogen chloride. The Board has not located any scientific study that places the HCl concentration of a baby's breathe near that of the proposed PELs. Please see the response to Mr. Derman on the question of reinvigorating the PEL advisory process. Finally, while the Board acknowledges that the issue of sequential regulation for substituted chemicals may be a problem in some instances, no information has been presented to show this to be an issue with HCl.

## **II. Oral Comments at the March 20, 2014 Public Hearing in Oakland, California:**

**Mr. James Unmack, Unmack Corporation**, stated that he participated in the Health Experts Advisory Committee (HEAC) and that two proposals were presented to the HEAC: one provided a short term exposure limit of 2 ppm with a Ceiling of 5 ppm, and one that lowered the time weighted average to 0.3 ppm with a Ceiling of 2 ppm. He said that a 0.3 ppm TWA is not well supported by science or human exposure data and will significantly impact California industries. He stated that products containing hydrogen chloride, such as hydrochloric acid and muriatic acid, create an exposure that is greater than the 0.3 ppm TWA. He said that the 0.3 ppm TWA would only equal half of the odor threshold. He also stated that it would confuse people by telling them that hydrogen chloride is more hazardous than hydrogen fluoride. He asked the Board to send the proposal back to the HEAC to get a better proposal.

Response: The Board thanks Mr. Unmack for his remarks, and directs him to the Board's response to his written comments. On the issue of odor threshold, the Board notes first, that there is a wide range of human odor sensitivity and some odor studies have shown some people can detect the odor of HCl at the proposed PEL. Second, the Board notes that many PELs, such as for carcinogens, are set clearly below the odor threshold of the chemicals, as the health endpoint that is being protected by the PEL is generally not the capacity to detect the chemical by smell. Regarding the relative toxicities of hydrogen chloride and hydrogen fluoride, the Board notes that this issue was discussed at the September, 2009 HEAC meeting which noted that below a concentration of about 3 ppm in air the irritant effects on the respiratory system of both hydrogen chloride and hydrogen fluoride were similar. On this topic, also see the responses to BFK solutions.

**Dr. Julia Quint** stated that she also participated in the HEAC and that it is just as important to consider the chronic effects of exposure to hydrogen chloride as it is to consider the acute effects that Mr. Unmack mentioned. She said that the 0.3 ppm TWA was calculated based on the chronic effects. She asked the Board to honor the toxicology performed and the procedures that the HEAC and FAC followed and move this proposal forward.

Response: Please see the responses to Dr. Quint's written comments.

**Ms. Dorothy Wigmore** stated that Worksafe is pleased to see a PEL come forward for hydrogen chloride, and that they support this proposal. She said that they support the 8-hour 0.3 ppm TWA and the 2 ppm ceiling. Ms. Wigmore also said that Worksafe supports deleting the term “muriatic acid” so that it is clear what chemical the PEL pertains to.

Response: Please see the responses to the written comments of Worksafe.

**Ms. Patty Quinlan, Board Member**, stated that she also participated in the HEAC for several years. She said that it has taken several years to get these proposals through the HEAC and approved by the FAC, and she asked the Board to move forward on this proposal as soon as possible.

Response: The Board thanks Ms. Quinlan for her comments.

**Mr. David Harrison, Board Member**, stated that he would like to see some scenarios and exposure statistics from the Division to support the proposed PEL before he makes a decision.

Response: The Board thanks Mr. Harrison for his comments. During the advisory process, the Division determined that HCl exposure may occur in a broad array of occupations from the chemical industry to the construction industry to the food industry. No industry representatives shared exposure records during the advisory process, but the Division queried its analytical lab and published results of HCl exposure assessments in order to assess the range of exposures currently experienced in the workplace. Measured exposures to HCl occur across a broad range, both above and below the proposed PEL of 0.3 ppm TWA, with about half of the reported exposures below it. However, literature review suggests that manufacturing operations utilizing engineering controls will be able to keep exposures at or below the proposed PEL of 0.3 ppm TWA. A review of the federal OSHA database for the last ten years revealed only five inspections performed in California that looked at HCl exposure. None of these inspections resulted in a finding that air monitoring was necessary to evaluate HCl inhalation risk to employees. All five inspections instead evaluated aspects of the risk of HCl skin exposure or hazard communication issues. Outside of California, the federal OSHA database for the entire nation over the ten years ending on December 31, 2013 records 207 inspections in which air monitoring for hydrogen chloride was performed. 823 samples were taken, with only 361 (44%) detecting any hydrogen chloride at all. Of these positive samples, 241 exceeded the proposed 0.3 ppm 8-hour TWA PEL, but generally only for a short portion of the eight hours. The existing federal PEL is a ceiling limit, but these short duration samples can be extrapolated to full eight hour TWAs. This calculation demonstrates that in only 16 instances of the federal OSHA air monitoring would the proposed California TWA PEL have been exceeded. Only in 39 instances would the proposed 2 ppm Ceiling have been exceeded. This national sampling database indicates that for most industrial users of HCl, significant exposures to HCl tend to be of shorter duration. These exposures are not of sufficient magnitude to make exceeding the proposed TWA PEL likely. The industries for which the highest exposures were recorded in the federal OSHA air monitoring tended to be metal galvanizing and a subsector of the electroplating industry.

There are only five galvanizing plants in California, while many electroplating processes do not utilize HCl. Since 2012, updated EPA regulations have imposed new requirements on the galvanizing and electroplating industries to further reduce their airborne emissions of HCl. The Division concludes that the proposed PELs are in the correct range to be both feasible and protective of employee health.

#### **ADDITIONAL DOCUMENTS RELIED UPON**

None.

#### **ADDITIONAL DOCUMENTS INCORPORATED BY REFERENCE**

None.

#### **DETERMINATION OF MANDATE**

This regulation does not impose a mandate on local agencies or school districts as indicated in the Initial Statement of Reasons.

#### **ALTERNATIVES CONSIDERED**

No reasonable alternatives have been identified by the 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, would be as effective and less burdensome to affected private persons than the proposed action, or would be more cost-effective to affected private persons and equally effective in implementing the statutory policy or provision of law.