**Miller, Diane M. (CDC/NIOSH/EID)**

**From:** Vicki Bor [bor@shermandunn.com]
**Sent:** Tuesday, March 31, 2009 4:49 PM
**To:** NIOSH Docket Office (CDC)
**Subject:** Docket No. NIOSH-144
**Attachments:** BCTD-CPWR Comments.doc

Dear Sir or Madam:

Attached for filing are the Comments of the Building and Construction Trades Department, AFL-CIO, and CPWR – The Center for Construction Research and Training, on NIOSH's Criteria Document Update: Occupational Exposure to Hexavalent Chromium.

If you have any difficulty opening the attachment, please contact me.

Thank you.

Victoria L. Bor
Sherman, Dunn, Cohen, Leifer & Yellig, P.C.
900 Seventh Street, N.W. Suite 1000
Washington, D.C. 20001
phone: 202/785-9300
fax: 202/775-1950
bor@shermandunn.com
www.shermandunn.com

**Comments of the Building and Construction Trades Department, AFL-CIO, and CPWR – the Center for Construction Research and Training on NIOSH's Criteria Document Update: Occupational Exposure to Hexavalent Chromium**

Docket No. NIOSH-144

## I. Background

The Building and Construction Trades Department, AFL-CIO ("Building Trades" or "BCTD") and CPWR - The Center for Construction Research and Training (formerly The Center to Protect Workers' Rights) appreciate the opportunity to provide NIOSH with input on its Criteria Document Update for Occupational Exposure to Hexavalent Chromium. The Building Trades is a labor organization comprised of thirteen national and international unions that together represent 3 million construction workers in the United States and Canada. CPWR is a § 501(c)(3) non-profit organization founded by the Building Trades to research the causes and prevention of injuries, illness and deaths among construction workers and to aid in training workers in procedures and practices to stay safe, healthy and productive on the job.

The Building Trades was actively involved in the Occupational Safety and Health Administration's rulemaking process for its hexavalent chromium ("Cr(VI)") standard for the construction industry (codified at 29 C.F.R. § 1926.1126). The BCTD submitted written comments concerning the proposed standard on November 19, 2002 and again on January 3, 2005. Copies of those comments were attached to the oral testimony that we submitted to NIOSH at its January 22, 2009 public meeting. The Building Trades also presented testimony at the OSHA's hearings on its proposed standard and submitted post-hearing comments on March 21, 2005 and a post-hearing brief on April 18, 2005.

The Building Trades and CPWR commend NIOSH for the extensive work that has gone into this Criteria Document Update, and we support its efforts to make recommendations to OSHA based on the best science available to protect workers from the adverse health effects of Cr(VI). We appreciate the opportunity to respond to NIOSH's request for comments.

## A. Exposure to Cr(VI) in the construction industry.

Workers in a number of construction trades risk workplace exposure to Cr(VI). The tasks construction workers commonly perform with potential Cr(VI) exposure include painting and surface preparation, welding and thermal cutting, cement finishing and concrete work, carpentry involving chromated copper arsenate treated lumber, refractory brick restoration, and hazardous waste work. These exposures may increase the risk of developing lung cancer, forms of cancer in the gastrointestinal system, dermatitis and occupational asthma.

The two most important sources of Cr(VI) exposure in construction are stainless steel welding fumes and Portland cement. Welding and/or thermal cutting is typically performed by pipefitters, ironworkers, sheet metal workers and boilermakers. However, members of other trades, including glaziers, electricians, carpenters, laborers and operating engineers, may occasionally perform welding and/or thermal cutting with high alloy steels.

Portland cement represents both a dermal and inhalation hazard in construction. Approximately 600,000 construction workers have frequent exposure to wet cement as a part of their trade. However, the number of workers periodically exposed to wet cement is far larger. Ruttenberg estimates approximately one million additional construction workers who, while not likely to be exposed daily over their careers, are also frequently exposed to wet cement.[1] Skin contact with wet cement can result in burns, irritant contact dermatitis (ICD) and allergic contact dermatitis (ACD). Burns and ICD result from the caustic or basic (low pH) nature of cement, and ACD occurs following sensitization to Cr(VI) found in cement. While burns heal and the symptoms of ICD decrease with treatment and the end of exposure to cement, a person is sensitized to Cr(VI) for life and may experience ACD following even the smallest exposure, placing the worker at risk of debilitating illness and loss of income if no longer able to work at his or her trade.[2]

In addition to these dermal hazards posed by wet cement, construction workers also risk inhalation exposures to Cr(VI) when working with dry Portland cement. For example, tile and terrazzo workers who work directly with dry Portland cement when mixing dry-beds and mixing slurries in which tiles are set may handle hundreds of pounds of Portland cement indoors. They may also use roto-tillers to mix mounds of sand with the cement. In addition, construction workers who mix mud for mortar and/or cement finishing may also be intermittently exposed to high levels of Cr(VI) in Portland cement through both inhalation and dermal exposures.

Unfortunately, there is little, if any, exposure data for many of these operations.

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1 Rutenburg, R. (August 2002). "Issues Related to Adding Ferrous Sulfate to Cement in Order to Prevent Contact Dermatitis." Prepared for CPWR. Silver Spring, MD.

2 As discussed later, the European Economic Community (EEC) has limited the concentration of Cr(VI) in Portland cement to 2 PPM since similar restrictions in member countries resulted in significant reductions in the incidence of contact dermatitis in construction workers. Goh, CL , Gan, SL [1996]. Change in cement manufacturing process, a cause for decline in chromate allergy? Contact Dermatitis 34(1): 51-4.

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## B. Regulation of occupational exposure to Cr(VI) in the construction industry.

OSHA's standard for Cr(VI), 29 C.F.R. § 1926.1126, provides protections for employees exposed through welding fumes. The standard, however, expressly excludes from its coverage exposures through Portland cement, *id.* § 1926.1126(a)(3), potentially leaving over a million workers unprotected. The Building Trades sued OSHA, challenging the exclusion of Portland cement from the scope of the standard. The parties settled the litigation, with OSHA's commitment to enforce existing construction standards that, if properly applied, would address the health issues raised by work with Portland cement. In particular, OSHA agreed that the following standards must be followed by employers using Portland cement as part of their construction operations:

1. Sanitation standard (§ 1926.51(f)), expressly interpreted to require employers to make clean water, non-alkaline soap and clean towels readily accessible to exposed workers;

2. Personal protective equipment (§ 1926.95), expressly interpreted to require employers to provide boots and gloves, to replace them when they are damaged or become ineffectual and to make provisions for keeping them clean;

3. Hazard communication (§ 1910.1200, made applicable to construction through § 1926.59);

4. Training (§ 1926.21(b) and 1910.1200(h)); and

5. Recordkeeping (Part 1904).[3]

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[3] *See* http://www.osha.gov/dep/hexchrom/BCTD_settlement_memo_20070416.html.

## II. Responses to NIOSH's Questions

### A. The Adequacy and Scientific Validity of the Studies Presented in NIOSH's Criteria Document (Questions 1, 2, & 3)

We urge NIOSH to consider recently published reports by the National Toxicology Program showing that chronic ingestion exposures to Cr(VI) are carcinogenic.[4] Ingestion of Cr(VI) in the workplace may occur through inhalation (and subsequent ingestion) of Cr(VI) on particles that lie in the size range between respirable and inhalable particles, or through contact with contaminated tools, workpieces or other surfaces and subsequent hand-to-mouth contact. Since construction work is transient and often conducted in areas remote from sanitation resources, workers are likely to eat lunch or take snack/coffee/cigarette breaks in areas close to where they were working and therefore with potentially contaminated surfaces, and without washing their hands. Take-home exposures on work clothes are an additional concern. Thus, more detailed or stringent recommendations for work practices and the maintenance of hygienic workplace conditions may be warranted. Effective engineering controls are also likely to reduce inhalation of non-respirable particles, workplace/surface contamination, and subsequent ingestion exposures.

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[4] Stout MD, Herbert RA, Kissling GE, Collins BJ, Travlos GS, Witt KL, Melnick RL, Adbo KM, Malarkey DE, Hooth MJ [2009]. Hexavalent chromium is carcinogenic to F344/N rats and B6C3F1 mice following chronic oral exposure. Environ Health Perspect, In Press. Available online: http://www.ehponline.org/members/2008/0800208/0800208.pdf (hereinafter "Stout 2009"); NTP [2008] Toxicology and Carcinogenesis Studies of Sodium Dichromate Dihydrate (CAS No. 7789-12-0) in F344/N Rats and B6C3F1 Mice (Drinking Water Studies). Technical Report 546. Research Triangle Park, NC: National Toxicology Program (hereinafter "NTP 2008"); NTP [2007] Toxicity Studies of Sodium Dichromate Dihydrate (CAS No. 7789-12-0) Administered in Drinking Water to Male and Female F344/N Rats and B6C3F1 Mice and Male BALB/c and am3-C57BL/6 Mice. Toxicity Report 72. Research Triangle Park, NC: National Toxicology Program (hereafter "NTP 2007").

**B. Support for the Proposed REL and Skin Designations (Question 4)**

*1.* ***REL***

We support NIOSH's recommendation that airborne exposures to all forms of Cr(VI) be limited to 0.2 ug/m$^3$ for an 8-hour time weighted average (TWA) during a 40-hour work week. We also support the recommendation that all reasonable efforts be made to reduce exposures to Cr(VI) compounds below the Recommended Exposure Limit (REL) through the use of work practice and engineering controls. We believe that the Updated Criteria Document provides ample evidence that an REL of 0.2 ug/m$^3$ is necessary to reduce the risk of lung cancer deaths to approximately one per thousand workers – the risk criteria OSHA has used for other carcinogens.

We also believe that there is sufficient evidence that the REL is attainable in most workplace situations. As part of a cooperative agreement with NIOSH, CPWR has sought to collect baseline exposure data for Cr(VI) and to study the effectiveness of local exhaust ventilation (LEV). CPWR's researchers have demonstrated that the use of local exhaust ventilation (LEV) systems in construction welding is feasible and, if used properly, can significantly reduce worker exposures to Cr(VI) from welding fumes.

CPWR's first data collection effort, beginning in 2005, assessed the feasibility and effectiveness of LEV to control exposures to Cr(VI) in welding fumes in a controlled setting. Working at a training facility of a local of the United Association of Plumbers and Pipefitters, the researchers compared Cr(VI) concentrations in a welder's breathing zone in paired trials with and without the use of a portable (33-lb. Lincoln Electric Miniflex) LEV unit. The trials involved tungsten inert gas (TIG) and shielded metal arc (SMA) welding of 6" ASTM A-312-03 stainless steel pipe. Three welds or "passes" were made for each pipe: a "root pass" that used TIG welding, followed by a "fill pass" and a "cap pass" using SMA welding. A 316L electrode was used for the TIG root pass, and a 308L electrode was used for SMA welding of the fill pass and cap. Trial durations were 120 minutes for controlled welds (n=7) and 60 minutes for the uncontrolled welds (n=8). LEV use was associated with a statistically significant 55% reduction in Cr(VI) fume levels. The mean Cr(VI) concentration without LEV was 1.82 $\mu g/m^3$ with a range of 0.47-2.82 $\mu g/m^3$. With LEV, the mean Cr(VI) concentration was 0.82 $\mu g/m^3$ with a range of (0.25-1.91 $\mu g/m^3$).

In the last two years, the researchers have surveyed two large coal power plant turn-around projects that involved stainless steel welding. The first site surveyed, in 2007, employed 300 boilermakers and 63 pipefitters over the duration of the project. The contractor had purchased portable LEV units but had not yet fully mobilized them. CPWR's researchers collected personal breathing zone samples from 14 pipefitters and 10 boilermakers under varying ventilation conditions. Use of LEV for SMA welding was associated with 76% lower Cr(VI) exposures than shifts where no LEV was used. SMA welding exposures associated with each ventilation group were as follows:

- No ventilation: mean=15.1 $\mu g/m^3$; range = 11.1 – 18.5 $\mu g/m^3$ (n=3)
- LEV: mean = 3.6 $\mu g/m^3$; range = 0.15 – 5.44 $\mu g/m^3$ (n=3)
- Mechanical ventilation: mean = 5.9 $\mu g/m^3$; range = 4.75 – 7.12 $\mu g/m^3$ (n=3)

The second survey, conducted in 2008, involved boilermakers at a project that employed 500 boilermakers and 200 pipefitters at its peak. Due to the difficulty of getting portable LEV units into the boilers and other tight spaces where boilermakers commonly work, this project utilized the Ventex system, which involves a large central fan and scrubber unit with up to eight main branches and smaller terminal bifurcating ducts with dust collection hoods. Shift samples collected at this site when this system was in use during MIG or SMA welding (n=13) had 79% lower Cr(VI) concentrations than shifts where the system was not used (n=6). Without LEV, mean Cr(VI) concentrations were 5.3 $\mu g/m^3$ with a range of 0.82-10.6 $\mu g/m^3$. This compares to a mean of 1.1 $\mu g/m^3$ and a range of 0.12-2.9 $\mu g/m^3$ with LEV.

We realize that many of our samples from welding operations utilizing LEV exceeded NIOSH's proposed REL of 0.2 $\mu g/m^3$. However, the employees in our experimental settings were welding during nearly 100% of the exposure sampling time. On an actual job site, the ratio of arc time to the overall typical workday would be much lower. Thus, the effective use of LEV is likely to reduce many TWA exposures to below 0.2 $\mu g/m^3$ for workers on a typical work shift, where they are not continuously welding but are instead also performing other tasks. Likewise, although the employees sampled were working 10-hour days, the typical sample times were generally not more than 7 hours and tended to exclude both the very beginning (set-up) and very end (pick-up) of the day. Factoring in the unsampled time would likely result in a lower TWA than our shift TWAs, which were only averaged over actual sample time.

Most importantly, LEV use in construction is still very new. In the field setting, CPWR's researchers observed that controls were not commonly available, and the equipment that was present on-site was often poorly selected and improperly used. For example, the researchers observed many instances where the LEV hood was placed much farther from the weld than is advisable for optimal capture of welding fumes, at times as far as 2-3 feet away from the weld, when a distance of several inches is desirable. Although the researchers demonstrated that the LEV units they tested were effective at reducing Cr(VI) exposures, we believe much greater effectiveness may be possible through improvements in equipment selection and design and worker training. We believe the updated NIOSH REL would serve as an important motivation to improve LEV design and worker education to achieve exposure levels within this limit.

### *2. Dermal Exposure*

We also support NIOSH's recommendation that measures be taken to prevent workplace exposures leading to adverse dermal effects. We support the recommendation that all Cr(VI) compounds be designated as corrosives and as substances that cause skin sensitization or allergic contact dermatitis. We believe the basis for the REL is presented in a clear and scientific manner.

## C. NIOSH Proposed Exposure Assessment Strategy and an Action Level (Question 5)

The Criteria Document Update, as written, provides minimal guidance on exposure monitoring strategies. Employers are instructed to establish their own exposure monitoring plan "that produces a high degree of confidence that a high percentage of daily 8-hr TWA exposures are below the REL." (Criteria Document, p. 140) The Criteria Document further explains this in statistical terms, referencing the *Occupational Exposure Sampling Strategies Manual*, NIOSH Document No.: DHHS(NIOSH) Publication Number 77-173 (1977).

The *Occupational Exposure Sampling Strategy Manual* is considerably dated. In addition, the statistical models the manual employs tend to overemphasize the importance of variations in sampling and analytic procedure, while underemphasizing the actual variability in exposures. It is well-recognized that analytical variability is generally minor relative to the variability associated with the work environment.

The manual does, however, contain some very useful concepts, particularly in *Technical Appendix L: The Need for An Occupational Exposure Measurement Action Level*. In this Appendix, the authors make an argument for why an action level is needed: to minimize the possibility that the exposure limit will be exceeded because elevated exposures were missed during air monitoring. Since exposures vary from day to day, the authors posit that we cannot be certain that sampling on any given day will, in fact, measure the highest exposure on the continuum of exposures in that workplace. The action level therefore provides a small buffer of protection to workers by ensuring that protections are in place when that trigger is met.

We agree with the goals of an exposure monitoring strategy (…*to assess the effectiveness of engineering controls, work practices, PPE, training and other factors in controlling airborne concentrations*). However, the "general exposure assessment" recommendations lack the specificity needed to ensure that employers will implement effective exposure monitoring where it is needed. We also believe an action level is a useful and necessary safeguard to include in a recommended standard. We recommend that NIOSH consider an action level of 0.1 $ug/m^3$, or one-half the proposed REL.

We recognize that exposure variability may differ greatly among workplaces and that less frequent air monitoring may be warranted where both the Cr(VI) mean exposure and variance are low. However, determining the frequency of monitoring based on the unique exposure distribution of each workplace requires expertise that the vast majority of employers will not have. With the exception of very large employers, few companies employ full-time professional industrial hygienists who would be uniquely qualified to develop individualized sampling strategies.

The Criteria Document Update calls for air monitoring to be performed at least annually or when a process change might change exposures. We believe that initial personal air monitoring should be required and the frequency of subsequent air monitoring should depend on the measured exposure levels. Although we believe it is inadequate for the construction industry, the OSHA Cr(VI) (29 CFR §1926. 1126) is instructive in offering one formula for monitoring frequency. In paragraph (d)(2), OSHA requires the following frequency:

1. If initial monitoring shows exposures below the action level, the employer may discontinue monitoring;
2. If results show exposures at or above the action level, the employer must perform periodic monitoring every six months;
3. If results are above the PEL, monitoring must be performed every 3 months.

For construction, where jobs are often of short duration and exposures are highly variable, OSHA's monitoring schedule may fall short. It also fails to incorporate corrective action into the monitoring schedule when exposures exceed the PEL. An alternative, more protective approach would require initial personal air monitoring and the following measures:

1. If the initial exposure monitoring shows exposure levels below the action level, periodic sampling should be conducted every 6 months or whenever conditions that could increase exposure change; the employer may

discontinue monitoring if exposures remain below the action level for two consecutive sampling periods;

2. If exposure levels are above the action level but below the REL, the employer must perform additional monitoring every three months or whenever conditions that could increase exposure change, until two consecutive samples show results less than the action level, at which point the employer may discontinue monitoring;
3. If exposure levels are above the REL, the employer must engage an industrial hygienist or other technically qualified individual to evaluate existing engineering and work practice controls and, if necessary, to recommend additional control measures to reduce exposures to below the REL. The employer must conduct personal air monitoring every three months, or whenever conditions that could increase exposure change, until control measures are in place that are shown to be effective in reducing employee exposure levels to below the AL for two consecutive sampling periods.
4. Examples of conditions that could increase exposure include decreased mechanical ventilation capacity, an increase in the number of workers generating contaminant, a process change or decreased natural ventilation due to closed doors and windows in the work area.

Regardless of the frequency of air monitoring, it is very important that NIOSH emphasize the need to document "exposure determinants" or task/process variables that might affect exposure in conjunction with personal air monitoring. Such variables include environmental conditions such as whether work is done inside or outside; the type of ventilation used, if any; the number of workers generating exposure; and materials and processes used. Employers can use this information in making *a priori* exposure estimates to determine control strategies prior to the start of work.

### D. Additional recommendations for worker protection (Question 7)

***1.*** ***<u>Engineering controls</u>:*** We urge NIOSH to recommend that local exhaust ventilation and welding process selection (*e.g.*, use of TIG welding or other lower fume generating process in lieu of stick welding) be used as engineering controls whenever performing stainless steel welding in construction. In addition to reducing inhalation exposures, use of LEV will reduce the dispersal of the Cr(VI) contaminant that may represent an ingestion hazard when eating, drinking or smoking. Although this issue is not addressed in the Criteria Document Update, as discussed above, recent research has demonstrated that Cr(VI) may be carcinogenic not only through inhalation exposures but also through ingestion.[5]

While respiratory protection may still be needed to supplement engineering controls until control technology effectiveness is improved, there are a number of practical obstacles to the use of respiratory protection in construction welding, including hindered mobility and communication, heat stress, and compliance. Our experience has also shown that non-LEV mechanical ventilation, which may be used in lieu of LEV in complying with the OSHA Cr(VI) standard, is not as effective as LEV at reducing worker exposures and would not offer the additional housekeeping advantages.

Finally, in light of the observations of CPWR researchers, we also recommend that NIOSH provide guidance regarding proper selection, placement, maintenance and use of LEV to ensure its effectiveness.

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5 Stout, in press; NTP 2008; NTP 2007.

*2.* ***Hygiene:*** Emphasize the importance, and ensure the availability of water and soap for hand washing, which are often lacking on construction sites.

*3.* ***Work practices:*** In areas in which there are potential exposures to Cr(VI), restrict access of any employees who are not engaged in the operation generating the exposure. Although engineering controls are the preferred method for controlling welding fume exposures, workers engaged in welding should also be trained to avoid exposure to welding plumes, *e.g.*, by not leaning into the plume and by working upwind from the direction of the plume.

*4.* ***Housekeeping:*** When using Portland cement, use wet clean-up methods (e.g., hose, then use squeegee or mop), rather than dry sweeping. Additionally, employers should make sure that the surfaces of all tools are cleaned before and after use wherever hexavalent chromium dust may accumulate, whether in Portland cement or any other source.

## III. Additional Recommendations

### A. Support Additional Research and Process Changes for Portland Cement

We support NIOSH's emphasis on sanitation, particularly in construction where basic hand-washing necessities such as soap and warm water are typically lacking. However, in the case of Portland cement, we urge NIOSH also to encourage process changes to reduce the exposure risk at the source.

Reducing the Cr(VI) content of cement has been shown to reduce the prevalence of allergic contact dermatitis (ACD), which is the most severe and long-lasting health effect of exposure to wet cement.[6] The European Economic Community (EEC) began limiting hexavalent chromium in cement to 2 parts per million in 2005. Denmark, Finland, Sweden and, to a lesser extent, Germany have used ferrous sulfate to control the hexavalent chromium content of cement since 1981, 1987, 1989 and 2000, respectively.[7] The prevalence of ACD has decreased since the addition of ferrous sulfate to Danish cement.[8]

The Cr(VI) content of cement is dependent on environmental conditions during production (primarily temperature and moisture) and on the trivalent and Cr(VI) content of the fuel, raw materials, refractory brick in the kiln, and grinding media in the finishing mill. The Cr(VI) content of cement can be lessened by using materials with lower chromium content during production or with the addition of agents that chemically reduce hexavalent chromium to trivalent chromium. Raw materials for the production of Portland cement (limestone, shale, clay, etc.) often contain trivalent chromium, some of which may be converted to Cr(VI) during the production process. Blended cements containing slag from iron blast furnace processing, in place of a portion of the Portland cement, have been found to have lower Cr(VI) content. Improvements to the slagging process and decreased availability of clinker has made slag a less expensive substitute

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6 Avnstorp C [1989]. Follow-up of workers from the prefabricated concrete industry after the additional of ferrous sulphate to Danish cement. Contact Dermatitis 20: 365-371 (hereinafter "Avenstorp 1989"); Winder C, Carmody M [2002]. The dermal toxicity of cement. Toxicology and Industrial Health. 18:321-331.

7 Risks to health from chromium VI in cement, Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) 2002 (hereinafter "CSTEE, 2002"); Roto P, Sainio H, Reunala T and Laippala P [1996]. Addition of ferrous sulfate to cement and risk of chromium dermatitis among construction workers. Contact Dermatitis. 34.1: 43-50 (hereinafter "Roto 1996").

8 Roto 1996; Avnstorp 1989; Zachariae COC, Agner T, Menne T [1996]. Chromium allergy in consecutive patients in a country where sulfate ferrous has been added to cement since 1981. Contact Dermatitis 1996: 35: 83–85.

for clinker, which has been used regularly in cement manufacturing in the United States and Canada since the mid-1980s and in Singapore since the late 1980s. While the addition of slag does not eliminate or chemically reduce Cr(VI), it produces cement with lower concentrations by diluting the Cr(VI) from the clinker and the manufacturing process.[9]

While not as well-documented in peer-reviewed literature as ferrous sulfate, stannous sulfate is also marketed (Grace Construction)[10] and used (Rugby/Cemex)[11] as a reducing agent in cement production.[12] Other reducing agents, including manganese sulfate, stannous chloride, ammonium and antimony, have been considered but not yet shown to be viable options for reduction of hexavalent chromium in cement.

The belief that reducing hexavalent chromium content in U.S. cement is not feasible are based on limited and outdated data.[13] NIOSH should conduct and promote research that will assist in reducing the Cr(VI) exposure risk associated with Portland cement, including the kinds of process changes that have been made in Europe. Material substitutions and process changes are more effective and, in the long-term, less costly than relying entirely on work practices and personal protective equipment.

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[9] CSTEE, 2002; Goh CL, Gan SL [1996]. Change in cement manufacturing process, a cause for decline in chromate allergy? Contact Dermatitis. 34: 51–54.

[10] http://www.uk.graceconstruction.com/cement/download/SYNCHRO_200_UK.pdf.

[11] http://rugby.cemex.co.uk/pages/chromiumvi.asp?menu=option5.

[12] http://www.mapei.it/dam/Pdf/ArticleResearchStudyStannousSulphate_WorldCement_February2007.pdf

[13] *See* Perone V, Moffitt A, Possick P, Keky M, Danzinger S, and Gellin G [1974]. The chromium, cobalt, and nickel contents of American Cement and their relationship to cement dermatitis. American Industrial Hygiene Journal 301-306; Klemm WA [1994]. Hexavalent chromium in Portland cement. Cement, Concrete and Aggregates. 16(1):43-47.

## B. Conduct and Support Additional Research to Characterize Cr(VI) Exposures in Construction

As noted earlier, there is little exposure data for many of the operations in which construction workers are exposed to Cr(VI). We encourage NIOSH to conduct or promote research aimed at better characterizing Cr(VI) exposures in construction, particularly with the use of controls. Section 2 of the Criteria Document Update uses a NIOSH field research study (1999-2001) and a report from Shaw Environmental (2006) to categorize operations based on a qualitative assessment of the difficulty of controlling exposure. Tables provide exposure ranges and geometric means associated with operations, job titles and tasks at twenty-one sites. While we appreciate the utility of this analysis, the conclusions drawn are based on very limited data. In addition, few of the operations surveyed were in construction. While it is not our intent to slow down publication of the Criteria Document Update, we urge NIOSH to continue to conduct and support additional field research to better characterize Cr(VI) exposure and demonstrate engineering control effectiveness in construction.

## C. Conduct and Support Additional Health Effects Research to Characterize Cr(VI) Health Effects in Construction

We also urge NIOSH to work with the construction unions representing workers exposed to Cr(VI) to conduct further research regarding the health effects of Cr(VI) exposure, including:

*1.* mortality studies for lung cancer and cancers involving the gastrointestinal system;

*2.* prevalence of occupational asthma; and

*3.* the incidence of dermatitis in workers entering the trades and the prevalence of dermatitis among those in the trades.

### D. Require Comprehensive Training

Section 8 of the Criteria Document Update includes recommendations that employers be required to establish comprehensive safety and health training for workers who make, handle, use or dispose of Cr(VI). We strongly support this recommendation and suggest that information on how to implement controls for reducing exposure and the preference for engineering controls be required as part of this training.

## CONCLUSION

We generally support NIOSH's recommendations in the Criteria Document Update. However, we urge NIOSH to reconsider the recommendations related to exposure assessment and the use of an action level in light of these comments. We also recommend that additional attention be given in the document to specific construction work processes associated with hexavalent chromium exposure, especially work with Portland cement and welding. Finally, we encourage NIOSH to conduct and promote additional research to better understand the health effects associated with exposure to Cr(VI) by employees in the construction trades and the means of controlling those exposures.