Testimony of CPWR – the Center for Construction Research and Training on the NIOSH Criteria Document Update: Occupational Exposure to Hexavalent Chromium, Robert A. Taft Laboratories, Taft Auditorium, NIOSH, CDC, 4676 Columbia Parkway, Cincinnati, OH 45226-1998. January 22, 2009, 9 a.m.-4 p.m. EST

CPWR - The Center for Construction Research and Training (formerly the Center to Protect Workers' Right) appreciates the opportunity to provide input to NIOSH on the Criteria Document Update for Occupational Exposure to Hexavalent Chromium. CPWR is a non-profit research and training arm of the Building and Construction Trades Department, AFL-CIO.

A number of construction trades may be exposed to hexavalent chromium (hereafter referred to as Cr VI). Tasks commonly performed by the construction trades with potential Cr VI exposure include: painting and surface preparation, welding and thermal cutting, concrete work, carpentry involving the handling of chromated copper arsenate treated lumber, refractory brick restoration and hazardous waste work. These exposures may increase the risk of developing lung cancer, dermatitis and occupational asthma.

We commend NIOSH for the extensive work that has gone into this criteria document update, and we support your efforts to make recommendations to OSHA based on the best science available to protect workers from the adverse health effects of Cr VI. The Building and Construction Trades Department, AFL-CIO, hereafter referred to as the Building Trades, was active in the OSHA rule-making process for Cr VI. Written comments concerning the proposed OSHA standard were submitted on November 19, 2002 and again on January 3, 2005. Copies of these comments are attached to our oral testimony. In addition, post-hearing comments were submitted by the Building Trades to the OSHA Docket on March 21, 2005 and April 18, 2005. CPWR plans to consult with the Building Trades Safety and Health Committee in preparing a more detailed written response to NIOSH's request for comments by the March 31, 2009 deadline.

NIOSH REL and Skin Designations. 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 REL through the use of work practice and engineering controls.* We believe that the updated criteria document provides ample evidence that a Recommended Exposure Limit (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 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.

Portland Cement. Portland cement represents both a dermal and inhalation hazard in construction, and reduction of exposures would greatly benefit construction employees. In fact, 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. [1] The omission of Portland cement from the OSHA Hexavalent Chromium standard in construction is a glaring deficiency that may leave over a million workers unprotected from the adverse effects caused by Cr VI in cement. Approximately 600,000 construction workers have frequent exposure to wet cement as a part of their trade. However, the number of workers exposed to wet cement periodically is far larger. Ruttenberg estimates approximately one million additional construction workers, who while not likely to be exposed daily over their career, are also frequently exposed to wet cement. [2]

In addition to the dermal hazards posed by wet cement and described above, inhalation exposure to Cr VI in dry Portland cement may occur in the construction trades. Examples include:

- Tile and terrazzo workers who work directly with dry portland cement when mixing dry-beds and mixing slurries in which tiles are set. This may involve handling hundreds of pounds of portland cement indoors. Roto-tillers may be used to mix mounds of sand with portland.
- Construction workers who mix mud for mortar and/or cement finishing may also be exposed, intermittently to high levels of Cr VI in portland cement (via inhalation and dermal exposure).

Unfortunately, there is little, if any, exposure data for many of these operations. We urge NIOSH to investigate the inhalation potential associated with these poorly characterized tasks. We also urge NIOSH to recommend the necessary process changes in cement manufacturing to reduce the Cr VI content in cement to 2 PPM. Reduction of Cr VI in cement can be achieved through the addition of ferrous sulfate in the production process. We urge NIOSH to partner with both OSHA and EPA in advancing research that would allow US manufacturers to reduce both the inhalation and dermal hazards associated with Portland cement and achieve parity with standards en force in Europe.

Welding in Construction. One of the most important sources of Cr VI exposure in construction is stainless steel welding. Welding and/or thermal cutting is

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[1] Goh, C. L. and S. L. Gan (1996). "Change in cement manufacturing process, a cause for decline in chromate allergy?" Contact Dermatitis **34**(1): 51-4.

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

typically performed by pipe-fitters, ironworkers, sheet metal workers and boilermakers. However, other trades including glaziers, electricians, carpenters, laborers and operating engineers may on occasion perform welding and/or thermal cutting with high alloy steels. As part of a cooperative agreement between CPWR and NIOSH, we have sought to collect baseline exposure data for Cr VI and study the effectiveness of local exhaust ventilation (LEV).

We 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 fume. Our first data collection effort assessed the feasibility and effectiveness of LEV to control Cr VI in welding fume in a controlled setting. Working at a Pipefitter Local training facility, we 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 stainless steel pipe. 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 CrVI 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 $\mu g/m^3$).

While it has been our intent to survey job sites where LEV was in use or to introduce LEV as part of our surveys, the use of this equipment is not yet well integrated into construction operations. In the last two years we have surveyed two large coal power plant turn-around projects which involved stainless steel welding. The first site we surveyed in 2007 employed 300 boilermakers and 63 pipefitters over the duration of the project. Portable LEV units had been purchased by the contractor but had not yet been fully mobilized. We collected personal breathing zone samples among 14 pipe-fitters and 10 boilermakers. Personal breathing zone samples were collected among workers with varying use of ventilation. Shifts using LEV for SMA welding were associated with 76% lower Cr VI exposures compared to shifts where no LEV was used. SMA welding exposures associated with each ventilation group were as follows:

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

Additional detail on samples collected during manual inert gas (MIG) welding will be included in our written comments.

Due to the difficulty of getting portable LEV units into boilers and other tight spaces where boilermakers commonly work, the second project surveyed in 2008 utilized the Ventex system; this project involved 500 boilermakers and 200 pipe-fitters at peak employment. The Ventex system manufactured and marketed Ventex specifically for boilermaker work 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 CrVI concentrations compared to shifts where the system was not used (n=6). Without LEV, mean CrVI 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.

The Feasibility of Engineering Controls for Welding in Meeting the REL. We realize that the proposed REL of 0.2 $\mu g/m^3$ was exceeded in many of our samples from welding operations that utilized LEV. However, in our experimental setting nearly 100% of the exposure sampling time was spent welding; the ratio of arc time to the overall work day would typically be much lower on an actual job site. Thus, effective use of LEV in combination with the less continuous welding over a work shift where tasks other than welding are performed would likely reduce many TWA exposures to below 0.2 $\mu g/m^3$. Likewise, although we sought to sample as much of each work shift as possible without interrupting production, our typical sample times were not more than 7 hours. Given 10 hour workdays were underway on both power plant jobs, and our sampling tended not to get the very beginning (set-up) part of the day and very end (pick-up) part of the day, un-sampled time would likely result in a lower time weighted average than our shift TWAs which were only averaged over actual sample time.

Most importantly, LEV use in construction is still very new and the correct selection and use of controls is often lacking. In the field setting we observed many instances where the LEV hood was placed much further away from the weld than would be advised for optimal capture of welding fume (at times the hood was observed to be 2-3 feet away from the weld; a distance of several inches is desirable). Although we demonstrated that the LEV units we tested were effective at reducing CrVI exposures, we believe much greater effectiveness may be possible through improvements in equipment 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.

We urge NIOSH to recommend that local exhaust ventilation and welding process selection be used as engineering controls whenever stainless steel welding in construction. In addition to reducing inhalation exposures, use of LEV will reduce the dispersal of Cr VI contaminant into the work environment that may represent an ingestion hazard when eating, drinking or smoking. Recent research has demonstrated CrVI may be carcinogenic not only through inhalation exposures but (though not addressed in the NIOSH Draft Criteria Document) also through ingestion (see Stout et al., in press, Environmental Health Perspectives and recent NTP technical reports). 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.

Additional Recommendations to NIOSH

- We support NIOSH's emphasis on sanitation, particularly for construction where basic hand-washing necessities such as soap and warm water are typically lacking. However, in cases such as Portland cement, we would urge NIOSH to also encourage process changes to reduce exposure risk at the source.
- We appreciate the enormity of the task of trying to categorize the relative exposure risk and controls in the vast number of processes and operations where Cr 6 exposure may occur. However, we feel that adequate data to address Cr VI exposure in construction and control technology options are lacking. Section 2 of the Criteria document 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 a very limited number of data. In addition, few of the operations surveyed were in construction. While it is not our intent to slow down publication of an updated criteria document, we urge NIOSH to conduct ongoing additional field research to better characterize Cr 6 exposure and demonstrate engineering control effectiveness in construction.
- We also urge NIOSH to work with the construction unions representing workers exposed to Cr 6 to conduct epidemiology studies investigating lung cancer and other adverse health effects of Cr VI.
- Section 8 of the Criteria document 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.
- The Building Trades recommended the use of an Action Level in the OSHA Cr VI standard. There are a number of practical reasons for this. However, we will revisit this issue and other questions raised by NIOSH in the coming weeks and address them in our written comments.

Respectfully submitted by Pam Susi, CPWR with assistance from Michael Cooper and Dr. John Meeker, University of Michigan.