

**Report of the Small Business Advocacy Review Panel
On the Draft OSHA Standards for
Hexavalent Chromium**

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1. Introduction

This report has been developed by the Small Business Advocacy Review Panel (the Panel) for the draft OSHA standards for hexavalent chromium (Cr(VI)). The Panel included representatives of the Occupational Safety and Health Administration, the Office of the Solicitor of the Department of Labor, the Office of Advocacy of the Small Business Administration, and the Office of Information and Regulatory Affairs of the Office of Management and Budget. On December 23, 2003, the Panel Chairperson, Robert Burt of OSHA, convened this Panel under section 609(b) of the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) (5 U.S.C. 601 *et seq.*). A list of the panel members and staff representatives with their affiliations is included in Appendix A.

This report consists of four parts. This introduction is Part 1. Part 2 provides background information on the development of the draft proposal. Part 3 summarizes the requirements of the draft proposal and the oral and written comments received from the small-entity representatives (SERs). Part 4 presents the findings and recommendations of the Panel. A list of the SERs is included in Appendix B of this report, a complete copy of the written comments submitted by the SERs is included in Appendix C of this report. In addition, the core of the materials sent to the SERs, the Preliminary Initial Regulatory Flexibility Analysis, is included as Appendix D to this document, and a contractor report sponsored by the Office of Advocacy entitled “Alternatives to OSHA’s Draft Proposed Hexavalent Chromium Standards for General Industry, Maritime Operations, and Construction,” is included as Appendix E of this document.

2. Reasons Why Action by the Agency is Being Considered

Several well-conducted scientific investigations have found increased lung cancer mortality among workers breathing Cr(VI) dusts and mists in the workplace. The high rate of lung cancer mortality has been documented in workers from several countries across multiple industries that use a broad spectrum of Cr(VI) compounds. Many of the studies found that the rate of lung cancer was greatest among workers in jobs where Cr(VI) exposure was highest and in workers employed in those jobs for the longest periods of time. These exposure-related trends implicate Cr(VI) as a likely causative agent and suggest that other known lung carcinogens to which the workers may be exposed, such as cigarette smoke, are unlikely to account for the increased lung cancers observed in the studies. The International Agency for Research on Cancer, the U.S. Environmental Protection Agency, and the American Conference of Governmental Industrial Hygienists have evaluated the human, animal, and other experimental evidence and concluded that Cr(VI) compounds are “known” or “confirmed” human carcinogens.

Two independent epidemiologic studies of workers from chromate production plants in Baltimore, Maryland (Gibb et al., Ex. 31-22-11) and Painesville, Ohio (Luippold et al., Ex. 33-10) were considered to present the strongest data sets for quantitative risk assessment. OSHA's analysis found that a linear, relative risk model provided the best fit to the data (Ex. 33-15; Ex. 33-12). The agency preliminarily estimates that the excess lifetime lung cancer risk for workers exposed at the current Permissible Exposure Limit (PEL) of $52 \mu\text{g}/\text{m}^3$ Cr(VI), as an eight-hour time-weighted average for a 45-year working lifetime, ranges from 106 to 351 excess lung cancers per thousand workers exposed. OSHA applied the linear relative risk model to preliminarily estimate excess lifetime lung cancer risks from 45-year exposure at alternative PELs ranging from $0.25 \mu\text{g}/\text{m}^3$ to $10 \mu\text{g}/\text{m}^3$ (the range considered in the draft proposed standard). The projected risks at these alternate PELs are between four- and 200-fold lower than risks estimated at the current PEL. NIOSH and the Exponent group have reported similar lung cancer risks based on the Gibb (Ex. 33-13; Ex. 31-18-15-1) and the Luippold (Ex. 31-18-3) data sets and a relative risk model. The risk estimates at the very lowest Cr(VI) exposure levels (e.g., 0.25 to $2.5 \mu\text{g}/\text{m}^3$) are considered to be more uncertain than those projected at the higher Cr(VI) levels because they involve risk model extrapolations below the range of exposures experienced by the Gibb and Luippold worker cohorts.

OSHA is aware that at least one group has raised the possibility that a linear risk model is inappropriate to predict lung cancer risk at low Cr(VI) air concentrations and they argue that there may be a "threshold" exposure below which the lung cancer risk is zero (Ex. 31-18-1). OSHA plans to carefully examine the scientific data to determine whether there is convincing evidence of a threshold, and, if so, whether it can be credibly predicted. Another concern is the influence of smoking on lung cancer risk. OSHA is aware that the chromate production workers at the Baltimore and Painesville plants were predominantly cigarette smokers and, thus, it is uncertain whether the estimated lung cancer risks attributable to Cr(VI) accurately reflect the risk to the current work force that has a greater proportion of non-smokers. OSHA is also aware that all Cr(VI) compounds are not equally carcinogenic. Most of the scientific evidence indicates that the highly water-soluble Cr(VI) compounds (e.g. primary source of chromate exposure in the Gibb and Luippold cohorts) are probably not as carcinogenic as the less water-soluble compounds (e.g., calcium chromate, zinc chromate, strontium chromate). OSHA plans to continue to evaluate the scientific evidence on the relative carcinogenic potency of Cr(VI) compounds, particularly for the highly insoluble and encapsulated lead chromate pigments and other inorganic color pigments.

Exposure to airborne Cr(VI) can cause other adverse effects to the respiratory tract and the skin. Occupational surveys and medical examinations have found nasal septum ulceration and perforation (i.e. 'chrome holes') among chromium production workers and chrome electroplaters exposed repeatedly to relatively high levels of Cr(VI) (e.g., $20 \mu\text{g}/\text{m}^3$ to $50 \mu\text{g}/\text{m}^3$). (Exs. 31-22-11; 9-126). Several case reports have also documented occupational asthma triggered by breathing Cr(VI) compounds in the workplace. Workers can develop an allergic reaction of the skin known as allergic contact dermatitis as a result of repeated direct dermal contact with Cr(VI) solutions or other Cr(VI)-containing materials. Allergic contact dermatitis is most common on the hands and arms of workers who mix and use wet Cr(VI)-containing cement. Dermal contact with Cr(VI) can also cause an irritant dermatitis and

ulceration of the skin called 'chrome ulcers'. This type of dermatitis is not an allergic condition and requires contact with a fairly concentrated form of Cr(VI). It has been reported primarily in chromate production plants and chrome electroplating facilities with poor industrial hygiene (work) practices.

3. Summary of SER Comments

Provisions of the Standard

Scope and Application

The scope of the draft proposed rule was a concern for many SERs, who questioned the coverage of specific industries and occupational groups. Several SERs felt that there was not clear evidence that exposure to Cr(VI) in these jobs led to adverse health effects because they had not seen the incidence of lung cancer indicated. Some SERs questioned the inclusion of the construction and maritime industries under the draft proposed rule, stating that the supporting data were inadequate to justify coverage of these industries. For example one SER observed that "There have been no studies concerning the [shipyard and ship repair] facilities in which the majority of workers in the maritime industry would be potentially exposed" and that ". . . if the marine industry is to come under these proposed lower standards for Cr(VI), then testing of personnel and work sites needs to be done in the actual maritime environment to prove that the maritime industry does have an exposure risk."(Chapman, p. 3) This SER also suggested that marine chemists should have greater involvement in the Cr(VI) rulemaking, as they possess special expertise on the maritime environment and will be responsible for enforcement of the new standard in the industry. SERs representing the construction and maritime industries also argued that the nature of work in shipyards and construction sites would make compliance with certain draft provisions difficult or impossible. Two SERs cautioned that

What may be appropriate in a traditional fixed manufacturing environment simply will not work in the diverse and dynamic environment of construction operations, which are characterized by variable operations, high employee turnover, outdoor work conditions, changing job sites and infrastructure, and other features that could impede implementation of the proposed rule (Jollay and Odom, p. 2) .

Several SERs recommended exclusion of wet cement and concrete from the proposed standard. For example, one pointed out that exposure to airborne Cr(VI) is negligible in cement work, so that lung cancer is unlikely to result from work with cement and concrete containing Cr(VI). (Hammersley, p. 1) Based on their experience in the concrete and cement industries, some SERs stated that dermatitis in these industries is infrequent and relatively mild. SERs, representing the masonry industry stated "We have polled a representative group of our members and there have been very few incidents reported in the last 15 years. This is due primarily to the fact the employees are trained to avoid contact, they are provided personal protective equipment, and any problems that do occur are dealt with immediately (Jollay and Odom, p. 3)." These SERs further argued that dermatitis results from the high Ph of cement rather than its Cr(VI) content.

A SER representing pigments manufacturing requested that OSHA consider exemption of color pigments and lead chromate from the proposed standard, based on the possibility that highly insoluble chromate compounds used in the pigment industry are less carcinogenic than others included in the standard. He stated, "There is a qualitative difference between color pigments and chromate compounds with higher water solubility... CPMA has found no study that shows a link between our products and cancer caused by exposure to Cr(VI) (Robinson, p. 9.)" Other representatives of the pigment industry agreed with OSHA's determination that chromium exposures in the industry can pose health risks to workers.

Other issues raised with the scope of the proposed standard included coverage of fume and liquid exposures. One SER believed that there is little conclusive evidence of lung cancer risk from exposure to welding fumes. He argued that;

based on the most recent Health Effects of Welding published in the Critical Reviews of Toxicology in 2003, regulation should probably be restricted to stainless steel, but [the publication] really notes that its findings only point to the need for more research to sort out the contradictory evidence that currently exists (Torchio, p. 1).

Another SER also stated that the water-soluble forms of Cr(VI) in fumes may be converted to Cr(III) before they can cause harm to workers.

One SER representing an electroplating company, expressed concern with the proposed standard's treatment of liquids containing Cr(VI), stating:

The primary concern for Cr⁺⁶ is the inhalation hazard associated with lung cancer. However, the standard would include liquids even if they do not present an inhalation hazard, only that they could reasonably be anticipated to contact the skin or eyes. Granted, there are some individuals that may develop an allergic reaction to skin exposures and/or chemical burns if not washed off promptly, but these are the same hazards associated with hundreds of other chemicals. Taking into consideration that such exposures have already been successfully addressed by other OSHA standards... it seems this requirement would provide little, if any, benefit. (Horton, p. 3)

A few SERs also questioned the applicability of the draft proposed rule to workers in analytical laboratories, whose potential exposure is limited to splashes from very dilute Cr(VI) solutions.

Finally, SERs commented that applicators of Chromated Copper Arsenate (CCA) should be exempt from an OSHA rule since the application of pesticides is covered by Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). For example, one SER stated, "OSHA should not assume responsibility for Cr(VI) in the CCA wood-preserving industry, because Cr(VI) in the wood-preserving industry is currently being regulated by the EPA as a component of a regulated pesticide... By having two separate federal agencies handle the same issue it would be a duplication of costs both on the government and industry (Wright, p.1)." He also questioned why the draft Cr(VI)

proposal did not grant an exemption to users of CCA-treated wood, given that such an exemption was granted under OSHA's standard for inorganic arsenic.

Permissible Exposure Limits (PELs)

The range of possible PELs presented in the draft proposed standard elicited a variety of responses from SERs. Most SERs considered the range of PELs presented in the draft proposal to be too low, and encouraged OSHA to examine the feasibility, anticipated costs, and projected risks associated with a proposed PEL in the range of 20 – 26 $\mu\text{g}/\text{m}^3$. One SER expressed concern that OSHA had not adequately assessed feasibility for CCA wood treaters. He commented that “A PEL of less than 20 $\mu\text{g}/\text{m}^3$ will be difficult for our industry to meet. You do not have enough data from your one visit to a CCA wood treating facility to set standards for our industry to meet (Wright, p. 2).” Other SERs expressed similar concerns with the feasibility of the PELs presented in the draft proposal. One SER called attention to the health and safety hazards associated with respirator use, which he believed would increase if OSHA reduces the Cr(VI) PEL to a level that cannot be met with engineering controls.

Several SERs also pointed out that while OSHA evaluates the feasibility and risk associated with the PEL, the action level, typically set at one-half the PEL, is the “effective” limit that small business owners must engineer for. Some SERs stated that they believed that most employers try to achieve half the action levels (or one quarter the PEL) in order to assure that they are unlikely under any circumstances to exceed the action level. These SERs suggested that because OSHA's assessment of feasibility and risk are based on the PEL, it may underestimate the actual costs of adjustment to the new standard and overestimate the risk that would be experienced by most workers after implementation of the proposed PEL. One SER commented that “one of the most practical suggestions made during the last conference call was for OSHA to consider, based on the one-half PEL limit action level provision, a PEL limit value up to 20 $\mu\text{g}/\text{m}^3$ that would be followed with real time scientific data collection and study for a period up to 10 years to see if a further reduction in the PEL is warranted (Tucker, p. 1).” Other SERs similarly suggested that a PEL of 20 – 26 $\mu\text{g}/\text{m}^3$ should be implemented now and revisited in 10 to 15 years, when the scientific understanding of the effects of Cr(VI) inhalation would be more certain and the data used to identify an appropriate PEL or PELs improved.

Several SERs questioned OSHA's preliminary determination that occupational exposures to Cr(VI) pose a significant risk of lung cancer. Some SERs expressed doubt that OSHA's predicted levels of excess lung cancer risk are realistic, based on the frequency of lung cancer they have observed among Cr(VI)-exposed workers in their employ and their knowledge of lung cancer rates in the general population. One SER commented “The alluded to findings that exposure results in a 300% increase in lung cancer deaths seems unlikely. If this was the case I have to believe the newspapers would be covered up with CrVI stories.” (Torchio, pp. 2-3) One SER pointed out that the occupational exposure conditions assumed in OSHA's projection of lung cancer risk, 45 years' duration at the PEL concentration, entail much higher cumulative exposure than workers typically experience. One SER suggested that if

OSHA's risk assessment is correct, then the risk at the current PEL is indeed unacceptably high.

Some SERs expressed concerns with the quality and relevance of the data used in OSHA's risk assessment. For example, one SER stated, "I do not doubt that Cr(VI) is dangerous to our health, but I don't feel the data presented to us justified the actions proposed. It is my impression that the data being used as the driving force behind this regulation is highly questionable at best." (Horton, p. 4) Some SERs observed that the data used in OSHA's risk assessment is not representative of modern exposure conditions, suggesting that the lower concentrations of Cr(VI) and specific Cr(VI) compounds to which most workers are now exposed may not be sufficient to cause lung cancer. A SER stated, "It is very unlikely that the types of exposures and the compounds to which workers were exposed in the chromate production industry in the 1930s through the 1970s are representative of the current exposures to Cr(VI) in either this or other industries." (Barnhart, p. 25) Other SERs made the general point that the conditions found in these plants were unlike those found today. This SER went on to describe the highly complex biochemical mechanisms that transport Cr(VI) into cells: "The rate at which these mechanisms occur and the relative importance of each mechanism is dependent on a number of factors including the environment surrounding the cell, the type of cell involved, the nature of the particle containing the Cr(VI), and the chemical properties of the Cr(VI) compound involved. Because the solubility equilibrium and rate of dissolution in biological fluids of the various hexavalent compounds varies by many orders of magnitude, it is very unlikely that each compound will result in the same concentration of Cr(VI) at the cell nucleus and therefore produce the same carcinogenic effect." He concluded that "it is probably not appropriate to apply the values from historical chromate chemical production to other types of exposures." (Barnhart, p. 26) Further comment by this SER argued that the epidemiological cohort studies used in OSHA's risk assessment should not be relied on to support the possible PELs identified in the draft proposal because the exposure levels experienced by the cohort members were often higher than the levels considered for the proposed PEL. Due to "the possibility of a threshold or threshold-like effect in the relationship between exposure to Cr(VI) and lung cancer," he suggested that "the additional risk of lung cancer due to exposure to low levels of Cr(VI) might be lower, perhaps significantly lower," than the risk predicted by OSHA's risk assessment. (Barnhart, pp. 26-27) He further identified two epidemiological studies of chromate production plants in which worker exposures were lowered through process changes and significantly elevated cancer risk was not shown.

Some SERs also cautioned that the exposure estimates used in the risk assessment may not have accounted for respirator use, that the analysis may not have adequately dealt with the effects of smoking, that the analysis did not clearly show that Cr(VI) rather than Cr(III) caused the high levels of lung cancer observed in the studies, and that the exposures may not have been accurately recorded. For example, one SER stated that, "The studies point out that there is no differentiation between trivalent and Cr(VI) testing. Without this differentiation, there is no evidence that Cr(VI) is the carcinogen of note in the report." (Chapman, p. 1) Another SER identified several reasons that the exposure values used in the risk assessment may have underestimated cohort members' actual exposures, perhaps leading to an overestimate of risk at the current and proposed PELs. (Barnhart, p. 27)

A few SERs voiced dissatisfaction with OSHA's intent to apply a single PEL to all workplaces covered by the rule, suggesting that the Agency should consider separate PELs for specific industries or Cr(VI) compounds. One SER proposed that OSHA should adopt a graduated system of PELs for different compounds, linking each compound's PEL to its toxicity and carcinogenic potency. (Chapman, p. 2) He also stated that the available evidence of Cr(VI) carcinogenicity is not relevant to exposures in the maritime environment, except for chrome plating shops, and that OSHA should therefore establish a separate rule or PEL for maritime employers other than platers.

Respiratory Protection

Relatively few concerns were raised regarding the use of respiratory protection. Several SERs noted the types of respirators currently worn and their compliance with OSHA's standard for respiratory protection. However, one SER requested that employers be given more flexibility with regard to the use of respiratory protection to protect employees. Two SERs raised concerns about the possible hazards caused by respirator use required by the draft proposal. A construction SER noted that the draft proposal requires that construction employees performing certain activities be assumed to be above the PEL and be provided respirators. This SER stated: "Requiring negative pressure respirators places a large strain on the respiratory and cardiovascular systems of workers. This is aggravated when combined with the heat and humidity of field construction environments. Air line respirators are very movement restrictive and pose a continuous trip hazard and neck strain situation. Vision is also restricted when respiratory protection is worn (Torchio, p. 5)." Similarly, another SER noted that "... To ensure that operators in paint areas are protected to the range of PELs for Cr(VI) contemplated by OSHA, it would likely be necessary to provide self-contained breathing apparatus (SCBA)," and "SCBA is not a feasible option because of the weight, the limitation and distortion of vision, and the limited use time of the breathing air cylinders (Kramer, p. 3)."

Exposure Monitoring

The SERs raised a number of different issues regarding exposure assessment. Many concerns were raised on how to monitor employees who work on different job sites or change their tasks from day-to-day. SERs stated there is no way to get a true exposure picture because exposures change from "minute to minute". For construction activities, SERs stated they would not know where to monitor on the site. They thought they would end up monitoring the whole site which is burdensome and impractical. Also, by the time they get sampling results back, the employees would have relocated to another job. SERs in other industries also explained that employees move around a lot. For example, one SER explained that an employee may work at a plating operation one or two days and then not be exposed for a while. While the employees may have worked over 30 days, their exposures are significant only for a very short amount of time, and the monitoring results would not give a true picture of their long term exposure. The draft provision for requiring additional monitoring was troublesome to some SERs. In particular, construction SERs stated that the construction environment changes every day. This would mean that under the draft proposed

standard they would have to monitor every day. Given that, they expressed concern on how to establish a monitoring strategy.

One SER objected to the requirement to monitor every three months for exposures above the PEL. He stated monitoring every three months is too frequent: "...engineering changes to reduce exposure could take longer than the 3 and 6 month intervals noted." (Fischer, p. 2, Attachment B) It would therefore seem to add no benefit to do additional monitoring while an employer was in the process of correcting the problem. He requested a six month instead of a three month monitoring frequency for exposures above the PEL.

Some comments suggested that monitoring would not be useful if employers found that exposures were above the PEL and that they could not be reduced below the PEL. Further monitoring would just be a waste of time and money. In a similar manner, after sampling for a while, the true exposures should be known, and historical data should suffice. A SER suggested, "...no additional monitoring be required." He then stated, "If required, it should be limited to no greater frequency than annually (Kramer, p. 2)."

One SER objected to periodic monitoring for employers using Cr(VI) infrequently. He raised the following example: Initial monitoring had indicated exposures above the action level. The employees were exposed more than thirty days a year but then the company did not use Cr(VI) for six months. Would the company still be subject to additional costs of the periodic monitoring six months later in order to stay in compliance with the standard, even though there was no Cr(VI) present (Sayre, p. 2)?

One SER supported an option presented in the PIRFA that would only require personal monitoring every six months where exposures are above the action level; no additional monitoring would be required for exposures above the PEL or to confirm exposures below the action level. He did not see a need for repeat or subsequent (second sample for confirmation) monitoring to reaffirm initial results. (Sayre, p 8) Another SER stated, "It does not make sense to take a sample seven days apart if the previous monitoring indicates that exposures are below the Action Level (Fischer, p. 2, Attachment B)."

One SER asked for clarification on the sampling and analytical method. He remarked that the draft standard does not list a method and questioned what inspectors would be required to use. He explained they used to use the NIOSH method with a limit of detection (LOD) of 0.5 ug/m³. Now they would have to use the OSHA method with a much lower LOD if the PEL is lowered. In addition, a SER asked how the plus or minus 25% (at a 95% confidence interval) could be interpreted at very low levels. A SER alleged that at low levels with a plus or minus 25% confidence interval, sampling results are not accurate (calling into question the feasibility of any sampling or analytical method). He further stated, "OSHA's trip reports and feasibility evaluation do not appear to be based on a method which meets these parameters." He then referenced a site visit report to a paint manufacturer as an example of faulty sampling results (Robinson, p. 26).

There were some concerns about resources. SERs involved in maritime activities were concerned about needing equipment and marine chemists. They wished to have marine

chemists available for comment. A SER stated there is a need for clarification because SERs are under the impression that only industrial hygiene technicians or certified industrial hygienists are able to monitor. Also, trade associations do not provide assistance in monitoring; they do not want to assume liability. "Insurance companies offer assistance with safety related issues, but generally not in the area of hazardous materials (Boldt, pp. 2- 3)."

There was some confusion among SERs about how objective data could be used. One SER representing cement activities pointed out that cement has very little Cr(VI) in the mixture, and work with wet cement would not generate significant inhalation exposure. Another SER stated that the use of objective or historical data is not feasible for construction activities and that it would not be prudent to use data from one job to another job due to extreme differences between construction sites. Also, the jobs and situations change so much that one cannot rely on similar data (Torchio, pp. 3 - 4).

SERs also expressed confusion about what would constitute "reasonably anticipated eye or skin contact." They asked if a barely detectable amount (e.g., in the case of certain quality control laboratory workers) would constitute "contact". Another SER expressed concern for the difficulty in determining "reasonably anticipated skin or eye contact" when "hundreds of other chemicals" are also present where contact with them can lead to allergic reactions (Horton, p. 3). SERs also questioned whether mixtures like cement containing very little Cr(VI) would be covered. They also asked how compliance safety and health officers would enforce "reasonably anticipated eye or skin contact." Some SERs stated, "There is, to our knowledge, no quantitative test with any degree of accuracy and reliability to measure exposure of skin absorption providing a nexus to Portland cement and Cr(VI) (Jollay/Odom, p. 2).

A SER remarked, concerning observation of monitoring, that having a non-employee on the site could present some legal and liability problems. He would want to be exempt from liability and have proof of workers compensation coverage for non-employees on site (Torchio, p. 5).

Methods of compliance

Many of the comments on methods of compliance were related to engineering controls for electroplating. Several of the SERs representing electroplating operations commented on the feasibility of engineering controls. For example, several SERs commented that it would be difficult to control exposures in electroplating particularly for hard chrome operations. One SER remarked that in electroplating it would be difficult to tweak the system to get it to work. Another SER indicated that the state of the art controls could achieve 1 to 3 $\mu\text{g}/\text{m}^3$ but noted that the manufacturers of controls will not guarantee the controls will achieve a lower PEL.

Another SER, representing the electroplaters took issue with OSHA's reliance on polyballs as a viable engineering control especially in facilities using automated processes. He noted that the use of Polyballs is an old technology which has virtually disappeared in electroplating mainly due to the fact that Polyballs trap heat in the tank and they often get

caught in the dipping process and fall on the floor creating dermal problems for employees who pick the balls up and clean up spilt electroplating fluid. He remarked that fume suppressants were a more viable option. Other SERs, however, commented that fume suppressants couldn't be used effectively for hard chrome operations. For example one SER's company had "tried them all" and had found that the addition of fume suppressants reduced the quality of the end product and in turn contaminated the electroplating bath, which then required the bath to be emptied and thus increased the amount of waste generated. Another wrote: "We produce optically pure mirror polished surface finishes that must be 100% pit and defect free. There is currently no suppressant chemistry available that will allow electrolytic hard chromium plating deposits that are defect free. Unfortunately, we cannot use them (JF Tucker, p. 1)."

Many SERs raised concerns that ventilation control changes made to meet OSHA reduced PELs would create testing burdens under the EPA requirements under the Maximum Achievable Control Technology (MACT) standard for electroplaters. One SER recommended that OSHA tie its engineering control provisions for the OSHA standard with meeting the MACT standard.

Additional engineering control issues were raised by other SERs. For example one SER commented:

Increasing ventilation to reduce chrome exposures is not a viable engineering control to meet a substantially reduced PEL for Cr(VI). Ventilation is necessary to prevent the buildup of flammable vapors and paint particulates in the paint booth. Excessive airflow, however, is detrimental to the process. Electrostatic painting, which has the greatest transfer efficiency of the spray application methods available to aerospace manufacturing, relies on the generation of a "cloud" of electrostatically charged atomized paint that is pulled to the grounded part by attractive forces. Introduction of increased ventilation to remove chrome from the breathing zone would overcome these attractive forces and pull the primer away from the part into the filters. Lower transfer efficiency results in more primer being sprayed to achieve the required primer film thickness (Kramer, p. 2).

Other methods of compliance comments touched upon a variety of issues. For example, one SER commented that engineering controls could not be done in the field for welding and another indicated that it was impossible to control for ripped bags containing chromate chemicals in dry form. Still another SER suggested that: "As a general matter, OSHA should not mandate engineering controls for certain job tasks or activities, nor can it require/prohibit certain work practices, unless they are specifically tailored to an individual jobsite and an accurate assessment of the cost feasibility is included in the evaluation (Boldt, p. 4)."

A few SERs expressed concern about OSHA's draft provision for the prohibiting of rotation of employees. One noted that, being a small employer, he had a small number of employees. This necessitated the rotation of those employees among various jobs so that he could

maintain production. He suggested that OSHA consider allowing rotation of employees similar to the way employees are rotated regarding exposure to ionizing radiation. Similarly, another SER wrote: "Although the proposed standard specifically prohibits the rotation of personnel to different jobs to achieve compliance with the standard, all of our mixing personnel are cross-trained to work in any blending area, and we are forced to rotate personnel to assure availability of mixing personnel when needed. Potentially that could result in Luster-On Products being forced to defend itself against charges of prohibited rotation of personnel to achieve compliance with the PEL (Miller, p. 2)."

One SER recommended that OSHA expand the use of the 30 day exclusion (which is currently only applied to medical surveillance) to other provisions of the standard, namely the use of engineering controls. In particular, he noted that this would be very useful and significantly reduce the burden for employers who only use Cr(VI) very intermittently.

One SER suggested that OSHA review the cadmium standard and how it handled several items such as Separate Engineering Control Airborne Limits (SECALs) and closed systems and apply similar approaches to the Cr(VI) rule.

Regulated Areas

Several SERs expressed concern that regulated areas would be difficult to implement and control. Some suggested that in many cases, the entire site could become a regulated area, particularly on construction sites. (Robinson, p. 22) Similarly for electroplating, if other areas are already regulated under another standard like arsenic, the addition of regulated areas for Cr(VI) could result in the whole plating area being regulated. One SER note that some work places are open floor areas with many processes or jobs going on simultaneously and that there are no walls or physical structures or boundaries. He questioned: "How far or what dimensions would the boundaries have to be as far as segregation? Here again, what if the Cr(VI) use is infrequent, such as once every six months (Sayre, p. 3.)?"

Some SERs remarked that the implementation of regulated areas was especially difficult on construction sites. For example one SER commented:

With respect to the requirement to establish regulated areas, we believe this is not only impractical, but generally infeasible. If you have two or three men on a scaffold laying brick and others on the ground cutting bricks and mixing and delivering mortar, the employer would have to establish a regulated area encompassing practically the entire job site. This means additional time would be required to establish the regulated area and it would have to change each day as the laying of brick progressed around the building (Jollay/Odom, p.2).

Several SERs expressed concern about where the boundaries would be located, stating that Cr(VI) exposures in one work area might spread to other work areas. For example, a shop adjacent to stainless steel work may use carbon steel. In these cases it would be difficult to delineate the boundaries. More particularly, one construction SER queried where regulated areas would be established if welding is occurring 150 feet up in the air. Another SER

commented the only prudent means of defining boundaries in construction is by area sampling which would increase employer cost (Torchio, p. 5). Another SER did not know how to define boundaries for regulated areas to avoid skin and eye contact. He wanted to know how to assess eye and skin contact and "...what level of exposure constitutes this condition?" and noted that skin contact can always occur because one's face is exposed (Fischer, p. 3 Attachment B).

Also, SERs were concerned about the administrative burdens of establishing regulated areas. They stated that the use of regulated areas would necessitate a lot of changing of Personal Protective Equipment (PPE) and respiratory protection for employees who go in and out for short periods of time. One SER was concerned about the placement of washing facilities and showers on construction sites near the regulated areas. Another SER explained that employees do not honor the barriers and that often barricades areas attract their attention. Other administrative concerns expressed by SERs included employees forgetting to don their respirators on when going in and out of regulated areas or eating or chewing tobacco in regulated areas. One SER remarked that with tight confines, multiple operations, and already existing work areas in a facility, the implementation of regulated areas is enormously complicated and difficult, or an entire area like a dry dock would have to be regulated (Barnhart, pp. 17 – 18). A few SERs added that outside contractors in regulated areas would have to be equipped with PPE and trained and suggested that OSHA had not considered the costs of including these outside personnel (Barnhart, p. 20; Robinson, p. 23).

Hygiene Areas and Practices/Housekeeping

The main hygiene practice concerns raised by several SERs were related to requirements for removing contaminated personal protective clothing and washing hands prior to eating lunch or taking other breaks. For example, one SER commented that: "Employees generally have mid-morning breaks, lunch, mid afternoon breaks, bathroom breaks and smoking breaks. In hot weather employees also get water breaks to assure proper hydration. Managing these activities with the requirements that employees do not contaminate any service or hygiene area surface in nonregulated areas is impractical without requiring that employees change and shower each time when exiting the regulated areas (Robinson, p.24)." ."

Other SERs expressed concerns about difficulties in providing separate change rooms. For example, one SER stated that "... the requirement for maintaining a clean/changing room would be an expensive requirement for the company." He added that

While we do maintain shower facilities and changing rooms at this time and maintain two lockers for each worker (one for company uniforms and one for street clothes) there are no provisions for separate areas. . . After showering, the employees return to the same room where they removed their industry uniforms and dress in their street clothes. To build an effective changing room with the shower facilities between the industry and street side would involve a completely new facility (Mills, p. 3)."

A construction SER raised similar concerns, stating that providing change rooms "free of cross-contamination" would "...be an enormous and unnecessary expense for small

contractors on a job site” and “. . . would likely necessitate the rental of two large trailers – one for changing to begin work and another to remove ‘contaminated’ clothing and wash up before going to the other trailer to dress in street clothes and leave the job site (Jollay, p. 3).” Another SER noted that such measures were “effective in controlling exposures (Sayre, p. 5)” but raised questions as to whether small businesses have to establish a specific change room specified only for use after chromium-related processes and nothing else. One SER suggested deleting requirements for change rooms when employers use of disposable PPE.

Several SERs raised concerns about the disposal of contaminated clothing, the disposal of wastes from housekeeping practices, and the disposal of Cr(VI)-contaminated water from handwashing facilities or showers. In particular one SER stated that: “We are not on a sewer system and therefore we must handle the water in house. Some type of soap, dirt, and chemical separation system must be used and we do not know of one on the market” (Wright, p. 2). One SER expressed concern about the probable impact on the environment.

Some SERs expressed concerns about their ability to control certain work practices. One SER stated that “The control of employee personal habits such as smoking, chewing tobacco or gum, drinking, eating, applying cosmetics, restroom use or even having hand contact with their skin. . . . will represent a major challenge in regards to policing (Fisher, p. 7).” Similarly, another SER voiced concerns about having to “ensure that employees wash their hands”. He stated that “Employers can REQUIRE this, but to ensure it would require some type of physical verification. Similarly, to ENSURE that employees do not carry products such as gum or chapped lip stick into regulated areas may be interpreted to include personal searches (Horton, p. 4).”

Personal Protective Clothing and Equipment

Most of the SERs described the type of PPE they use at their work site. In general industry most of the SERs noted the use of some type of uniform as well as eye protection (glasses with side shields or goggles) hard hats, and boots. Most SERs noted that their employees either used gloves or had them available for use. One SER in construction indicated that for cement work, gloves were made available but that it was up to the individual worker whether he or she wanted to wear them or not. Some SERs indicated that they stressed to their employees the importance of keeping skin dry since this was the most important factor related to contracting cement dermatitis. One SER suggested that wearing gloves could make you sweat and would thus make the hands become wet and place the employee at a greater risk of developing dermatitis.

Similar to their comments regarding exposures monitoring, several SERs wanted a clarification as to what constituted “reasonably anticipated eye or skin contact” for purposes of determining when protective clothing would be required.

For example, one SER wrote:

“. . . we do not know how to interpret . . . skin or eye contact with Cr(VI) is reasonably anticipated. Is this a zero tolerance requirement? In order to identify which operations in our workplace where the draft standard provisions would be

triggered will require new exposure studies and identification of the new Cr(VI) PEL, ie 10 . . . 0.25 $\mu\text{g}/\text{m}^3$ and the action level to know where engineering changes/protective clothing etc may be required. The issue with skin contact and the allowed Cr(VI) exposure level must be clarified. Does this include the facial area, and if so how do we protect this area of the body, full head gear (Fischer, p.2)?”

Similarly, another SER asked whether a laboratory worker coming into contact with very minute quantities of Cr(VI) would need to be provided with PPE, while another SER asked whether OSHA would be setting a numerical limit for eye or skin contact with Cr(VI).

Several SERs raised concerns about the draft proposal’s provisions for laundering of contaminated clothing and questioned their ability to find a commercial laundry to handle their work clothing. One SER summed up these concerns stating that : “At least one company of which we are aware – and we suspect this will be common occurrence was unable to contract with any industrial laundry in the local areas to clean clothing that was labeled as a cancer hazard, as is required by the draft proposal. Accordingly, this company would be required to construct laundry facilities on-site to clean its employees’ personal protective clothing, obviously at considerable expense (Barnhart, p. 22).” Construction SERs voiced similar concerns. One SER stated that “Employers will effectively have to either provide disposable clothing or provide laundry services on site. At construction sites typical of our industry there are no local laundries or at best if they do exist they would never receive clothing tagged as toxic (Torchio, p. 5).” A second SER added that;

“ . . the employer would have the option of either assigning one employee with the responsibility for laundering and cleaning of PPE or take the PPE to a laundry facility and informing any person who launders or cleans the protective clothing or equipment contaminated with chromium VI of the potentially harmful effects of exposure to the chemical. Either way, the employer’s exposure to liability is extraordinary and can and should be avoided under the proposed standard by exempting construction from its provisions altogether (Jollay, p. 5).”

A few SERs also wondered about the treatment and disposal of discharge water from shower and washing facilities.

Medical Surveillance

A variety of different issues regarding medical surveillance was raised by SERs. In particular, the need for medical surveillance was questioned. Some SERs indicated that they provided medical examinations as part of an overall employee health program, but questioned the benefits to be gained by adding medical surveillance specifically for Cr(VI)-related health effects to their programs. One SER expressed concern about the vagueness of the draft provisions regarding the content of the medical examination and his inability to find a health care professional who might be familiar with Cr(VI) tests. For example, one SER stated that “To date, no program has been established for the testing of hexavalent chrome at any of the local industrial medicine practitioner’s offices in the surrounding area. Inquiries into the makeup and implementation of said monitoring programs have been met with silence

(Chapman, p. 2).” Similarly another SER noted that “While large companies have the benefit of in-house medical staff, smaller companies tend to rely on local medical professional[s] to service their companies’ employees.” He added that “based on the discussions I have had with management at some of these small companies using chromium chemicals, the local medical community that would service their employees are not at all familiar with signs or symptoms associated with Cr(VI) health risks (Barnhart, p. 14).” Other SERs expressed concern about the inclusion of specific tests such as urine tests and examinations at the termination of employment and questioned what value such tests might add. In particular a SER remarked that “Often when an employee quits they just leave or do not report to work,” and that “It would be extremely difficult to get this employee to undergo a medical exam (Wright, p. 1).”

Regarding medical surveillance coverage issues, several SERs suggested that medical surveillance might have to be offered to a broader range of employees (e.g., emergency responders, supervisors, employees formerly exposed) than those directly related to current Cr(VI) work. Construction SERs raised questions about whether employees working for several different employers during a year would have to receive multiple exams from different employers. Another SER indicated that the medical surveillance provisions would force them to cover individuals who might have outside lifestyle factors (e.g., smoking) that would adversely impact their health. Still another SER suggested that any employee who thought he might have symptoms of Cr(VI)-related test would have to be offered surveillance: “The requirement that employers determine if an employee is experiencing signs of symptoms of adverse health effects associated with Cr(VI) exposure places the employer in an unacceptable position. Since the employer is not a medical professional, any employee seeking a medical examination can simply assert that symptoms have or are occurring and the employer will be left with no choice but to incur the costs of medical monitoring (Robinson, p. 25).”

One SER suggested that OSHA make the medical surveillance provisions similar to the OSHA Inorganic Arsenic standard to ease compliance burdens by employers who already must follow the standard for Arsenic. Another SER thought it would be relatively easy to comply with the proposed medical surveillance provisions given that he was already following the medical surveillance provisions outlined under OSHA’s lead standard. A few SERs expressed concern that one indirect burden of the medical surveillance provision would likely be increased insurance costs due to an increase in workers’ compensation costs or liability costs.

Hazard Communication

Most SERs noted that their workplaces had some level of hazard training, although many SERs’ programs were focused more towards safety hazards such as falls and confined spaces. One SER noted that he did “not anticipate a problem in including Cr(VI) training” and that “For employees working in a regulated area(s) or required to wear Cr(VI) protective clothing, they would receive job specific training (Fisher, p. 8).”

Several SERS expressed some concern over the impact of extra training requirements specific to Cr(VI) hazards.

One SER stated if additional training is required after the initial training on the standard, the training should not be any more frequent than every three years. "In our case and in similar businesses, annual training on this standard would be overkill (Sayre, p. 9)."

Other SERs expressed concern with the draft proposal's requirements for labeling. For example, one SER expressed concern over having to bag waste and label the bags before the bags are deposited in the landfill. Two other SERs expressed concern regarding posting signs for regulated areas. For example one SER questioned when the sign should be posted: "I would not see obtaining and posting the signs as a problem, but would like to inquire about when/ at what times the signage would apply. Here again, as a place of employment where the Cr(VI) is used very little, would these signs apply at all times (Sayre, p. 7)?" A second SER raised concern with the wording of the sign: "Furthermore, posting signs that state RESPIRATORS ARE REQUIRED, even if this is not a true statement is somewhat like the "boy who cried wolf." We will be conditioning our employees to disregard such signs. Assuming most exposures are short term (30 min or less a couple of times per week) at such low levels never exceeding the TWA PEL, such posting would be inadvisable (Horton, p.4)."

Costs and Economic Impacts

General Comments on Costs and Impacts

A number of SERs commented on the general nature of the cost impacts of the draft proposed standard.

A SER in Plastic Colorant Production stated in written comments that although costs to comply with the draft proposed standard would be significant, his firm would be able to remain in business. This SER believed that his company essentially was meeting the spirit of the proposed requirements through a good safety culture and that other companies may not place as high a value on employee safety. Regarding technological and economic impacts and the possibility for materials substitution, this SER wrote that "the standard might result in a lessening of chromium-based products that we manufacture and in turn lessen our use of metal-based pigments (Sayre, pp. 7-8) ."

Other SERs expressed concerns about the potential cost impacts of the draft proposed standard on profitability and competitiveness.

A SER in Electroplating wrote:

My company is very typical of the decorative chrome platers in the US. I can say with great certainty that if you elect to impose the rules, even at the highest levels, that decorative chrome plating in the US will become extinct (McBride 1, p. 1).

Two SERs in Masonry jointly submitted the following written statement:

The cost of compliance with the standard would be extremely burdensome for small businesses and as the risk is reduced, the costs of risk reduction increase dramatically. (Jollay and Odom, p.1)

A SER in Electroplating expressed the view that if OSHA's final PEL is significantly lower than the current level, many facilities in his industry would not remain in business (Tucker).

Costs associated with Engineering Controls

SERs had comments on both the direct costs and the indirect costs associated with compliance with the draft OSHA standard. Among the types of engineering controls, several SERs, particularly those in Electroplating, quantified costs for ventilation systems in their shops under the current PEL and projected additional costs if the PEL were lowered. SERs who operate electroplating shops believed that upgrades to their local exhaust ventilation would be needed to meet a lower PEL. Some of the SERs in the electroplating industry also noted the potential interface of the OSHA draft proposed standard with the EPA National Emission Standards and Maximum Achievable Control Technology (MACT) standards and the costs that could possibly result if an OSHA standard forces a modification to EPA-permitted control technology.

A SER in electroplating and a SER who makes plating mixtures sent industry comments on engineering costs for their industry. Regarding the proposed PELs and engineering controls, he wrote:

Contrary to OSHA beliefs, the industry believes that all facilities will have to install new equipment or modify their existing LEV system. Additionally, some facilities will have to use chemical fume suppressants, floating balls, and/or install tank covers based on the particular operations being performed at a facility. If the PEL is set at 10 ug/m³, then the action level would be 5 ug/m³. To meet an action level of 5 ug/m³ on a consistent basis and to avoid the significant compliance costs associated with the action level, the control technology for the facility would need to achieve an exposure level of no more than 2.5 ug/m³, with a more likely engineering design target of 1.0 ug/m³. Accordingly, industry believes that a more realist [sic] capital cost is approximately \$226,000 If the PEL is at 5 ug/m³ or less, additional costs will likely occur (McBride 3, p. 1; Gandhi, p.1).

A SER whose company specializes in plating mixtures compared OSHA's costs for engineering controls with his cost estimates and concluded that costs per establishment in his industry could reach ten times OSHA's estimate, or in excess of \$100,000 in some cases (Horton 3, p.1).

A SER who oversees safety and health in a shipyard said that he anticipates difficulty reducing exposures to low PELs for the workers who weld on his site.

A SER whose company produces chromates sent extensive written comments on the costs of engineering controls. This SER wrote:

I am aware that one steel producer that will be impacted by the standard has estimated based on a recent study of his facility that it will cost between \$5 [million] and \$7.5 million in capital costs alone to install engineering controls to meet a PEL of 5 ug/m³. These costs compare to OSHA's assumption that the industry will incur no cost to meet a PEL of 5 ug/m³ (because OSHA incorrectly assumes all impacted steel mills already achieve a PEL of less than 5 ug/m³ with engineering controls currently in place) and \$227,259 to meet a PEL of 1 ug/m³. The four lines (tinning, chrome, and two electro tinning lines) at this facility that have Cr(VI) emissions each have about 6 operators. Thus, it will cost this steel company between \$208,333 and \$312,500 *per employee* to control exposures to 5 ug/m³. This example demonstrates how severely OSHA has underestimated the costs to meet the contemplated PELs in the steel industry based on extrapolating costs from an unrepresentative facility (Barnhart 1, p. 9).

A SER whose company makes plating mixtures stated that his firm would incur substantial cost to upgrade air handling equipment if OSHA sets a low PEL. This SER also anticipated significant cost increases associated with showers and clothing.

A SER whose industry association represents pigment producers, plastic colorant producers, and catalyst producers and users believed that cost estimates for purchase, installation, permitting and operation of engineering controls were underestimated or absent from OSHA's analysis. As an example, this SER cited OSHA's estimated cost for the purchase and installation of a laboratory ventilation hood for a Colored Glass facility (Robinson 1, pp.17-18).

A SER whose firm performs welding in construction submitted the following comments on costs for controlling fume emissions:

If the testing showed action level exposures, weld fume exhaust guns would be the most practical solution to engineering out the exposure. Costs approximate \$1500 per station for a gun and exhaust system and an annual expendable budget of \$650 for filters and replacement gun parts. With current welder staffing at 60 this would translate into an initial expenditure of \$90,000 to which a 5 year depreciation cost would have to be factored for replacement of equipment and an annual hard maintenance cost of \$39,000 per year for the welding exposure control. This would amount to a \$144,000 first year and \$54,000 per year on going cost to our companies for equipment. Assuming two hours a month for equipment maintenance and filter changing with a loaded labor rate of \$60 per hour we would expend another \$86,400 per year keeping the equipment operating properly. Loss of productivity due to bulky equipment and weld defects caused by loss of shielding is not factored in to these calculations (Torchio, p. 1).

Costs associated with Regulated Areas, Hygiene Facilities, and Personal Protective Equipment

With regard to the provisions for regulated areas and hygiene facilities, several SERs noted that the draft proposed rule would significantly alter their operations and affect their productivity. Some SERs commented that the requirements for showers and change rooms or areas and the prohibition of eating and drinking in the regulated area would add to labor time and slow production. Some SERs were concerned that the practical effect of the OSHA standard would be to define the entire shop floor as a regulated area, thereby impacting work flow and personnel movement.

A SER in Chromate Production listed three cost categories that he believed were overlooked by OSHA in its cost analysis for regulated areas. These costs stem from 1) any productivity losses associated with the need for employees to work in and around the regulated area; 2) possible reconfiguration of the worksite; and 3) the need to equip most workers with personal protection if they are likely to enter the regulated area (Barnhart 1, pp. 20-21).

A SER whose industry association represents color pigments, plastic colorants, and catalyst producers and users anticipated that laundering facilities and wastewater decontamination would need to be introduced to many affected facilities (Robinson 1, p. 24).

A few SERS questioned OSHA's estimate of 7.5 minutes of worker time per shower. A masonry contractor believed OSHA's estimate of the labor time and equipment cost to construct a change room was too low.

A SER whose company specializes in chromate production estimated that employee shower time would be 20 minutes per shower and that there would be additional costs for handling contaminated wastewater from the shower facilities (Barnhart 1, p. 24).

SERs described their current practice with respect to personal protective equipment. One construction contractor with welding operations that involve exposures to Cr(VI) objected to the provision for removal, storage, and cleaning of protective work clothing. Other SERs expressed concern that the need for additional clothing ? particularly specialized clothing ? and the need for laundering of clothing would be unnecessarily burdensome and might not be necessary for the purposes of controlling risk.

Two SERs in masonry, in comments jointly submitted to the Panel, indicated that PPE usage was fairly widespread in their industry:

We have polled a representative group of our members about incidents of overexposure to wet Portland cement and there have been very few incidents reported in the last 15 years. This is due primarily to the fact that employees are trained to avoid contact, they are provided personal protective equipment and any problems that do occur are dealt with immediately. But more importantly, as a general rule, we in the masonry industry would argue that exposure incidents are more attributable to the high Ph content of the wet cement than contact with trace elements of Chromium VI (Jollay and Odom, p. 2).

SERs in plating mixture manufacturing submitted written comments with cost estimates for hygiene facilities:

Other Industries have found clean/changerooms are very expensive to install and operate. They must have an industry side and a street cloth side with showers and washing facility between them. There will need to be appropriate clean/changeroom for both men and women with additional showers. Depending on the size of the facility, clean/changerooms can cost as much as \$500,000 or more. The industry cost model for a facility with 20 employees is calculated to be approximately \$50,000 (McBride and Ghandi, p. 3).

A SER whose company produces Portland Cement stated that OSHA's costs for showers and change rooms appear to be reversed. This SER observed that, contrary to OSHA's cost estimate, his experience was that change rooms cost more than individual showers (Hammersley 1, p.2).

Costs associated with Exposure Assessment

A few SERs who specialize in construction activities objected to the requirement for initial monitoring because of the potential difficulty of defining a work operation or workspace in that industry, in contrast to fixed sites in general industry. Some SERs in Construction argued in favor of a PPE-specific standard rather than one that would mandate assessment vis-à-vis a PEL.

A SER in the Maritime industry stated that the requirement in the OSHA standard to assess shipyards and related facilities would create upward pressure on the demand for the services of a professional marine chemist and these are currently in fairly limited supply.

A SER whose firm produces plating mixtures predicted that his company would need to hire an outside consulting laboratory to perform exposure assessment, at costs of \$300 - \$350 per employee (Miller, p. 2).

A SER in electroplating predicted that all establishments in his industry would incur initial monitoring expenses and that job shop and captive shop platers would need to perform quarterly and semi annual monitoring at PELs of 10 and 5 in addition to PELs of 1, 0.5, and 0.25 ($\mu\text{g}/\text{m}^3$)(Horton 3, p. 2).

A SER whose company supplies ready-mix concrete estimated that the cost for one sample, including IH travel time, sample preparation, sample collection, and report preparation, would range from \$2,700 to \$3,000. This SER anticipated that he would collect ten exposure samples per employee and that total costs for analytical sampling would total \$35,000 (Hammersley 1, pp. 1-2).

In contrast to comments critical of OSHA's unit cost estimates for exposure assessment, a SER who produces Plastic Colorants believed that OSHA's time estimates "seem reasonable (Sayre, p. 4)".

Similarly, a SER in Superalloy Production stated that "the time estimates for setting up, wearing and removing monitoring devices and for record keeping appears appropriate (Fisher 1, p. 3)."

Costs associated with Medical Surveillance

Many of the SERs commented extensively on the provisions for medical surveillance in the draft OSHA standard. A few SERs noted that intermittent use of CrVI, beyond the thirty-day threshold, would greatly complicate compliance and increase costs of the draft provision. In construction, worker mobility would mean that some employees would qualify for medical screening several times a year, according to SERs. Several SERs observed that the OSHA cost estimate may not have captured the indirect costs associated with medical surveillance, namely travel and waiting time to see a health care professional. Some SERs stated that existing tests have not been widely adopted throughout industry and that in some cases chromium exposure cannot be easily identified by conventional tests. In addition, some SERs questioned the value of annual (ongoing) medical testing.

Two SERs in masonry, in comments submitted jointly, wrote that medical surveillance would create

an additional financial burden which many small businesses like ours could not absorb easily. Many small businesses across the country do not now provide health insurance for their employees because it is so costly. To require them to pay for this cost individually, in addition to having to keep numerous records related to the medical screening, monitoring and testing will create a real hardship for many small companies and could force some of them out of business (Jollay and Odom, p. 4).

The two masonry SERs urged OSHA to exempt the construction industry from the medical surveillance provision (Jollay and Odom, p.4).

A SER in electroplating submitted the following industry comments on medical surveillance costs:

Industry believes that all employees will need a medical exam for the company liability purposes. In the industry cost model, industry believes 5 employees will need comprehensive exams and the other 15 employees will need limited medical exams. The nature of lowering the chrome PEL or any PEL will greatly heighten the probability of lawsuits being brought against a facility. As a result, all employees including administrative office personnel will be given the medical exam for liability purposes. . . . If the hex chrome PEL is significantly less than 5 ug/m³, then even more comprehensive examinations are likely to occur (McBride 3, pp. 3-4).

Other Costs and Economic Impacts

Several SERs challenged OSHA's estimate of revenues and profits in their industry. In particular, SERs in electroplating noted an apparent discrepancy between the financial data reported by OSHA and the financial performance observed within their companies. SERs in electroplating voiced concern that the OSHA impact analysis had not accounted for the intense international competitiveness ? and thus the sensitivity of customer markets to regulation-induced price changes ? in the electroplating industry.

A SER whose company specializes in chromate production contrasted OSHA's estimate of revenues for his application group with estimates produced by his group and other application groups potentially affected by the proposed standard. This SER wrote:

Based on discussions I have had with other SERs, it seems that OSHA has significantly overestimated revenues and profits across most, if not all, industry sectors. Obviously, this artificial inflation of the revenues and profits for the impacted industries will have a dramatic impact on the economic feasibility calculations (Barnhart 1, p. 5).

Similarly, a SER whose trade association represents chrome pigment producers, paint and coatings producers, and other Cr(VI) application groups, commented that:

Revenues and profits for all of the impacted industries appear to be overstated significantly. The chromate pigments industry does not earn 20 billion dollars in gross revenues, nor has the chromate pigment industry enjoyed a profit margin of 8.65% in many years. Using production estimates from eight years ago, when production was much higher, the total revenue of the industry was \$30 million. The current market generates approximately \$10 million in revenues. Current profit rates are between zero and three percent (Robinson 1, p. 14).

Several SERs in electroplating emphasized that compliance costs could not be passed forward in their industry and instead would have to be absorbed from profits.

A SER in plating mixtures production described a reduction in company employment of 25 percent over the past three years due to the decline in their customer base in the electroplating industry. This SER anticipated the closing of 20 percent of plating shops due to foreign competition and potential regulatory costs (Miller, p. 4).

A representative of chromium catalyst producers and users stated that OSHA's profit estimates for his industry were overestimated by two to three times.

A SER in chromate production predicted that "outside contractors used by businesses, especially small businesses, to handle air-conditioning, electrical, plumbing repairs, etc. also will need to be trained and afforded the appropriate PPE before they could effect repairs in a regulated area." This SER believed that these costs were not recognized in OSHA's analysis (Barnhart 1, p. 20). In addition to that comment, this SER indicated in written comments that

OSHA overestimated revenues and profits for many of the application groups affected by the draft rule (Barnhart 1, pp. 4-5).

A SER in plating mixtures production, in written comments that compared OSHA's analysis of costs with his company's analysis, stated that:

it is likely that our chromium blending operations will become unprofitable without a price increase. Annualized costs would exceed our profit margin on those product lines which contain Cr(VI). It is possible, therefore, that we would consider discontinuing manufacture of these products (Miller, p. 4).

Several SERs voiced concern that if an OSHA standard with a low PEL is promulgated, insurance costs, liability risks, and expensive lawsuits will mount. However, in response to questions from OSHA on these developments, some SERs acknowledged that the trends toward insurance risk and legal action would probably continue irrespective of the OSHA rulemaking.

Several SERs cited indirect costs as a type of cost that OSHA appeared either to overlook or underestimate. A SER in wood preserving chemical manufacturing listed four examples of indirect costs:

- 1) the paid wages for the time expended during medical testing;
- 2) the paid wages associated with showering at the end of the shift;
- 3) lost production while the employee is undergoing medical testing; and
- 4) changes in the production process that may be required to meet exposure limits (Wright, p. 2).

Several SERs also expressed concern that the complex nature of a new OSHA standard would mean that affected firms would need to out-source to compliance specialists, thereby elevating compliance costs. Related to this concern was the feeling among some SERs that the paperwork and other administrative demands would consume management resources in activities that had questionable benefits. SERs in construction and maritime especially felt that conditions on their sites made compliance with a comprehensive health standard such as the draft chromium rule virtually unmanageable.

Duplicative and Overlapping Regulations

Several SERs observed that OSHA's proposed chromium standard would potentially overlap with existing OSHA standards for other toxic substances, including, in particular, lead and cadmium. Because OSHA standards for those substances have provisions that are identical or are closely related to the draft proposed requirements for hexavalent chromium, some SERs objected to the additional burden imposed, and possible confusion created, by an OSHA rule for chromium.

A SER in maritime noted the overlap of OSHA's forthcoming proposed chromium standard with the OSHA lead standard:

Personnel already trained in housekeeping and PPE use for lead are the same individuals that would be involved in a completely separate rule for Cr6. The proposed standard parrots the lead regulations so much, that the same industry practices and engineering controls could effectively eliminate the need for separate regulations for Cr6 (Chapman, pp. 3-4).

A SER in electroplating commented on his company's experience with the EPA MACT standard and the additional costs that might result if OSHA establishes a low PEL for Cr(VI):

Consequently, the only viable alternative for those that offer hard chrome plating services is to increase the air flow across the tanks. Installing a larger and more powerful fan on existing equipment is probably not an option for most of us. The EPA MACT standard governs our facility, and it is regulated for compliance by our State Department of Health and Environmental Control (DHEC), for hex chromium emissions into the atmosphere. For the mesh pad technology to achieve the necessary efficiency, a flow rate of 500 cfm across each pad is required. Increasing the flow rate beyond this rate lowers the effectiveness, putting the equipment out of compliance for emissions. . . . Our operating costs (electricity, waste treatment, maintenance, and heat) [average] approximately \$3.00 per cfm/year. We would increase that expense from the present \$123,000 per year to \$150,000 per year. Those cost estimates do not include expenses for the required engineering study, air dispersion modeling, State DHEC construction permit, stack testing – presently @ \$5,000 per device plus travel expenses, and final operational permit. It should also be noted that acquiring the permits took a [year's] time for our present systems (Tucker).

The use of chromated copper arsenate (CCA) in the treatment of lumber and other wood products is another activity that could be affected by other environmental regulations in addition to the OSHA draft proposed standard. EPA's rules under the FIFRA at one time identified CCA as potentially toxic when used to treat wood products. However, later study by EPA led to the removal of CCA wood treatment from FIFRA review. SERs who participated in the OSHA Chromium SBREFA process raised questions about the effect of an OSHA proposed standard on registration with EPA under FIFRA.

A SER whose company manufactures wood preserving chemicals objected to an OSHA regulation of his industry because of current EPA oversight. This SER wrote:

Should OSHA decide to regulate the chromium in the CCA wood preservative it would be a duplication of regulations on the same product by EPA and OSHA, which potentially could be in conflict. By having two separate federal agencies handle the same issue it would be a duplication of costs both on the government and industry. Under EPA pesticide regulations, each of our treating plant personnel undergo required Department of Agricultural and Consumer Services testing and training to become either Certified Pesticide Applicators or Registered Technicians working under the supervision of the Certified Applicator (Wright, p. 1).

A third area of potential regulatory overlap concerns actions by States or other local governmental bodies to control air limits of toxic substances at the property line of plant facilities. In some States, the air standards for chromium bear a loose relationship with the level set by federal OSHA. In the Panel's conference call with chromium small entity representatives, a SER whose company produces chromates in Texas raised a concern that his State could possibly lower the "fence line" air limit if the OSHA PEL is lowered.

A SER whose trade association represents chrome pigment producers, paint and coatings producers, and other chromium VI application groups, expressed a similar concern in written comments:

In cases where companies have installed various types of process and hygiene exhaust equipment to meet Federal, state and local environmental requirements OSHA should not force such companies into additional immediate expenditures for replacement equipment to comply with the Proposed Rule.

Our members have also indicated that some states base their allowable ambient air standards for fence line analysis of facilities on the OSHA PEL. OSHA has not considered the cost of implementing changes in outside air standards that will be impacted by the Proposed Rule, and the PEL changes may require expensive changes to exhaust air filtration equipment (Robinson 1, p.25).

Regulatory Alternatives

The Panel asked SERs for recommendations on alternatives to the regulatory proposal drafted by OSHA. In particular, OSHA asked SERs to comment on the option of phasing in some or all of the provisions of the standard.

Some SERs favored the idea of phase-ins, believing that such an option would enable companies to budget for exposure controls and other expenses. A plating mixture manufacturer stated that a phase-in would allow small businesses to spread costs over time.

Other SERs, however, were doubtful that a phase-in would be of much help. These SERs expressed the opinion that any problems with a stringent PEL or ancillary provisions should be addressed up-front in the rule itself and would not be solved by an extended phase-in schedule.

A SER whose company specializes in chromate production favored broadening the 30-day exclusion in the medical surveillance paragraph to all provisions of the standard (Barnhart 1, p. 32).

Several SERs suggested that OSHA consider the varied toxicity of the different chromium compounds when setting the PEL. A SER who represents chromium pigment producers and chromium catalyst producers and users specifically identified lead chromate as a chromium compound that should be distinguished from other compounds that he views as more toxic.

Related to the toxicity-based PEL recommendation described above was the suggestion by some SERs that a PEL of $20 \mu\text{g}/\text{m}^3$ be proposed and that OSHA continue collecting data to evaluate the need to raise or lower the PEL from that level.

Another regulatory alternative concerns the extension of the scope to include construction activities that involve contact with wet cement. OSHA currently is excluding wet cement work in construction from the scope of the draft proposed standard but raised the possibility of including wet cement in the scope.

Other alternatives to the draft proposed standard suggested by SERs included the use of separate engineering control air limits (SECALs), as was applied in the Cadmium standard; and the elimination of the action level as a trigger for controls.

A SER in chromate production submitted the following written comments on SECALs:

Adoption of SECAL for certain job tasks, such as welding, for instance, would not dramatically change the current proposal, but, rather, would provide significant relief to a myriad of businesses – many of them small – across a broad range of industries. As the standard is currently drafted, engineering controls must be put in place to achieve the PEL or, if it is infeasible to reach the PEL, engineering controls must reach the lowest level feasible. Respirators are then allowed and required to lower any actual exposure to the PEL. Inclusion of SECALs for certain job tasks or operations would simply allow for the use of respirators (rather than the much more expensive engineering controls) to bring an employee's exposure down from the SECAL level to the PEL (Barnhart 1, p. 30).

A SER in maritime recommended that OSHA's forthcoming proposed chromium standard be combined with the OSHA lead standard. This SER wrote:

Personnel already trained in housekeeping and PPE use for lead are the same individuals that would be involved in a completely separate rule for Cr6. The proposed standard parrots the lead regulations so much, that the same industry practices and engineering controls could effectively eliminate the need for separate regulations for Cr6 (Chapman, pp. 3-4).

A SER whose company specializes in Aerospace products and services stated that his industry would need a SECAL if the final PEL is lower than $10\mu\text{g}/\text{m}^3$ (Kramer, p. 4).

A SER whose industry association has interests in chromate pigment production, paint and coatings production, and several other chromium VI application groups, identified six alternatives to the draft proposed standard that appeal to their member industries. These six alternatives are:

- 1) removal of specific industries with limited exposure from the scope of the rule;
- 2) setting of a PEL higher than the range under consideration by OSHA;
- 3) creation of a toxicity-based system of graduated PELs;

- 4) providing an exemption for industries or facilities where exposures at or above the PEL occur only on 30 days per year or less;
- 5) allowing small businesses that purchased equipment and ventilation systems to achieve compliance with EPA or OSHA requirements within the past ten years to delay compliance with the chromium VI standard until the purchased equipment reaches end of life; and
- 6) use of SECALs where appropriate (Robinson 1, pp. 12-13).

This SER dismissed, however, the merits of an equipment phase-in as a means of providing relief from foreign competition (Robinson 1, p. 14).

4. Panel Findings and Recommendations

Costs and Economic Impacts

General Comment

The SERs generally believed that OSHA had underestimated the costs of the draft proposed standard. Some SERs argued that OSHA may have underestimated the costs by a factor of ten. OSHA is committed by law to develop its analyses using the best available evidence, and OSHA will carefully consider the SER comments in light of this obligation.

The Panel recommends that, as time permits, OSHA revise its economic and regulatory flexibility analyses as appropriate to reflect the SERs' comments on underestimation of costs and that the Agency compare the OSHA revised estimates to alternative estimates provided and methodologies suggested by the SERs. For those SER estimates and methodological suggestions that OSHA does not adopt, the Panel recommends that OSHA explain its reasons for preferring an alternative estimate and solicit comment on the issue.

Technological Feasibility and Costs Associated with Achieving the PEL

Many SERs said that somewhat lower PELs could be met in many, if not all, operations, though many had doubts as to whether or not the lowest PELs were technologically achievable. The SERs were concerned that meeting a lower PEL would be both more costly than OSHA estimated, and that, in many cases, controls beyond those OSHA estimated would be required. For example, small firms in the electroplating industry felt that lower PELs would require extensive increases in Local Exhaust Ventilation (LEV) not accounted for in OSHA's cost analysis. Other SERs felt that the costs for LEV did not include the costs of heating and air-conditioning make-up air. Another SER felt that lower PELs could only be met by building a new area that totally isolated chromium related operations from the rest of the plant. Some SERs argued that, in some operations, a PEL of five or below would require extensive isolation, and PELs of 1 or below would require total enclosure and automation so no human being entered the area where chromium was being used. SERs were also concerned that the cost did not reflect the possibility that sometimes installation of

extensive engineering controls would not guarantee achieving the PEL, requiring further re-engineering or extensive use of respirators.

The Panel recommends that, to the extent time permits, OSHA should carefully consider the ability of each potentially affected industry to meet any proposed PEL for Cr(VI) and solicit comment on the costs and technological feasibility of the PEL.

Costs Associated with Medical Surveillance

Some SERs questioned the cost estimates of the medical surveillance provisions. They indicated the cost of the medical examinations was higher than estimated. Some SERs were concerned that OSHA had not adequately accounted for high employee turnover after pre-placement physicals. Some SERs indicated other problems with the effective unit cost in terms of cost of the physical examination itself, the waiting time of employees, and the amount of travel time required to meet with licensed health care professionals with the required credentials.

The Panel recommends that OSHA carefully review the basis for its estimated medical surveillance compliance costs, consider these concerns raised by the SERs, and ensure that its estimates are revised, as appropriate and time permits, to fully reflect the costs likely to be incurred by potentially affected establishments.

Costs Associated with Exposure Assessment

Some SERs were concerned that OSHA had failed to account for the need to take multiple samples in order to account for the variability in worker exposures.

Some SERs in the construction sector were concerned about how to conduct exposure assessments of constantly changing worksites, and felt that OSHA should explicitly address the issue with some alternative to frequent monitoring, or greatly increase its estimate of the cost of monitoring associated with construction sites.

The Panel recommends that, as time permits, OSHA consider alternatives that would alleviate the need for extensive monitoring on construction sites, and solicit comment on this issue. If OSHA does not adopt such alternatives, then OSHA should consider increasing the estimated costs of such monitoring in construction, and solicit comment on the costs of monitoring.

Costs Associated with Hygiene Provisions

Several SERs complained that the costs would be greater than estimated by OSHA for provisions related to hand washing or showers. SERs were concerned that OSHA had not adequately considered the costs of retrofitting such facilities into existing workplaces with little space, and with the time employees would spend showering (including waiting in line for limited facilities). SERs were also concerned with costs of the disposal/treatment of potentially contaminated water from showers and hand washing facilities.

The Panel recommends that OSHA carefully review the basis for its estimated hygiene compliance costs, consider the concerns raised by the SERs, and, to the extent time permits, ensure that its estimates are revised, as appropriate, to fully reflect the costs likely to be incurred by potentially affected establishments.

Costs Associated with Regulated Areas

Some SERs felt that OSHA's cost estimates for regulated areas did not take account of the supervisory efforts necessary to maintain regulated areas, and did not account for the costs of changing normal traffic on the work floor to accommodate regulated areas.

The Panel recommends that OSHA examine and solicit comment on this issue.

Costs of PPE Requirements

While many SERs reported currently having PPE programs for dermal protection, many SERs were concerned about the potential costs associated with PPE that needed special treatment in cleaning or disposal. Some SERs also argued that OSHA had underestimated PPE costs for working in regulated areas because there might need to be several changes of PPE per day. Some SERs were also concerned that labeling laundry with a chemical warning label would significantly increase costs of laundering PPE. Some SERs were also concerned that, in some situations, the regulation would require anyone above the PEL, even with no apparent dermal exposure, to use PPE.

The Panel recommends that OSHA examine and solicit comment on these issues.

Costs Associated with Hazard Communications Provisions

Some SERs reported that they currently did not address Cr(VI) in their existing hazard communication programs. Others reported that they did not address the issues in the depth that would be required by the standard. OSHA notes that the failure of some employers to comply with existing hazard communication requirements does not necessarily mean that the costs of compliance with these existing requirements should be added as a cost of the Cr(VI) standard. However, the Panel recommends that OSHA examine whether its cost estimates reflect the full costs of complying with the hazard communication standard.

Economic Impacts and Economic Feasibility

Many SERs were concerned that some PELs might not be economically feasible. SERs raised major questions with respect to OSHA's analysis of economic impacts and economic feasibility. First, some SERs felt that the levels of revenues and profits reported by OSHA were higher, and sometimes vastly higher, than they were experiencing. Second, SERs in manufacturing industries consistently argued that foreign competition gave them very little room to raise prices, and that costs that would only be incurred by U.S. firms would

inevitably result in business moving outside the U.S. Third, many SERs who sold chromium chemicals and products were concerned that occasional and intermittent users of their products would, if at all possible, abandon chrome related products for substitutes that would not require them to meet OSHA's regulatory provisions.

The Panel recommends that OSHA thoroughly review the economic impacts of compliance with a proposed Cr(VI) standard and develop more detailed feasibility analyses where appropriate. The Panel also recommends that OSHA, to the extent permitted by time and the availability of economic data, reexamine its estimates of profits and revenues in light of SER comments, and update economic data to better reflect recent changes in the economic status of the affected industries, consistent with its statutory mandate. The Panel also recommends that OSHA examine, to the extent feasible with the time available, the possibility that users will substitute non-chromium products for chromium products. The Panel recommends that OSHA solicit comment on the extent to which foreign competition may or may not impact what is feasible for the industries affected by this rule.

Provisions of the Proposed Rule

Scope and Application

Several SERs raised concerns about various industries covered under the scope of the standard (e.g., construction and maritime) and raised questions as to whether there was scientific evidence to support the coverage of these industries under the proposed Cr(VI) standard. Concerns were also raised by manufacturers of CCA-treated wood who noted that in OSHA's inorganic arsenic standard, applicators of arsenical pesticides like CCA were exempted.

The Panel recommends that OSHA consider and solicit comments on selective exemption of some industries from the proposed standard, especially those industries whose inclusion is not supported by the industry-specific data or in which inhalation exposure to Cr(VI) is minimal.

The Panel recommends that OSHA exempt applicators of CCA given that they are already regulated by EPA as pesticide applicators under FIFRA. In addition, OSHA should clarify and seek comment as to why users of CCA-treated wood should be covered under the Cr(VI) proposal given that the use of CCA-treated wood was previously excluded by OSHA in its standard for inorganic arsenic.

Permissible Exposure Limits (PELs)

Several SERs questioned OSHA's estimates of occupational lung cancer risks from exposure to Cr(VI). These SERs questioned the epidemiological data, adequacy of controls for smoking, and assumptions concerning linear risk and lifetime exposure. In particular, a few SERs questioned why OSHA had not considered PELs higher than 10 in light of data that they believed showed a threshold effect. A few SERs also raised issues regarding the

relative potencies of various Cr(VI) compounds and suggested a graduated system of PELs to take into account these varying toxicities.

The Panel recommends that OSHA clearly explain the way that Cr(VI) exposure and risk for the worker cohort studies used in the quantitative risk assessment were calculated, and should consider and seek comment as to whether the major assumptions used in these calculations are reasonable.

The Panel recommends that OSHA consider the available information on reduction of inhaled Cr(VI) to Cr(III) in the body, to determine whether exposures below a threshold concentration can be shown not to cause the genetic alterations that are believed to cause cancer. In addition, OSHA should review epidemiological analyses relevant to the question of threshold dose, to determine whether such a dose is identifiable from the available human data. OSHA should further consider and seek comment on these findings in relation to the risk assessment and the proposed PEL, allowing for a higher PEL than those presented in the draft standard if the risk assessment so indicates.

The Panel recommends that OSHA should clarify the meaning of the projected lung cancer risk estimates used to support the proposed standard. In particular, OSHA should explain these estimates, which are based on a working lifetime of 45 years' exposure at the highest allowable Cr(VI) concentration, and, where appropriate, note projected excess cancers that may result from shorter periods of occupational Cr(VI) exposure.

The Panel recommends that OSHA solicit information to better characterize the exposure patterns and Cr(VI) compounds encountered in the maritime environment, and should encourage input from marine chemists at appropriate points in the rulemaking.

The Panel recommends that OSHA consider the appropriateness of separate PELs for specific Cr(VI) compounds, with attention to the weight and extent of the best available scientific evidence regarding their relative carcinogenic potency.

Respiratory Protection

A few SERs raised issues about respiratory protection. Of major concern was the need for flexibility in using respiratory protection and the need to consider potential hazards that may be created by overuse of respiratory protection.

The Panel recommends that OSHA solicit information to better define construction activities likely to be above and below the PEL (for initial exposure monitoring purposes) to minimize the amount of respiratory protection that would need to be used for compliance.

Exposure Monitoring

A number of SERs expressed concerns about the draft provisions for exposure monitoring and the practicality and utility of implementing those provisions in construction settings

where conditions change on a day-to-day basis. Other SERs raised questions about the frequency and need for monitoring when exposures are in excess of the PEL.

Some SERs questioned the feasibility of the standard with respect to monitoring, arguing that existing analytic methods are not reliable at lower PELs.

The Panel recommends that OSHA provide a better explanation of how to implement an exposure assessment program for construction activities. Also, OSHA should provide further explanation on monitoring-related topics like the selection of sampling and analytical methods, the selection of plus-or-minus 25% as a confidence interval, and the use of objective data in lieu of monitoring.

The Panel recommends that OSHA consider less frequent monitoring for exposures above the PEL, especially in situations where the employer has already engineered down to the lowest feasible level and is not able to maintain levels below the PEL.

Methods of Compliance

Several SERs questioned the feasibility of engineering controls to reduce exposure levels to the range of PELs under consideration by OSHA. In particular concerns were raised about OSHA's reliance on polyballs and fume suppressants as a viable method for reducing airborne Cr(VI) levels. Electroplating SERs were also concerned about the impact an OSHA standard would have on their ability to meet EPA's MACT standard. Other concerns raised by SERs included the prohibition of employee rotation and the inability to control for certain activities such as welding and ripped bags. Some SERs suggested OSHA consider other alternatives such as 30 day triggers for engineering and SECALs.

The Panel recommends that OSHA review the technologies used to reduce Cr(VI) exposure to ensure that they are available or reasonably anticipated to be available in the future.

The Panel recommends that OSHA clarify the purpose of the prohibition on the use of employee rotation to meet the PEL and take into account the needs expressed by the SERs on the issue.

The Panel recommends that OSHA clarify the methods of compliance section.

Regulated Areas

Several SERs raised questions as to how regulated areas could be feasibly delineated from other parts of the worksite particularly at construction sites. Additional concerns were raised about administrative difficulties that would arise in limiting access to other employees, prohibiting eating or chewing, and requiring PPE changes when entering and exiting regulated areas.

The Panel recommends that OSHA clarify how to implement the use of regulated areas particularly for construction activities. OSHA should better explain how employers would

delineate boundaries for regulated areas and should better clarify the use of respiratory protection, personal protective clothing and equipment, and hygiene facilities and practices in regulated areas.

Hygiene Areas and Practices/Housekeeping

Several SERs raised concerns about the need for and the lost time and production that would result if employees were required to wash their hands and remove contaminated clothing every time they took a break. Other concerns were raised regarding the disposal of contaminated clothing. In particular SERs were concerned about the types of things that might fall under the rubric of “contaminated waste” and the added burden of providing special treatment for that waste.

The Panel recommends that OSHA provide a clearer explanation of why it is necessary to remove Cr(VI)-contaminated protective clothing and wash hands prior to entering non-Cr(VI) work areas and eating, drinking or smoking and take into account lost time and costs associated with conducting such activities.

The Panel recommends that OSHA clarify its definition of contaminated clothing or waste, provide evidence supporting the view that “contaminated” clothing presents a hazard, and better explain the special treatment of such items and why the treatment is necessary.

Personal Protective Clothing and Equipment

Several SERs raised concern as to when personal protective clothing and equipment would be required and specifically questioned how OSHA would enforce “reasonably anticipated contact” as a trigger for requiring protective clothing or equipment.

The Panel recommends that OSHA clarify its definition of reasonably anticipated skin and eye contact.

The Panel recommends that OSHA clarify the circumstances under which the proposed rule would require the use of personal protective equipment to prevent dermal exposures to solutions containing Cr(VI). In particular, OSHA should reconsider the requirements for the use of dermal protection when the PEL is exceeded; consider alternatives that are more clearly risk based; and determine whether the use of very dilute Cr(VI) solutions, as used in some laboratories, requires the use of personal protective equipment.

Medical Surveillance

Many SERs questioned the need for medical surveillance for Cr(VI)-related health effects. SERs questioned the benefits to be gained from conducting medical surveillance, particularly for biological tests. Many SERs expressed concern about the vagueness of the provisions

and the extent to which the draft provisions required anything more than an annual physical. SERs were also concerned with the ability to find health care providers familiar with Cr(VI)-related testing. Suggestions were given to make any Cr(VI) medical surveillance provisions consistent with previous OSHA substance specific standards.

The Panel recommends that OSHA provide a clearer explanation of the benefits and the need for its proposed medical surveillance provisions.

The Panel recommends that OSHA provide clearer guidance as to which employees are intended to be covered under the medical surveillance provisions and, in particular, how the standard is intended to cover employees who work for several different employers during the course of a year.

The Panel recommends that OSHA clarify the qualifications necessary to provide a medical examination (including what knowledge of Cr(VI) is necessary) and what the elements of such a medical examination should be.

The Panel recommends that OSHA design the medical surveillance provisions to be consistent with existing OSHA standards (e.g., lead and arsenic) wherever possible, in order to minimize the need for duplicative medical examinations. The Panel also recommends that OSHA clarify that differences in medical surveillance requirements that may be unavoidable across OSHA standards nevertheless often will not require completely separate medical examinations.

Overlapping and Duplicative Regulations

SERs noted several possible conflicts with environmental rules. SERs in electroplating noted that EPA's MACT requirements for electroplating would require them to retest their facilities at considerable expense if they changed their air flows to meet occupational exposure requirements. SERs noted that this cost had not been included in OSHA's cost analysis. Some SERs noted that applicators of CCA were already covered by EPA under FIFRA. Some SERs were concerned that change in the OSHA PEL might cause some states to revise their "fenceline" air quality standards downward in accordance with the OSHA PEL.

With respect to the EPA electroplating standards, the Panel recommends that OSHA examine whether important costs have been omitted, seek to develop alternatives that minimize these costs, and seek comment on the issue.

With respect to possible dual jurisdiction with FIFRA, the Panel recommends that OSHA consider dropping CCA applicators from the scope of the rule, and seek comment on this issue.

With respect to the issue of using OSHA PELs as a basis for fenceline standards, the Panel recommends that OSHA make clear the purpose of its PELs, and explain that they are not developed or examined in terms of their validity as a basis for air quality standards.

Some SERs and the Office of Advocacy (See Appendix E), also noted that in many cases the employees covered by the chromium standard may be covered by other OSHA standards, such as confined spaces, welding, lead, arsenic and cadmium.

The Panel recommends that OSHA examine whether existing standards are adequate to cover occupational exposure to chromium, and, if not, develop the chromium standard in such a way as to eliminate duplicative and overlapping efforts on the part of employers.

Significant Alternatives

Because OSHA stated that the court order required OSHA to develop a new rule on occupational exposure to Cr(VI), the SERs were not asked to discuss the possibility of no new rules, nor were they asked to discuss alternative approaches to the problem that did not involve rulemaking.

The SERs did, however, suggest a number of alternatives to the OSHA's draft proposed rule.

A PEL of 20 or greater: Some SERs argued that the scientific evidence supported only a PEL of 20 or more. Some SERs felt that was the only PEL that they would consider to be economically feasible. The Panel recommends that OSHA consider the scientific evidence in favor of a higher PEL, analyze the costs and economic impacts of a PEL of 20 or greater, and solicit comment on this option.

Intermittent Exposures: Some SERs were concerned that employers whose employees were only intermittently exposed to Cr(VI) would need to spend large sums of money for relatively little long term benefit. One SER suggested adopting a provision of the OSHA cadmium standard that allowed employers whose employees were subject to only intermittent exposure to meet the requirement PEL with respirators rather than engineering controls. The Panel recommends that OSHA carefully examine the entire issue of intermittent exposures, consider options that can alleviate the burden on such firms while meeting the requirements of the OSH Act, and solicit comment on such options.

Different PELs for Different Cr(VI) Compounds: Some SERs argued that some Cr(VI) compounds offer lesser risks of cancer than others, and should be subject to different PELs. The Panel recommends that OSHA consider these arguments and seek comment on the issue.

Treatment of the Construction Industry: The draft proposed rule did not include construction employers engaged in using wet cement within the scope of the standard. SERs from the affected industry endorsed this approach. There was also concern over whether the standard was suitable to the dynamic worksite conditions of the construction industry. Advocacy (See Appendix E) questions whether there are any exposures in construction not already covered by existing standards. The Panel recommends that OSHA continue to exempt wet cement from the scope of the standard, and that if OSHA seeks comment on this option, OSHA should note the Panel's recommendation and the reasons for the recommendation.

The Panel also recommends that OSHA seek ways of adapting the standard better to the dynamic working conditions of the construction industry, examine the extent to which Cr(VI) exposures are already covered by other standards, and seek comment on these issues. The Panel also recommends that OSHA consider the alternative of developing a construction standard in a separate rulemaking.

Treatment of the Maritime Industry: SERs in the maritime industry were concerned that the draft standard failed to recognize many of the unusual conditions in shipyards. The Panel recommends that OSHA consider, and solicit comment on, approaches to their special problems; that OSHA consider the possibility of making the maritime proposed standard more similar to the construction draft standard, or consider the alternative of developing a maritime standard in a separate rulemaking.

Phase-In of the Standard: Some SERs felt that allowing a multiyear phase-in of the standard would allow for better opportunities to budget needed capital, and to coordinate environmental and occupational health protection needs. However, some SERs were not sure that a phase-in period would help them. Some SERs urged that OSHA not use the concept of a phase-in as a basis for finding an otherwise economically infeasible standard feasible. One SER argued that employers who have recently invested in other occupational or environmental health controls be allowed additional time to comply with an chromium regulation beyond that required in a more general Phase-In. The Panel recommends that OSHA consider and seek comment on multi-year phase-in alternatives.

No Action Level: Several SERs suggested that the standard have no action level, and allow employers of employees with exposures below the PEL to avoid the requirements triggered by an action level. The Panel recommends that OSHA better explain the action level, including its role in ensuring workers are protected.

Separate Engineering Control Airborne Limits (SECALs): One SER suggested that OSHA consider the use of SECALs, provisions that allowed employers with difficult to control operations to meet the standard through respirator use while only being required to meet a somewhat higher PEL with engineering controls. The Panel recommends that OSHA consider the use of SECALs and solicit comment on whether and in what industries they are appropriate using the Cadmium standard as a model.

Appendix A -- Small Business Advocacy Review Panel Members and Staff Representatives
for the Draft OSHA Standard on Hexavalent Chromium

Robert Burt, Chairperson -- OSHA

Steven Witt -- OSHA

Amanda Edens -- OSHA

David O'Connor -- OSHA

Maureen Ruskin -- OSHA

Kathleen Martinez -- OSHA

Deborah Aiken -- OSHA

Robert Blicksilver -- OSHA

Dale Krupinski -- OSHA

Claudia Thurber -- Office of the Solicitor, U.S. Department of Labor

Susan Sherman -- Office of the Solicitor, U.S. Department of Labor

John Graham -- Office of Information and Regulatory Affairs, OMB

Brenda Aguilar -- Office of Information and Regulatory Affairs, OMB

Dominic Mancini -- Office of Information and Regulatory Affairs, OMB

Thomas Sullivan -- Office of Advocacy, Small Business Administration

Charles Maresca -- Office of Advocacy, Small Business Administration

Radwan Saade -- Office of Advocacy, Small Business Administration

Appendix B -- List of Small Entity Representatives

**SBREFA Hexavalent Chromium
Small Entity Representatives**

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Appendix C -- Written Comments Submitted by Small Entity Representatives

Appendix D: Preliminary Initial Regulatory Flexibility Analysis

Appendix E: Office of Advocacy Contractor Report Entitled “Alternatives of OSHA’s Draft Proposed Hexavalent Chromium Standards for General Industry, Maritime Operations, and Construction: