

### **III. Costs of Compliance**

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#### **III.1 Cost Methodology**

##### **GENERAL INDUSTRIES, MARITIME, AND CONSTRUCTION**

The compliance cost estimates presented in this section are based upon Shaw's analysis of the requirements contained in OSHA's February 7, 2006, draft hexavalent chromium regulatory text for general industry, shipyards, and construction. Costs associated with meeting other standards (e.g., compliance with OSHA's open tank standard, etc.) are not included in the development of the cost estimates. The methodology outlined in this chapter reflects the guidance for ancillary provisions, as described under OSHA's Primary Choice Regulatory Alternative for the revised PEL.

Five types of costs are calculated in this section: capital costs, capital charges, up-front costs, up-front charges, and annual operation and maintenance (O&M) costs. Capital costs and capital charges are associated with material that has a useful life of more than one year. Up-front costs are one-time charges to meet requirements of the standard. Annual O&M charges occur every year. All costs that are presented in the subsequent costing tables are annualized over ten years.

Capital cost items include all engineering control equipment, sampling pumps, warning signs/labels, shower facilities, changing areas, HEPA vacuums for housekeeping, and computer file space. These items are purchased in the first year but have various years of useful life.

To account for the useful life of the equipment (including engineering controls), the capital costs are annualized based on the useful life of the item and a 7 percent discount rate. This annualized capital cost is termed capital charge. Detailed capital costs for each industry sector that have been annualized using a 7 percent discount rate are included later in this chapter. Capital costs that have been annualized using a 3 percent discount rate are included in the summary tables, but the details are not included in this report.

Up-front costs are those costs which only occur in the first year (e.g., conducting initial exposure monitoring, conducting initial medical exams, and conducting initial training). To account for up-front costs in the annualized costs, it was estimated that up-front costs are annualized over 10 years with a 7 percent discount rate. Up-front costs for each industry sector that have been annualized using a 7 percent discount rate are included later in this chapter. Up-front costs that

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have been annualized using a 3 percent discount rate are included in the summary tables, but the details are not included in this report.

Annual O&M costs are costs associated with routine O&M. These costs include conducting annual exposure monitoring, conducting annual medical exams, conducting respirator fit-testing, maintenance on shower and changing facilities, conducting annual physicals, conducting routine housekeeping operations, and fulfillment of annual recordkeeping requirements.

This section presents an analysis of how the estimated costs for each requirement of the revised regulatory text were developed. All costs are presented in 2003 dollars. The analysis presents the costs for affected industries to come into compliance with new revised PEL of 20  $\mu\text{g}/\text{m}^3$ , 10  $\mu\text{g}/\text{m}^3$ , 5  $\mu\text{g}/\text{m}^3$ , 1  $\mu\text{g}/\text{m}^3$ , 0.5  $\mu\text{g}/\text{m}^3$ , and 0.25  $\mu\text{g}/\text{m}^3$  for hexavalent chromium.

**ENGINEERING CONTROLS**

OSHA requires that all feasible engineering controls be used for reducing personal exposures prior to implementing the use of personal protective equipment (PPE). When engineering controls are required to meet the revised hexavalent chromium PEL, that is, when exposure to hexavalent chromium is reasonably believed by the employer to occur greater than thirty days per year, Shaw developed cost estimates for technologically feasible engineering controls as discussed in the report "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." The direct cost of each type of engineering control was estimated based on discussions with equipment manufacturers and vendors; consulting catalogs, product literature, journal articles, and company websites; engineering judgement based on previous experience; and other sources, as relevant to each capital cost item.

Cost factors were then applied to determine other costs (instruments, freight, installation, etc.) associated with the controls. These cost factors were obtained from a cost engineering reference text "Process Design and Economics for Chemical Engineers, 4<sup>th</sup> Edition" by Peters and Timmerhaus, supplemented by engineering judgement based on previous experience. The table below shows the cost factors used to calculate the total annualized cost.

Cost Factor =	Value*	Explanation
Instruments (10% of direct) =	10	Meters and sensors
Freight (5% of direct) =	5	Shipping
Installation (44% of direct) =	44	Associated piping, electrical equipment, and materials
Startup and Contingency (31% of direct) =	31	Spares, bonding, engineering, startup, shakedown, and contingency
Maintenance (5% of capital) =	5	Replacement parts and labor
Inspection (1% of capital) =	1	Inspection
Electricity Cost (\$0.04840/kwh) =	0.0484	Rolling 12-months ending in March; Average Revenue per Kilowatt-hour from Retail Sales to Ultimate Consumers (Industry). Electric Power Monthly June 2003. Energy Information Administration
Useful Life (10 years) =	10	Payment period
Discount Rate (7%) =	7	Interest rate
Annualized Factor For Initial Costs for Engineering Controls (14.24% of capital) =	14.24	Based on useful life and discount rate
Escalation Factor (1.038) =	1.038	Chemical Engineering Magazine Plant Cost Index or similar (current year/past year)

Detailed cost estimates for industry sectors calculated with a discount rate of 7 percent are included later in this chapter. Summary (but not detailed) cost estimates for industry sectors calculated with a 3 percent discount rate are also included.

Based on the exposure profiles developed for each affected industry sector, Shaw estimated the number of large and small establishments that required controls to meet the revised PEL. The number of controls required at each establishment was also estimated based on knowledge of the affected industry sector as based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." In general, the percent of facilities requiring controls was estimated to be equivalent to the percent of workers estimated to be exposed to hexavalent chromium over the revised PEL, as developed in the Exposure Profile.

Because HEPA (high efficiency particulate air) filter vacuums are required under the housekeeping ancillary provision of the revised standard, HEPA filter vacuums were typically not included in the engineering control section. However, because the construction and maritime draft hexavalent chromium regulatory texts did not include a housekeeping ancillary provision in their original incarnation, HEPA filter vacuums were included in the engineering controls for the construction and maritime industries, if required. The construction industry is covered under Section 31 (Construction), as well as the construction industry segments of Sections 2 (Welding), 3 (Painting), and 26 (Woodworking) in the industry profile. The maritime industry is covered under the maritime industry segments of Sections 2 (Welding), 3 (Painting), and 26 (Woodworking) in the industry profile.

Lastly, OSHA does not require facilities with less than 30 days of exposure to hexavalent chromium to install engineering controls to reduce hexavalent chromium exposures. Respirators, rather than engineering controls, may be used to achieve the PEL in these establishments. Industries estimated to be exposed to hexavalent chromium less than 30 days per year include Sections 9 (Printing Ink Producers), 10 (Plastic Colorant Producers and Users), 17 (Chromium Dye Producers), 20 (Textile Dyeing), and 22 (Printing).

## **EXPOSURE MONITORING (INITIAL AND PERIODIC)**

Under this provision of the revised hexavalent chromium standard, the employer must determine if any employee is exposed to hexavalent chromium above the revised PEL. This determination can be made by either of two methods:

1. Full-shift (8-hour), time-weighted-average (TWA) exposure measurements of each shift, for each job classification, in each work area are collected and analyzed. The work area is defined as the portion of the plant or establishment where the workers conduct their daily job activities. The exposure monitoring must be done initially (after the standard takes effect) and then semi-annually or quarterly, depending on the results of the initial monitoring (as discussed below). However, the employer is not required to conduct initial monitoring if exposure monitoring satisfying the requirements of the revised standard has been conducted within the past twelve months or if the employer has “objective data” demonstrating that exposures cannot be at or above the action level. If two consecutive initial exposure measurements – taken at least seven days apart – are below the action level, monitoring may be discontinued. Otherwise, if initial exposure measurements show exposures above the action level but below the PEL, semi-annual exposure monitoring (every 6 months) must be conducted until two consecutive readings are below the PEL. If the initial monitoring results show exposures above the PEL, then quarterly exposure monitoring (every 3 months) must be conducted until two consecutive readings are below the action level at which time the monitoring becomes semi-annual. When periodic monitoring demonstrates that exposures are below the action level, monitoring may be discontinued. However, additional monitoring must be performed if there is any change in the workplace that may result in employees being exposed at or above the action level.
2. Alternatively, the employer may determine the 8-hour TWA exposure for each employee on the basis of air monitoring data or objective data demonstrating the exposure of hexavalent chromium associated with a specific process, operation, or activity.

In the cost estimate, Shaw estimated that each establishment would conduct periodic monitoring as discussed in Option 1. It was proposed that Option 1 would provide a more conservative cost estimate. Facilities having objective data would reduce the cost of exposure monitoring.

This provision has associated capital, up-front, and annual O&M costs. These costs were determined by the following equations and variables:

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Up-Front Cost

$$\text{EMUFCOST} = ((\text{SAMPCOST} * \text{JOB CAT} * \text{SHIFTS} * \#\text{SAMPS} * \#\text{INIT} * \%\text{INITADD}) + (\text{ADMINTIME} * \text{NONSUPEWAGE} * \text{JOB CAT} * \text{SHIFTS} * \#\text{SAMPS} * \#\text{INIT} * \%\text{INITADD} * \%\text{LEARN}) + (\text{INITCONTTIME} * \text{CONTCOST} * \#\text{INIT} * \%\text{INITADD} * (\%\text{LEARN} + \%\text{CONT})) + (\text{TRAINTIME} * \text{NONSUPEWAGE} * \%\text{LEARN}) + (\text{TRAINFEE} * \%\text{LEARN}) + ((\text{NONSUPEWAGE} + \text{SUPWAGE}) * \text{NOTETIME} * \text{JOB CAT} * \text{SHIFTS} * \#\text{SAMPS} * \#\text{INIT})) * \#\text{PLANTS}$$

Capital Cost

$$\text{EMCAPCOST} = \text{PSPCOST} * \#\text{PSP} * \%\text{LEARN} * \#\text{PLANTS} + \%\text{LEARN} * \#\text{PLANTS} * \#\text{CU} * \text{CUCOST}$$

Quarterly Laboratory Analysis Cost

$$\text{EMQUARTLAB} = (\text{SAMPCOST} * \text{JOBPEL} * \text{SHIFTS} * \#\text{SAMPS} * 4 * \%\text{NOTQUART} * \%\text{ABOVEPEL}) * \#\text{PLANTS}$$

Quarterly Administration Cost

$$\text{EMQUARTADMIN} = (\text{ADMINTIME} * \text{NONSUPEWAGE} * \text{JOBPEL} * \text{SHIFTS} * \#\text{SAMPS} * 4 * \%\text{NOTQUART} * \%\text{ABOVEPEL} * (\%\text{INHOUSE} + \%\text{LEARN})) * \#\text{PLANTS}$$

Quarterly Contractor Cost

$$\text{EMQUARTCONT} = (\text{QUARTCONTTIME} * \text{CONTCOST} * 4 * \%\text{NOTQUART} * \%\text{ABOVEPEL} * \%\text{CONT}) * \#\text{PLANTS}$$

Quarterly Cost of Employee Notification

$$\text{EMQUARTNOTE} = (((\text{NONSUPEWAGE} + \text{SUPWAGE}) * \text{NOTETIME} * \text{JOBPEL} * \text{SHIFTS} * \#\text{SAMPS} * 4) * \%\text{NOTQUART} * \%\text{ABOVEPEL}) * \#\text{PLANTS}$$

Quarterly O&M Cost

$$\text{EMQUARTCOST} = \text{EMQUARTLAB} + \text{EMQUARTADMIN} + \text{EMQUARTCONT} + \text{EMQUARTNOTE}$$

Semi-Annual Laboratory Analysis Cost

$$\text{EMSEMILAB} = (\text{SAMPCOST} * \text{JOBAL} * \text{SHIFTS} * \#\text{SAMPS} * 2 * \%\text{NOTSEMI} * \%\text{ABOVEAL}) * \#\text{PLANTS}$$

Semi-Annual Administration Cost

$$\text{EMSEMIADMIN} = (\text{ADMINTIME} * \text{NONSUPEWAGE} * \text{JOBAL} * \text{SHIFTS} * \#\text{SAMPS} * 2 * \%\text{NOTSEMI} * \%\text{ABOVEAL} * (\%\text{INHOUSE} + \%\text{LEARN})) * \#\text{PLANTS}$$

Semi-Annual Contractor Cost

$$EMSEMICONT = (SEMICONTTIME * CONTCOST * 2 * \%NOTSEMI * \%ABOVEAL * \%CONT) * \#PLANTS$$

Semi-Annual Cost of Employee Notification

$$EMSEMINOTE = (((NONSUPEWAGE + SUPWAGE) * NOTETIME * JOBAL * SHIFTS * \#SAMPS * 2) * \%NOTSEMI * \%ABOVEAL) * \#PLANTS$$

Semi-Annual O&M Cost

$$EMSEMICOST = EMSEMILAB + EMSEMIADMIN + EMSEMICONT + EMSEMINOTE$$

Annual O&M Cost

$$EMO\&MCOST = EMQUARTCOST + EMSEMICOST + ((EMCAPCOST) * PSPFACT)$$

Capital Charge

$$EMCAPCHG = EMCAPCOST * EMCAPCRF \text{ (where } n = PSPLIFE, i = DISCRATE)$$

Annualized Cost of Exposure Monitoring

$$EMCOST = EMO\&MCOST + EMCAPCHG$$

Variables

#CU	Number of calibration units required
#INIT	Number of initial exposure measurements required to be satisfied with semi-annual monitoring requirements
#NOTSEMI	Percent of plants not performing semi-annual monitoring requirements
#PLANTS	Number of plants represented by the model input
#PSP	Number of personal sampling pumps required
#SAMPS	Number of samples per exposure measurement
\$ABOVEAL	Percent of plants that have an employee in at least one job category above the AL
%ABOVEPEL	Percent of plants that have an employee in at least one job category above the PEL
%CONT	Percent of plants that will continue to use an outside contractor for monitoring
%INHOUSE	Percent of plants already with in-house monitoring capabilities
%INITADD	Percent of plants that have not satisfied the initial monitoring requirement
%LEARN	Percent of plants that will develop in house monitoring capability
%NOTQUART	Percent of plants not performing quarterly monitoring requirements

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ADMINTIME	In-house administrative time (e.g., for pump calibration and report writing) per sample, in hours
CONTCOST	Cost per hour for an outside industrial hygiene contactor
CUCOST	Cost of a calibration unit
DISCRATE	Discount rate
EMCAPCHG	Annualized capital cost
EMCAPCOST	Capital cost of exposure monitoring
EMCOST	Total annualized cost
EMO&MCOST	Total annualized O&M cost
EMQUARTADMIN	Administrative cost of associated with quarterly monitoring
EMQUARTCONT	Cost of outside contractor for quarterly monitoring
EMQUARTCOST	Quarterly monitoring O&M cost
EMQUARTLAB	Cost of laboratory processing samples associated with quarterly monitoring
EMQUARTNOTE	Cost associated with notifying employees of quarterly monitoring results
EMSEMIADMIN	Administrative cost of associated with semi-annual monitoring
EMSEMICONT	Cost of outside contractor for semi-annual monitoring
EMSEMICOST	Semi-annual monitoring O&M cost
EMSEMILAB	Cost of laboratory processing samples associated with semi-annual monitoring
EMSEMINOTE	Cost associated with notifying employees of semi-annual monitoring results
EMUFCOST	Up-front cost of exposure monitoring
INITCONTTIME	Time, in hours, for an outside contractor (industrial hygiene technician) to conduct the initial monitoring
JOBAL	Number of job categories exposed at or above the action level
JOBCAT	Total number of job categories (covering each work area)
JOBPEL	Number of job categories exposed at or above the PEL
NONESUPEWAGE	Non-supervisory wage rate, \$/hr
NOTETIME	Time, in hours, to notify an employee of the exposure monitoring results
PSPCOST	Cost of a personal sampling pump
PSPCRF	Capital recovery factor for capital cost of exposure monitoring
PSPFACT	Annual O&M cost of a personal sampling pump as a percentage of capital cost (assumed to be 10% of capital cost)
PSPLIFE	Useful life, in years, of a personal sampling pump
QUARTCONTTIME	Time, in hours, for an outside contractor (industrial hygiene technician) to conduct quarterly-annual monitoring
SAMPCOST	Variable cost per sample (e.g., laboratory analysis)
SEMICONTTIME	Time, in hours, for an outside contractor (industrial hygiene technician) to conduct semi-annual monitoring
SHIFTS	Number of work shifts
SUPEWAGE	Supervisory wage rate, \$/hr
TRAINFEE	Flat fee for training course



TRRAINTIME            Number of hours of training required to develop in-house monitoring capability

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in “Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors).” Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The capital cost (EMCAPCOST) equation applies the cost of personal sampling pumps and calibration units to plants that currently do not monitor in-house but will develop the capability to do so (and, therefore, will need to invest in one or more personal sampling pumps), as represented by %LEARN. The unit cost of personal sampling pumps is PSPCOST. This cost includes the purchase of a pump, charger, hose/clip assembly, and filter holder. The unit cost of a calibration unit is CUCOST. EMCAPCOST is annualized to determine an annualized charge for the capital cost of exposure monitoring (EMCAPCHG) using a useful life for personal sampling pumps of 10 years (PSPLIFE = 10 years) and a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

The up-front cost (EMUFCOST) equation contains six terms. The first term calculates the cost of processing “breathing zone air samples” (laboratory analysis). The variable cost, SAMPCOST, is estimated to be \$60 per sample. SAMPCOST is applied to all job categories because all job categories are required to be monitored initially. It is also applied to all work shifts. Each work area is also represented because job categories are distinguished by work area. When more than one worker was employed per job category per shift, Shaw estimated that up to three exposure monitoring samples were collected for that job category and shift. #INIT equals two, reflecting that initial monitoring will have to be conducted twice – with readings below the action level – in order for the requirement of semi-annual monitoring to be waived. Finally, the term applies to all plants that have not satisfied the initial monitoring requirement (because, for example, they have not conducted monitoring in the past year), as represented by %INITADD.

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The second term in the up-front cost equation applies only to plants that already have in-house monitoring capability (represented by %INHOUSE). Such plants will incur administrative costs in performing the initial monitoring in-house. Nonsupervisory administrative time — for such tasks as calibrating personal sampling pumps, collecting samples, sending samples to a laboratory for analysis, and preparing a written report documenting the results — of one hour per sample (ADMINTIME = 1 hour) is estimated.

The third term estimates the cost to pay an outside industrial hygiene contractor to conduct initial monitoring. It applies to plants that will develop the capability to monitor in-house (it is estimated that they will not develop this capability before initial monitoring is required) and to plants that will continue to use an outside contractor (represented by %CONT). The contractor will require time to travel, survey operations, take the measurements, and report the findings. The contractor's time to conduct initial monitoring, INITCONTTIME (and also QUARTCONTTIME and SEMICONTTIME), is estimated at a minimum of 12 hours, ranging up to 28 hours, based on previous exposure monitoring experience. The contractor's time depends on the industry/process sector and the number of potentially exposed workers. In addition to ½ day to prepare a written report, one day will be required to visit the plant and take measurements if the combination of job categories and shifts (JOB CAT x SHIFTS) is 12 or fewer, two days will be required if JOB CAT x SHIFTS is 13 to 24, and three days will be required if JOB CAT x SHIFTS is 25 or more. This recognizes that the time required depends on the number of job categories and shifts that need to be monitored. The contractor is estimated to be a junior industrial hygiene technician.

The fourth and fifth terms address the costs of training for plants that will develop in-house monitoring capability. It is estimated that two days of training (TRAINTIME = 16 hours) will be necessary for the staff industrial hygienist or a qualified technician (nonsupervisory wage rate). In addition, there is a flat fee for a training course.

The sixth term addresses the cost of notifying the employee of the results of monitoring. Within 15 working days after the receipt of the results of any monitoring performed under this provision, the employer shall notify each affected employee individually in writing of the results. In addition, within the same time period, the employer shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected employees. It is estimated that 15 minutes (0.25 hours) of the supervisor's and nonsupervisor's (employee sampled) time will be required to notify the employee of the results for each sample.

The annual O&M cost of exposure monitoring (EMO&MCOST) is made up of three terms: the cost of conducting quarterly exposure monitoring for employee with exposures to hexavalent chromium above the PEL (EMQUARTCOST), the cost of semi-annual monitoring for employees with exposures above the AL (EMSEMICOST), and the maintenance cost for personal sampling pumps and calibrations units. The quarterly and semi-annual exposure monitoring costs are similar to the cost of initial exposure monitoring in that they include costs for laboratory analysis, in-house administrative costs, industrial hygiene contractor costs, and the cost of employee notification of monitoring results. They do not include the cost of training time and training fees for the development of in-house monitoring capabilities, as these are treated as cost incurred only during the first year. In addition, the annual O&M cost of exposure monitoring (EMO&MCOST) has a final term included for the upkeep of capital equipment such as personal sampling pumps and calibration units. This term is represented by the quantity  $EMCAPCOST \times PSPFACT$ , which estimates that the annual cost of upkeep of capital equipment is 10 percent of the total capital of the equipment.

A term in the annual O&M cost is the cost associated with the quarterly monitoring of employees with exposures above the PEL (EMQUARTCOST). This term is comprised of four costs: the cost of laboratory analysis of samples (EMQUARTLAB), the cost of in-house administrative time (EMQUARTADMIN), the cost of the use of an outside industrial hygienist to conduct monitoring (EMQUARTCONT), and the cost of employee notification of monitoring results (EMQUARTNOTE).

The quarterly cost of laboratory analysis (EMQUARTLAB) equation calculates the cost of processing "breathing zone air samples" (laboratory analysis). The variable cost, SAMPCOST, is estimated to be \$60 per sample. SAMPCOST is applied to all job categories with exposures above the PEL (represented by JOBPEL). It is also applied to all work shifts. Each work area is also represented because the job categories are distinguished by work area. When more than one worker was employed per job category per shift, Shaw estimated that up to 3 exposure monitoring samples were collected for that job category and shift. This value is multiplied by four because quarterly monitoring will occur four times per year. This is then multiplied by the percentage of establishments that have employees with exposures above the PEL (%ABOVEPEL) and by the percentage of establishments that do not perform quarterly exposure monitoring in the baseline (%NOTQUART). Finally, this cost is multiplied by the number of

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plants represented by the model input to yield the annual cost to that particular industry from quarterly laboratory analysis.

The second term of the quarterly cost of exposure monitoring is the cost of in-house administrative time (EMQUARTADMIN). Establishments will incur administrative costs in performing the quarterly monitoring in-house. Nonsupervisory administrative time – for such tasks as calibrating personal sampling pumps, collecting samples, sending samples to a laboratory for analysis, and preparing a written report documenting the results – of one hour per sample (ADMINTIME = 1 hour) is estimated. ADMINTIME is multiplied by the number of job categories above the PEL, the number of shifts worked at the establishment (JOBPEL), and by the number of samples taken (#SAMPS). This cost is then multiplied by four because the quarterly monitoring will occur four times per year. The resultant cost is multiplied by the percentage of establishments that have employees with exposures above the PEL (%ABOVEPEL) and by the percent of establishments that do not perform quarterly monitoring in the baseline (represented by %NOTQUART). This cost is then multiplied by the quantity (%INHOUSE + %LEARN). This quantity (%INHOUSE + %LEARN) represents the percentage of establishments that will have in-house monitoring capabilities after the first year. Finally, the cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for quarterly in-house administrative time for exposure monitoring.

The third term in the quarterly cost of exposure monitoring is the cost to pay an outside industrial hygiene contractor to conduct quarterly monitoring (EMQUARTCONT). It applies to plants that will continue to use an outside contractor (represented by %CONT). The contractor will require time to travel, survey operations, take the measurements, and report the findings. The contractor's time to conduct quarterly monitoring, QUARTCONTTIME, is estimated at a minimum of 12 hours, ranging up to 28 hours, based on previous exposure monitoring experience. The contractor's time depends on the industry/process sector and the number of potentially exposed workers. In addition to ½ day to prepare a written report, one day will be required to visit the plant and take measurements if the combination of job categories and shifts (JOBPEL x SHIFTS) is 12 or fewer, two days will be required if JOBPEL x SHIFTS is 13 to 24, and three days will be required if JOBPEL x SHIFTS is 25 or more. This recognizes that the time required for sampling depends on the number of job categories and shifts that need to be monitored. The contractor is estimated to be a junior industrial hygiene technician. The contractor's time to conduct quarterly monitoring is multiplied by the cost of an outside contractor (CONTCOST). This cost is then multiplied by four because exposure monitoring will

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occur four times per year. This cost is then multiplied by the percentage of establishments that will continue to use an outside contractor for exposure monitoring (%CONT), the percentage of establishments that have an employee with exposure above the PEL (%ABOVEPEL), and the percentage of establishments that are not performing quarterly exposure monitoring in the baseline (represented by %NOTQUART). Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for quarterly cost of hiring an outside contractor to conduct quarterly exposure monitoring.

The final term in the quarterly cost of exposure monitoring is the cost of employee notification time of exposure monitoring results (EMQUARTNOTE). Within 15 working days after the receipt of the results of any monitoring performed under this provision, the employer shall notify each affected employee individually in writing of the results. In addition, within the same time period, the employer shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected employees. It is estimated that 15 minutes (0.25 hours) of the supervisor's and nonsupervisor's (employee sampled) time will be required to notify the employee of the results for each sample. This wage rate is represented by the quantity (NONSUPEWAGE + SUPWAGE). This rate is then multiplied by the time it takes to notify each employee (NOTETIME), the number of job categories exposed above the PEL (JOBPEL), the number of work shifts (SHIFTS), the number of samples (#SAMPS), and then multiplied by four to since the quarterly monitoring will occur four times per year. This cost is then multiplied by the percentage of plants that do not conduct quarterly exposure monitoring in the baseline (%NOTQUART) and by the percentage of establishments that have employees with exposures above the PEL (%ABOVEPEL). Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for the quarterly cost of hiring an outside contractor to conduct quarterly exposure monitoring.

A term in the annual O&M cost is the cost associated with the semi-annual monitoring of employees with exposures above the AL (EMSEMICOST). This term is comprised of four costs: the cost of laboratory analysis of samples (EMSEMILAB), the cost of in-house administrative time (EMSEMIADMIN), the cost of the use of an outside industrial hygienist to conduct monitoring (EMSEMICONT), and the cost of employee notification of monitoring results (EMSEMINOTE).

The semi-annual cost of laboratory analysis (EMSEMILAB) equation calculates the cost of processing "breathing zone air samples" (laboratory analysis). The variable cost, SAMPCOST,

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is estimated to be \$60 per sample. SAMPCOST is applied to all job categories with exposures above the AL (represented by JOBAL). It is also applied to all work shifts. Each work area is also represented because job categories are distinguished by work area. When more than one worker was employed per job category per shift, Shaw estimated that up to three exposure monitoring samples were collected for that job category and shift. This value is multiplied by two because semi-annual monitoring will occur two times per year. This is then multiplied by the percentage of establishments that have employees with exposures above the AL (%ABOVEAL) and by the percentage of establishments that do not perform semi-annual exposure monitoring in the baseline (%NOTSEMI). Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry from semi-annual laboratory analysis.

The second term of the semi-annual cost of exposure monitoring is the cost of in-house administrative time (EMSEMIADMIN). Establishments will incur administrative costs in performing the semi-annual monitoring in-house. Nonsupervisory administrative time – for such tasks as calibrating personal sampling pumps, collecting samples, sending samples to a laboratory for analysis, and preparing a written report documenting the results – of one hour per sample (ADMINTIME = 1 hour) is estimated. ADMINTIME is multiplied by the number of job categories above the AL, the number of shifts worked at the establishment (JOBAL), and by the number of samples taken (#SAMPS). This cost is then multiplied by two because the semi-annual monitoring will occur two times per year. The resultant cost is multiplied by the percentage of establishments that have employees with exposures above the AL (%ABOVEAL) and by the percent of establishments that do not perform semi-annual monitoring in the baseline (represented by %NOTSEMI). This cost is then multiplied by the quantity (%INHOUSE + %LEARN). This quantity (%INHOUSE + %LEARN) represents the percentage of establishments that will have in-house monitoring capabilities after the first year. Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for semi-annual in-house administrative time for exposure monitoring.

The third term in the semi-annual cost of exposure monitoring is the cost to pay an outside industrial hygiene contractor to conduct semi-annual monitoring (EMSEMICONT). It applies to plants that will continue to use an outside contractor (represented by %CONT). The contractor will require time to travel, survey operations, take the measurements, and report the findings. The contractor's time to conduct semi-annual monitoring, SEMICONTTIME, is estimated at a minimum of 12 hours, ranging up to 28 hours, based on previous exposure monitoring

experience. The contractor's time depends on the industry/process sector and the number of potentially exposed workers. In addition to ½ day to prepare a written report, one day will be required to visit the plant and take measurements if the combination of job categories and shifts (JOBAL x SHIFTS) is 12 or fewer, two days will be required if JOBAL x SHIFTS is 13 to 24, and three days will be required if JOBAL x SHIFTS is 25 or more. This time recognizes that the time required depends on the number of job categories and shifts that need to be monitored. The contractor is estimated to be a junior industrial hygiene technician. The contractor's time to conduct semi-annual monitoring is multiplied by the cost of an outside contractor (CONTCOST). This cost is then multiplied by two because exposure monitoring will occur two times per year. This cost is then multiplied by the percentage of establishments that will continue to use an outside contractor for exposure monitoring (%CONT), the percentage of establishments that have an employee with exposure above the AL (%ABOVEAL), and the percentage of establishments that are not performing semi-annual exposure monitoring in the baseline (represented by %NOTSEMI). Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for semi-annual cost of hiring an outside contractor to conduct semi-annual exposure monitoring.

The final term in the semi-annual cost of exposure monitoring is the cost of employee notification time of exposure monitoring results. Within 15 working days after the receipt of the results of any monitoring performed under this provision, the employer shall notify each affected employee individually in writing of the results. In addition, within the same time period, the employer shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected employees. It is estimated that 15 minutes (0.25 hours) of the supervisor's and nonsupervisor's (employee sampled) time will be required to notify the employee of the results for each sample. This wage rate is represented by the quantity (NONSUPEWAGE + SUPWAGE). This quantity is then multiplied by the time it takes to notify each employee (NOTETIME), the number of job categories exposed above the AL (JOBAL), the number of work shifts (SHIFTS), the number of samples (#SAMPS), and then multiplied by two to since the semi-annual monitoring will occur two times per year. This cost is then multiplied by the percentage of plants that do not conduct semi-annual exposure monitoring in the baseline (%NOTSEMI) and by the percentage of establishments that have employees with exposures above the AL (%ABOVEAL). Finally, this cost is multiplied by the number of plants represented by the model input to yield the annual cost to that particular industry for semi-annual cost of hiring an outside contractor to conduct exposure monitoring.

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The total annualized cost of exposure monitoring (EMCOST) is comprised of two terms, the annualized capital cost of exposure monitoring equipment (EMCAPCHG), which is determined by multiplying the capital cost of exposure monitoring equipment (EMCAPCOST) with the capital recovery factor for exposure monitoring equipment (PSPCRF), and the annual O&M cost of exposure monitoring (EMO&MCOST), which has been determined previously. The sum of these two factors yields the total annualized cost of exposure monitoring.



## REGULATED AREAS

The revised hexavalent chromium standard requires that regulated areas be established in general industry where exposures to hexavalent chromium exceed the PEL. These areas must be demarcated with warning signs. There is also a requirement to affix warning labels to shipping and storage containers; however, the Hazard Communication Standard already requires this. Therefore, incremental costs are attributed only to warning signs.

These are capital costs, and these costs were determined by the following equations and variables:

### Capital Cost

$$\text{RACAPCOST} = ((\text{SIGNCOST} * \#\text{SIGNS} * (\text{JCPEL})) + (\text{SIGNTIME} * \text{NONSUPEWAGE} * \#\text{SIGNS} * (\text{JCPEL}))) * \% \text{SIGNADD} * \#\text{PLANTS}$$

### Capital Charge

$$\text{RACAPCHG} = \text{RACAPCOST} * \text{SIGNCRF} \text{ (where } n = \text{SIGNLIFE, } i = \text{DISCRATE)}$$

### Annualized Cost of Regulated Areas

$$\text{RACOST} = \text{RACAPCHG}$$

### Variables

#PLANTS	Number of plants represented by the model plant
%SIGNADD	Percent of plants requiring additional warning signs for regulated areas
#SIGNS	Number of warning signs required for each regulated area
JCPEL	Number of job categories exposed above the PEL
NONSUPEWAGE	Non-supervisory wage, \$/hr
SIGNCOST	Unit cost of OSHA-regulation warning signs with mounting materials
SIGNLIFE	Useful life, in years, of a warning sign
SIGNTIME	Time, in hours, to mount a warning sign
RACAPCOST	Total capital cost of regulated areas - signs and labels
RACAPCHG	Annualized capital charge for the total capital cost of regulated areas-signs and labels
RACOST	Annualized cost of regulated areas
SIGNCRF	Capital recovery factor for the total capital cost of regulated areas-signs and labels
DISCRATE	Discount rate

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based

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on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The capital cost for this provision comprises the cost of two warning signs (#SIGNS = 2) for every regulated area and the cost of nonsupervisory time to mount the signs. The unit cost of a warning sign is SIGNCOST. The warning signs are 14" x 20" semi-rigid industrial signs with custom wording. The number of signs at each facility depends on the number of process areas that require these signs. Each job category constitutes a separate regulated area. The number of regulated areas was estimated after accounting for engineering controls to be installed in the facility, if necessary to reduce worker exposure below the revised PEL. An estimated \$3.84 is added for mounting materials.

The time to mount a warning sign, SIGNTIME, is estimated to be ½ hour. Because the revised standard has specific wording requirements for warning signs, it is projected that all plants will require new signs for their regulated areas (%SIGNADD = 100%).

Finally, the capital cost is annualized (RACAPCHG) using a useful life for warning signs of ten years (SIGNLIFE = 10 years) and a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

In the summary tables, the estimated cost for regulated areas has been included in the estimate cost of the communication provision.

## RESPIRATORY PROTECTION

Under this provision of the revised hexavalent chromium standard, employers must provide all workers exposed above the 8-hour PEL with respirators and ensure that the employees use them during:

- Periods necessary to install or implement feasible engineering controls and work practices,
- Work operations, such as maintenance and repair activities, for which engineering and work practice controls are not feasible,
- Work operations for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL, and
- Work operations where employees are exposed above the PEL for fewer than 30 days per year and the employer has elected not to implement engineering and work practice controls to achieve the PEL.

Therefore, if engineering controls and work practices cannot reduce exposures to concentrations below the PEL, supplementary use of respirators becomes necessary. Also, facilities with less than 30 days exposure to hexavalent chromium are not required to install engineering controls and may use respirators to achieve the PEL. This provision has associated capital and annual O&M costs. These costs were determined by the following equations and variables:

### Capital Cost

$$\text{RESPCAPCOST} = (((\text{HALFUSERSPEL} + \text{HALFUSERSAL}) * (1 - \% \text{HALFBASE})) * \text{HALFCOST} + ((\text{FULLUSERSPEL} + \text{FULLUSERSAL}) * (1 - \% \text{FULLBASE})) * \text{FULLCOST} + ((\text{AIRUSERSPEL} + \text{AIRUSERSAL}) * (1 - \% \text{AIRBASE})) * \text{AIRCOST} + ((\text{HLMTUSERSPEL} + \text{HLMTUSERSAL}) * (1 - \% \text{HLMTBASE})) * \text{HLMTCOST}) * \# \text{PLANTS}$$

### O&M Cost

$$\text{RESPO\&M} = (((\text{AIRUSERSPEL} * (1 - \% \text{AIRBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \# \text{DAYS} * \text{NONSUPEWAGE} + (\# \text{DAYS} * \text{SHIFTS} * \text{RESPCLEAN}))) + (\text{FULLUSERSPEL} * (1 - \% \text{FULLBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \# \text{DAYS} * \text{NONSUPEWAGE} + (\# \text{DAYS} / \# \text{FILT DAYS}) * \text{CRTRDGCOST} + (\# \text{DAYS} * \text{SHIFTS} * \text{RESPCLEAN}))) + (\text{HALFUSERSPEL} * (1 - \% \text{HALFBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \# \text{DAYS} * \text{NONSUPEWAGE} + (\# \text{DAYS} / \# \text{FILT DAYS}) * \text{CRTRDGCOST} + (\# \text{DAYS} * \text{SHIFTS} * \text{RESPCLEAN}))) + (\text{HLMTUSERSPEL} * (1 - \% \text{HLMTBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \# \text{DAYS} * \text{NONSUPEWAGE} + (\# \text{DAYS} / \# \text{FILT DAYS}) * \text{CRTRDGCOST} + (\# \text{DAYS} * \text{SHIFTS} * \text{RESPCLEAN})))) * \# \text{PLANTS}$$

$$\begin{aligned}
 & (\text{RESPTIME} * \text{SHIFTS} * \#\text{DAYS} * \text{NONSUPEWAGE} + (\#\text{DAYS} * \\
 & \text{SHIFTS} * \text{RESPCLEAN}))) * \#\text{PLANTS}) + ((\text{AIRUSERSAL} * (1 - \\
 & \% \text{AIRBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \#\text{DAYSUPSET} * \\
 & \text{NONSUPEWAGE} + (\#\text{DAYSUPSET} * \text{SHIFTS} * \text{RESPCLEAN}))) \\
 & + (\text{FULLUSERSAL} * (1 - \% \text{FULLBASE}) * (\text{RESPTIME} * \text{SHIFTS} \\
 & * \#\text{DAYSUPSET} * \text{NONSUPEWAGE} + (\#\text{DAYSUPSET} / \\
 & \#\text{FILTDAYS}) * \text{CRTRDGCOST} + (\#\text{DAYSUPSET} * \text{SHIFTS} * \\
 & \text{RESPCLEAN}))) + (\text{HALFUSERSAL} * (1 - \% \text{HALFBASE}) * \\
 & (\text{RESPTIME} * \text{SHIFTS} * \#\text{DAYSUPSET} * \text{NONSUPEWAGE} + \\
 & (\#\text{DAYSUPSET} / \#\text{FILTDAYS}) * \text{CRTRDGCOST} + \\
 & (\#\text{DAYSUPSET} * \text{SHIFTS} * \text{RESPCLEAN}))) + (\text{HLMTUSERSAL} \\
 & * (1 - \% \text{HLMTBASE}) * (\text{RESPTIME} * \text{SHIFTS} * \#\text{DAYSUPSET} * \\
 & \text{NONSUPEWAGE} + (\#\text{DAYSUPSET} * \text{SHIFTS} * \text{RESPCLEAN}))) \\
 & * \#\text{PLANTS}
 \end{aligned}$$

Capital Charge

$$\text{RESPCAPCHG} = \text{RESPCAPCOST} * \text{RESPCRF} \text{ (where } n = \text{RESPLIFE, } i = \text{DISCRATE)}$$

Total Annualized Cost for Respiratory Protection

$$\text{RESPCOST} = \text{RESPCAPCHG} + \text{RESPO\&M}$$

Variables

#DAYS	Number of operating days per year that a respirator is worn by a worker because exposures are above the PEL after engineering controls are implemented
#DAYSUPSET	Number of operating days per year that employees above the AL must wear respirators because of process upsets
#FILTDAYS	Number of days a respirator filter cartridge may be in use before it must be changed
#PLANTS	Number of plants represented by the model plant
%AIRBASE	Percent of the workers using air-supplied respirators
%FULLBASE	Percent of the workers using full-face respirators
%HALFBASE	Percent of the workers using half-mask respirators
%HLMTBASE	Percent of the workers using blasting helmet air-supplied respirators
AIRCOST	Unit cost per worker for an air-supplied respirator
AIRUSERSAL	Number of workers requiring air-supplied respirators because above AL
AIRUSERSPEL	Number of workers requiring air-supplied respirators because above PEL
CRTRDGCOST	Cost of replacement cartridges (2 cartridges per mask)
DISCRATE	Discount rate
FULLCOST	Unit cost per employee for a full-face respirator
FULLUSERSAL	Number of workers requiring full-face respirators above AL
FULLUSERSPEL	Number of workers requiring full-face respirators above PEL

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HALFCOST	Unit cost per employees for a half-mask respirator
HALFUSERAL	Number of workers requiring half-mask respirators above AL
HALFUSERSPEL	Number of workers requiring half-mask respirators above PEL
HLMTCOST	Unit cost per employee for a blasting helmet air-supplied respirator
HLMTUSERSAL	Number of workers requiring blasting helmet air-supplied respirators above AL
HLMTUSERSPEL	Number of workers requiring blasting helmet air-supplied respirators above PEL
NONSUPEWAGE	Non-supervisory wage rate, \$/hour
RESCRF	Capital recovery factor for respirators
RESPCAPCHG	Capital charge for respirator protection
RESPCAPCOST	Total capital cost for respirators
RESPCLEAN	Cost of materials to clean one respirator
RESPCOST	Total annualized cost of respirator protection
RESPLIFE	Useful life of respirators
RESPO&M	Total annualized O&M cost
RESPTIME	Time, in hours, for an employee to clean a respirator
SHIFTS	Number of shifts per day

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The percent of workers already using respirators was estimated from the NIOSH report, "Respirator Usage in Private Sector Firms, 2001" (U.S. Department of Labor, Bureau of Labor Statistics, September 2003). It was estimated that the percent of workers using respirators was equal to the percent of firms supplying respirators. While the report did not distinguish between large and small establishments at the 2-digit SIC Code, it did provide differentiation between large and small establishments for industry overall (general industry, construction, and maritime together). The overall ratio between large and small establishments was then multiplied by the 2-digit SIC Code data to estimate respirator usage for large and small establishments at the 2-digit SIC Code level.

Although the revised hexavalent chromium standard only specifies respirators for workers exposed to hexavalent chromium above the PEL, Shaw estimated that workers in general industry exposed to hexavalent chromium above the AL would choose to wear respirators 30 days per year due to process upsets or by their preference.

OSHA's respiratory protection regulation [29CFR1910.134] requires that workers who wear respirators have a medical evaluation to determine their fitness to wear a respirator. For those respirator wearers who have annual physical examinations provided by the employer (either before the revised hexavalent chromium standard, or as a result of the revised hexavalent chromium standard), no additional costs were estimated to be required to specifically meet this standard, since any requirements could be met at the time of that examination at little or no additional cost (Compliance Cost Analysis Current and Proposed Respiratory Protection Standards, Centaur, 1986). The cost for this medical evaluation has been included in the cost of medical surveillance and is not included in the respiratory protection costs.

The capital cost equation considers the cost of supplying workers with respirators. This cost equation has four terms. The first term represents the capital cost for half-mask respirator, the second term represents the cost for full-face respirators, the third term represents the cost for air-supplied respirators, and the last term represents the cost for a blasting helmet with full-face supplied air respirator. The type of respirator for each job category of workers within an industry/process sector was specified in the technological feasibility chapter.

Each of the four terms for the capital cost equation has three parts. These parts include the following items: the number of workers in a job category within an industry/process sector requiring respirators (e.g., half-mask, full-face, and air-supplied), the percentage of the plants within a job category presently not supplying respirators (e.g., half-mask, full-face, and air-supplied), and the cost of a respirator (e.g., half-mask, full-face, and air-supplied). These three items are multiplied together to obtain the cost for supplying each type of respirator. Next, these costs are added together (half-mask cost plus full-face cost plus air-supplied cost). This cost represents the average cost per plant for supplying respirators. Lastly, the unit cost of respirators per plant is multiplied by the number of plants in the industry/process sector to obtain the capital cost for each job category within the industry/process sector.

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The capital charge cost equation considers the annual cost of supplying respirators for workers exposed above the PEL as an 8-hour TWA based on the useful life of the equipment. The difference between the capital cost equation and the capital charge equation is that, in the latter, the costs of the respirators and support equipment are annualized using a capital recovery factor.

The annual O&M cost equation has two components. The first component accounts for the annual cost for supplying miscellaneous parts for the respirators (e.g., air for the air-supplied respirators and cartridges for the half-mask respirator and full-face respirator) while the second component accounts for the routine O&M cost (cleaning) of the respirators. The two components of the O&M cost equation are added together and multiplied by the number of plants in the industry/process sector.

The annual O&M cost for respirator protection includes costs for employee time to clean a respirator, the cost of cleaning materials per respirator cleaning for respirators, and the cost of replacement filter cartridges for half and full face respirators. The term representing the cost for the employee's time cleaning a respirator is represented by the term  $(RESPTIME \times \#SHIFTS \times \#DAYS \times NONSUPEWAGE)$ . This cost represents the amount of time it takes an employee ( $RESPTIME = 10$  minutes) to clean one respirator times the number of shifts per day times the number of days that the respirator is in service per year times the wage rate of the employee. This value is then multiplied by the number of times each type of respirator is in service times (1 minus percent of that particular type of respirator being used in the baseline). This is applied for all four types of respirators used.

The second term is the cost of the cleaning materials for each respirator, represented by  $(RESPCLEAN \times \#SHIFTS \times \#DAYS)$ . This cost is the cost of material to clean one respirator ( $RESPCLEAN$ ) times the number of times one respirator of each type is cleaned per year represented by  $(\#SHIFTS \times \#DAYS)$ . This cost is then multiplied by the number of respirators in service times (1 minus percent of that particular type of respirator being used in the baseline). This cost is applied for all four types of respirators used.

The final term of note in the respirator protection O&M cost equation accounts for the fact that full-face and half-face respirators require additional filter cartridge changes per year. This maintenance generates an additional cost for replacement filters. The term is  $(\#DAYS / \#FILTDAYS) \times FILTCOST$ . This equation states that there are a certain number of days per year that a respirator is in use with its cartridges ( $\#DAYS$ ). This number is divided by the

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number of days that the filter cartridges may be in use before they must be per changed. This division gives the number of times that the filter cartridges must be changed be year. The number of filter cartridge changes per year (represented by #DAYS / #FILTDAYS) is then multiplied by the cost of new filter cartridges (FILTCOST) to provide the cost per respirator for replacement filter cartridges. This number is then multiplied by the number of respirators in service times a factor (1 minus fraction of that particular type of respirator being used in the baseline). This cost is only applied for half and full-face respirators.

The second large bracketed term takes into account the operation and maintenance cost associated with the use of respirators by employees exposed above the action level during process upsets. This is not a cost directly incurred by the revised standard, but it was included in cost analysis for general industry to account for the fact that there may be times when plant operations are upset and employee exposure may arise from being above the action level to being above the PEL. This term is the same as the first term with the exception that the number of employees wearing each type of respirator is only the number of employees who are exposed above the action level but below the PEL. Also, the number of days per year that the respirators are worn has been changed to represent the number of days per year that process conditions may become upset. The number of days per year that process conditions may become upset is estimated at thirty days per year.



**RESPIRATOR FIT TESTING**

The revised hexavalent chromium standard mandates the following items: 1) annual qualitative or quantitative fit-testing for employees wearing a tight-fitting, air-purifying respirator and whose exposure to hexavalent chromium does not exceed 10 times the PEL (qualitative fit-testing will be estimated because it is less expensive), 2) annual quantitative fit-testing for employees wearing a tight-fitting, air-purifying respirator and who are exposed at greater than 10 times the PEL, and 3) annual quantitative fit-testing for employees wearing a tight-fitting, supplied-air respirator or a self-contained breathing apparatus (SCBA), regardless of exposure level. Therefore, there are associated annual costs. Employees who have exposure to hexavalent chromium above the PEL are required to undergo medical examinations. It is estimated the cost of medical questionnaires for respirator use and any medical examinations will be conducted at that time, and therefore, no cost was incurred in the respirator fit testing section for these employees. Employees with exposure above the AL and below the PEL are not required to receive medical examinations for their exposures and are also not required by the Revised Standard for general industry to wear respirators. In the respiratory protection section, it was estimated that employees with exposures above the AL will wear respirators during process upsets because their exposures at that time may increase above the PEL. Therefore, the cost of fit testing, medical history questionnaires, and any medical examinations for respirator usage are incurred by employees with exposures above the AL.

Total O&M Cost

$$\text{FITO\&MCOST} = ((\text{QLFITMTRLS} * \text{QLFITEMP}) + ((\text{QLFITTIME} + \text{QLFITTECH}) * \text{NONSUPEWAGE} * \text{QLFITEMP}) + (\text{QNFITCOST} * \text{QNFITEMP}) + (\text{QNFITTIME} * \text{NONSUPEWAGE} * \text{QNFITEMP})) * (1 - \% \text{FITBASE}) * \# \text{PLANTS} + ((\text{EMPAL} * \text{MEDHISTTIME} * \text{NONSUPEWAGE}) + (\text{EMPAL} * \text{MEDHISTCOST}) + ((\text{EMPAL} * \text{RESPEXAMTIME} * \text{NONSUPEWAGE}) + (\text{EMPAL} * \text{RESPEXAMCOST})) * \% \text{EMPMEDEXAM}) * \# \text{PLANTS} * (1 - \% \text{FITBASE})$$

Total annualized cost of respirator fit testing

$$\text{FITCOST} = \text{FITO\&MCOST}$$

Variables

- #PLANTS                      Number of plants represented by the model plant
- %EMPMEDEXAM              Percent of employees that will require a medical exam for respirator use
- %FITBASE                      Percent of plants conducting annual respirator fit-testing in the baseline

EMPAL	Number of employees who wear respirators for more than 5 hours/week and who are above the AL and below the PEL in the model plant
FITCOST	Total annualized cost of respirator fit testing
FITO&MCOST	Total annualized O&M Cost
MEDHISTCOST	Cost of medical history questionnaire
MEDHISTTIME	Employee time to complete medical history questionnaire, in hours
NONSUPEWAGE	Non-supervisory wage rate
QLFITEMP	Number of employees requiring annual qualitative fit-testing
QLFITMTRLS	Cost of materials per qualitative fit-testing
QLFITTECH	Time, in hours, for a technician to conduct one qualitative fit-test
QLFITTIME	Time, in hours, for an employee to be qualitative fit-tested
QNFITCOST	Cost of an industrial hygiene technician contractor per quantitative fit-test
QNFITEMP	Number of employees requiring annual quantitative fit-testing
QNFITTIME	Time, in hours, for an employee to be quantitative fit-tested
RESPEXAMCOST	Cost of a medical exam for respirator use
RESPEXAMTIME	Employee time for medical exam for respirator use, in hours

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The percent of workers already being fit-tested was estimated from the NIOSH report, "Respirator Usage in Private Sector Firms, 2001" (U.S. Department of Labor, Bureau of Labor Statistics, September 2003). It was estimated that the percent of workers being fit-tested for respirators was equal to the percent of firms supplying respirators (i.e., if a firm supplies respirators, it also fit-tests). While the report did not distinguish between large and small establishments at the 2-digit SIC Code, it did provide a differentiation between large and small establishments for industry overall (general industry, construction, and maritime together). The overall ratio between large and small establishments was multiplied by the 2-digit SIC Code data

to estimate respirator usage (and fit-testing) for large and small establishments at the 2-digit SIC Code level.

The cost equation for calculating the annual O&M cost for general industry contains several terms. The first term calculates the cost of annual qualitative fit testing and is comprised of two smaller terms. The first of these smaller terms calculates the cost of the materials used for qualitative fit testing by multiplying the number of employees who require qualitative fit testing by the cost of materials per fit test. This is represented by  $(QLFITEMP \times QLFITMTRLS)$ . The cost of qualitative fit test materials are estimated to be \$0.07 per fit-test, i.e.,  $QLFITMTRLS = \$0.07$ . The second smaller term calculates employee time to be fit-tested ( $QLFITIME = \frac{1}{4}$  hour), and the time for a technician – estimated to be plant staff – to conduct the fit testing ( $QLFITTECH = \frac{1}{4}$  hour per fit-test). This is represented by  $(QLFITIME + QLFITTECH) * NONSUPEWAGE * QLFITEMP$ .  $QLFITEMP$  and  $QNFITEMP$  include both employees with exposure to hexavalent chromium above the PEL and above the AL.

The next term is comprised of two smaller terms and calculates the cost for conducting quantitative fit testing for employees. The first of these smaller terms calculates the cost of an industrial hygiene technician to conduct quantitative fit test by multiplying the cost of an industrial hygiene technician contractor per quantitative fit-test by the number of employees that require quantitative fit testing. This cost is represented by the quantity  $(QNFITCOST * QNFITEMPPEL)$ . The second smaller term represents the cost of employee time to be quantitatively fit tested. The time, in hours, for an employee to be quantitative fit-tested is multiplied by the number of employees that require quantitative fit testing and by the non-supervisory wage rate of these employees. This cost is represented by  $(QNFITTIME * NONSUPEWAGE * QNFITEMPPEL)$ . The cost of a quantitative fit-test,  $QNFITCOST$ , presumes that an industrial hygiene technician contractor using a Port-A-Count will visit the plant. This will cost approximately \$30 per employee ( $QNFITCOST = \$30$ ) for fit-testing four or more employees. If 16 workers are fit-tested during one day, then the total contractor's cost is \$480 ( $\$30 \times 16$ ). The minimum daily cost by the contractor is \$120; therefore, it is \$40 per employee if three employees are fit-tested, \$60 per employee if two are fit-tested, and \$120 if one employee is fit-tested.

The first two terms are added together and multiplied by the number of plants represented by the model input and by the quantity (1-percent of plants conducting annual respirator fit-testing in

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the baseline) to apply the cost of respirator fit testing only to those plants that are not conducting respirator fit testing in the baseline (represented by  $\#PLANTS * (1 - \%FITBASE)$ ).

The second cost incurred under respirator fit testing is the cost of medical evaluations and examinations to determine if an employee may wear a respirator. OSHA's respiratory protection regulation [29CFR1910.134] requires that workers who wear respirators have a medical evaluation to determine their fitness to wear a respirator.

It is estimated that employees with exposures above the AL (and therefore are not required to undertake medical examinations for their exposure to hexavalent chromium under the revised standard for general industry) will be required to fill out a medical history questionnaire, which will be reviewed by a licensed physician. It is estimated that 23 percent of these employees would "fail" the medical questionnaire and be required to undertake a medical examination for respirator use. The factor of 23 percent was obtained from information contained in OSHA's "Preliminary Regulatory Impact and Regulatory Flexibility Analysis of the Proposed Respirator Protection Standard (29 CFR 1910.134)".

There are costs attributable to employee time to fill out questionnaire, the cost of the questionnaire itself and review by a licensed physician, employee time for medical examinations, and the cost of the examinations themselves.

The cost of employee time to fill out the medical history questionnaire is determined by multiplying the number of employees who wear respirators for more than 5 hours/week and who are above the AL and below the PEL in the model plant by the time that it takes to fill out the medical history questionnaire and by the non-supervisory wage rate. This is represented by the term  $(EMPAL * MEDHISTTIME * NONSUPEWAGE)$ .

The cost of the medical history questionnaire and review by a licensed physician is determined by multiplying the number of employees who wear respirators for more than 5 hours/week and who are above the AL and below the PEL in the model plant by the cost of the medical history questionnaire. This is represented by  $(EMPAL * MEDHISTCOST)$ . It is estimated that the cost of the questionnaire includes the cost of physician review.

The next cost that is calculated is that of a medical examination for employees that "fail" the medical history questionnaire. It is estimated that 23 percent of employee will not pass the

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medical history questionnaire and, therefore, will require a medical examination by a physician ( $\%EMPMEDEXAM = 0.23$ ). The cost is determined by multiplying the number of employees who wear respirators for more than 5 hours/week and who are above the AL and below the PEL in the model plant by the cost of a respirator medical examination and by the percent of employees that “fail” the medical history questionnaire. This is represented by  $(EMPAL * RESPEXAMCOST * \%EMPMEDEXAM)$ .

The cost of employee time to fill out the medical history questionnaire, medical history questionnaire review by a licensed physician, and medical examination cost are summed and multiplied by the number of plants represented by the model input and by the quantity (1-percent of plants conducting annual respirator fit-testing in the baseline) to apply the cost of employee time to fill out the medical history questionnaire, medical history questionnaire review by a licensed physician, and medical examination cost only to those plants that are not conducting respirator fit testing in the baseline (represented by  $\#PLANTS * (1 - \%FITBASE)$ ).

**PPE**

Where skin or eye contact with hexavalent chromium is present or likely to be present after implementing the appropriate engineering controls, the employer is required to provide the appropriate personal protective equipment (PPE) to reduce worker exposure to hexavalent chromium at no expense to the employee. The PPE is typically in the form of eye protection, gloves, coveralls, etc. This provision has associated annual costs for protective work clothing and equipment. These costs were determined by the following equations and variables:

Annual O&M Cost to Establishments that Do Not Supply PPE in the Baseline

$$\begin{aligned} \text{PPEO\&MNOTSUPPLYBASE} = & ((\text{EYECOST} * \text{EYEREPL} * (1 - \% \text{EYEBASE})) + \\ & (\text{GLOVECOST} * \text{GLOVEREPL} * (1 - \% \text{GLOBEBASE})) + \\ & (\text{CVAPCOST} * \text{CVAPREPL} * (1 - \% \text{CVAPBASE})) + \\ & (\text{LAUNDER} * \text{LAUNDERCOST}) * (1 - \% \text{CVAPBASE}) + \\ & (\text{GLOVEREPL} * (1 / 60) * \text{BAGTIME} * \text{NON-} \\ & \text{SUPERVISORY WAGE RATE} * (1 - \% \text{GLOBEBASE})) + \\ & \text{GLOVEREPL} / 1602 * \text{BAGCOST} * (1 - \% \text{GLOBEBASE})) \\ & * \# \text{PLANTS} \end{aligned}$$

Annual O&M Cost to Establishments that Supply PPE but at Employees Expense

$$\begin{aligned} \text{PPEO\&MSUPPLYNOTPAY} = & ((\text{EYECOST} * \text{EYEREPL} * (\% \text{EYEBASE}) * (1 - \\ & \% \text{EYEINDUSTPRACT})) + (\text{GLOVECOST} * \text{GLOVEREPL} \\ & * (\% \text{GLOBEBASE}) * (1 - \% \text{GLOVEINDUSTPRACT})) + \\ & (\text{CVAPCOST} * \text{CVAPREPL} * (\% \text{CVAPBASE})) * (1 - \\ & \% \text{CVAPINDUSTPRACT}) + (\text{LAUNDER} * \\ & \text{LAUNDERCOST}) * (\% \text{CVAPBASE}) * (1 - \\ & \% \text{CVAPINDUSTPRACT}) + \text{GLOVEREPL} / 1602 * \\ & \text{BAGCOST} * (\% \text{GLOBEBASE})) * \# \text{PLANTS} \end{aligned}$$

Annual PPE Cost

$$\text{PPECOST} = \text{PPEO\&MNOTSUPPLYBASE} + \text{PPEO\&MSUPPLYNOTPAY}$$

Variables

#PLANTS	Number of plants represented by the model plant
%CVAPBASE	Percentage of plants in the baseline that supplied coveralls or aprons
%CVAPINDUSTPRACT	Percentage of employers that will pay for coveralls or aprons according to industry practice under revised standard
%EYEBASE	Percentage of plants in the baseline that supply eye protection
%EYEINDUSTPRACT	Percentage of employers that will pay for eye protection according to industry practice under revised standard
%GLOBEBASE	Percentage of plants in the baseline that supply gloves
%GLOVEINDUSTPRACT	Percentage of employers that will pay for gloves according to industry practice under revised standard

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BAGCOST	Unit cost of hexavalent chromium hazard labels for glove disposal bags
BAGTIME	Employee time to dispose of a pair of gloves in labeled container, in minutes
CVAPCOST	The unit cost for coveralls or aprons
CVAPREPL	The annual number of replacements for coveralls or aprons
EYECOST	Unit cost of eye protection
EYEREPL	Number of replacement during the year for eye protection
GLOVECOST	The unit cost for gloves
GLOVEREPL	Number of replacements during the year from gloves
LAUNDER	Total number of PPE laundered per year
LAUNDERCOST	Unit cost of laundering one article of PPE
PPECOST	Total annualized O&M cost for protective work clothing and equipment
PPEO&MNOTSUPPLYBASE	Total annualized O&M cost for establishments that do not supply protective work clothing and equipment in the baseline
PPEO&MSUPPLYNOTPAY	Total annualized O&M cost for establishments that supply protective work clothing and equipment in the baseline but have employees pay

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The percent of workers already being supplied PPE was estimated from the report, "PPE Cost Survey, Final Report" (Eastern Research Group, Inc., June 23, 1999). This report provided a differentiation between large and small establishments for industry (separated between general industry, construction, and maritime); although, it did not provide the percent of workers being supplied PPE at the 2-digit SIC Code. Therefore, Shaw estimated that the percent of workers supplied PPE was independent of SIC Code and only dependent upon the size of the establishment.

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The percent of companies that pay for PPE was also determined from that report. These figures were separated by SIC Code; however, there was no differentiation between large and small establishments. Therefore, Shaw estimated that the percent of workers paying for PPE was independent of the size of the establishment and only dependent upon SIC Code.

The affected industry sectors were qualitatively characterized with respect to worker potential for inhalation, dermal, and inhalation/dermal exposures based on OSHA guidance and specific industry sector knowledge. PPE requirements were invoked for industry sectors with potential for dermal exposure after engineering controls were implemented.

The annual cost equation considers the cost of supplying appropriate protective clothing to those employees where a hazard is present or likely to be present from hexavalent chromium in establishments that 1) do not supply appropriate protective clothing in the baseline and 2) do supply personal protective clothing to employees in the baseline but have their employees pay the cost.

The first cost equation determines the cost to establishments that do not supply protective work clothing and equipment to their employees in the baseline and will now be required to do so under the revised standard. The first term in this cost equation is the cost of purchasing eye protection for their employees. This cost is calculated by multiplying unit cost of eye protection by the number of replacements for eye protection required throughout the year and by the quantity  $(1 - \%EYEBASE)$ . This quantity  $(1 - \%EYEBASE)$  represents the percentage of establishments that do not supply eye protection for their employees.

The second term is the cost of purchasing gloves for their employees. This cost is calculated by multiplying the unit cost of gloves by the number of replacements for gloves required throughout the year and by the quantity  $(1 - \%GLOVEBASE)$ . This quantity  $(1 - \%GLOVEBASE)$  represents the percentage of establishments that do not supply gloves for their employees.

The third term is the cost of purchasing coveralls or aprons for their employees. This cost is calculated by multiplying the unit cost of coveralls or aprons by the number of replacements for coveralls or aprons required throughout the year and by the quantity  $(1 - \%CVAPBASE)$ . This quantity  $(1 - \%CVAPBASE)$  represents the percentage of establishments that do not supply coveralls or aprons for their employees.



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The fourth term is the cost of laundering articles of personal protective equipment for their employees. This cost is calculated by multiplying the unit cost to launder one article of PPE by the number of replacements for coveralls or aprons required throughout the year and by the quantity (1 - %CVAPBASE). This quantity (1 - %CVAPBASE) represents the percentage of establishments that do not supply coveralls or aprons for their employees. The product of all of these represents the cost of laundering personal protective equipment for their employees.

The communication provision also requires that bags or containers of contaminated clothing to be removed for laundering (and in general industry, waste consigned for disposal) be labeled with the appropriate information (Danger, Contains Chromium VI, etc.). It is projected that the laundering company will be informed of the presence of hexavalent chromium in the laundry at the commencement of the laundering agreement. Laundering facilities typically collect dirty uniforms for cleaning. It is estimated that the laundering facility will assume the cost burden for labeling the contaminated laundry and include that cost in their laundering fee.

The fifth term is the cost associated with employee time for glove disposal into appropriately-labeled disposal containers. It is estimated that the time required for an employee to dispose of one pair of gloves into an appropriately-labeled container (represented by BAGTIME) is 1 minute. The number of replacement gloves used throughout the year is multiplied by the time it takes an employee to dispose of a pair of glove, by a factor of 1/60 which is the conversion of minutes to hours, and by the non-supervisory wage rate of the employee. The product of these factors is then multiplied by the term (1-%GLOVEBASE). This quantity (1-%GLOVEBASE) represents the percentage of establishments that do not supply gloves for their employees.

The sixth term is the cost associated with purchasing appropriate labels for glove disposal containers. The number of replacement gloves used throughout the year is divided by 1,602. The factor of 1,602 is the estimated number of gloves that can fit into a thirty-gallon garbage bag. This factor (1,602) was determined by using the shipping volume of a box of 50 pairs of disposable nitrile gloves. The shipping volume of the box of 50 pairs of gloves is 144.14 in<sup>3</sup> or 0.624 gallons. The shipping volume was divided by 100 gloves to yield the volume of one glove. It was then estimated that the disposed gloves would be placed in a thirty-gallon garbage bag. It was estimated that the bag would not be filled to its entirety but, rather, only filled two-thirds before disposal would occur. This yields an effective disposal volume of 20 gallons. The effective disposal volume was then divided by the volume of one glove (determined previously) to yield the number of gloves that would fit into one disposal bag. It was then estimated that one

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label was needed for each bag. The number of replacement gloves was divided by the 1,602 factor, multiplied by the cost of a label for each bag (represented by BAGCOST), and multiplied by the quantity (1 - %GLOVEBASE). This quantity (1 - %GLOVEBASE) represents the percentage of establishments that do not supply gloves for their employees. The product of all of these terms is the cost of labels for glove disposal bags by establishments that do not supply gloves to their employees in the baseline.

The sum of the six terms was multiplied by the number of plants represented by the model input to yield the cost to the industry for personal protective clothing by establishments that did not supply personal protective clothing to their employees prior to the passage of the revised standard.

The second cost equation determines the cost to establishments that supply protective work clothing and equipment to their employees in the baseline but require the employee to pay the cost of the personal protective equipment. These companies will now be required to provide the personal protective equipment at no charge to the employee so under the revised standard. The first term in this cost equation is the cost of purchasing eye protection for their employees. This is calculated by multiplying the unit cost of eye protection by the number of replacements for eye protection required throughout the year by the percentage of establishments that provide eye protection to their employees. This is then multiplied by the quantity (1 - %EYEINDUSTPRACT). This quantity (1 - %EYEINDUSTPRACT) represents the percentage of establishments that had employees pay for eye protection in the baseline.

The second term is the cost of purchasing gloves for their employees. This cost is calculated by multiplying the unit cost of gloves, by the number of replacements for gloves required throughout the year, by the percentage of employers that provided gloves for their employees in the baseline, and by the quantity (1 - %GLOVEINDUSTPRACT). The quantity (1 - %GLOVEINDUSTPRACT) represents the percentage of establishments that had employees pay for gloves in the baseline.

The third term is the cost of purchasing coveralls or aprons for their employees. This cost is calculated by multiplying the unit cost of coveralls or aprons, by the number of replacements for coveralls or aprons required throughout the year, by the percentage of employers that provided coverall or aprons for their employees in the baseline, and by the quantity (1 -

%CVAPINDUSTPRACT). The quantity  $(1 - \%CVAPINDUSTPRACT)$  represents the percentage of establishments that had employees pay for coveralls or aprons in the baseline.

The fourth term is the cost of laundering articles of personal protective equipment for their employees. It was estimated that, since the employer had the employee pay for personal protective equipment, they would also require the employee to launder personal protective equipment at the employees' expense. Under the revised standard, the employer is required to clean, launder, repair, and replace all protective clothing at no expense to the employee. This cost is calculated by multiplying the unit cost to launder one article of PPE, by the number of replacements for coveralls or aprons required throughout the year, and by the percentage of establishments that do supply coveralls or aprons for their employees in the baseline. The product of all of these factors represents the cost of laundering personal protective equipment for their employees, who were provided personal protective clothing in the baseline.

The communication provision also requires that bags or containers of contaminated clothing to be removed for laundering (and in general industry, waste consigned for disposal) to be labeled with the appropriate information (Danger, Contains Chromium VI, etc.). It is projected that the laundering company will be informed of the presence of hexavalent chromium in the laundry at the commencement of the laundering agreement. Laundering facilities typically collect dirty uniforms for cleaning. It is estimated that the laundering facility will assume the cost burden for labeling the contaminated laundry and include that cost in their laundering fee.

The fifth term is the cost associated with purchasing appropriate labels for glove disposal containers. The number of replacement gloves used throughout the year is divided by 1,602. The factor of 1,602 is used as the estimated number of gloves that can fit into a thirty-gallon garbage bag. This factor (1,602) was determined by using the shipping volume of a box of 50 pairs of disposable nitrile gloves. The shipping volume of the box of 50 pairs of gloves is 144.14 in<sup>3</sup> or 0.624 gallons. The shipping volume was divided by 100 gloves to yield the volume of one glove. It was then estimated that the disposed gloves would be placed in a thirty-gallon garbage bag. However, it was estimated that the bag would not be filled to its entirety but, rather, only filled two-thirds before disposal would occur. This yields an effective disposal volume of 20 gallons. The effective disposal volume was then divided by the volume of one glove (determined previously) to yield the number of gloves that would fit into one disposal bag. It was then estimated that one label was needed for each bag. The number of replacement gloves is divided by the 1,602 factor, multiplied by the cost of a label for each bag (represented by

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BAGCOST), and multiplied by the percentage of establishments that provided gloves for their employees in the baseline. The product of all of these terms is the cost of labels for glove disposal bags by establishments that supplied gloves to their employees in the baseline but are now required to label disposal bags. The cost of employee time for the disposal of gloves into appropriately labeled containers was not included because it was estimated that, prior to the passage of the revised standard, employees were already disposing of gloves into a container, and it would take the employee no additional time to dispose of gloves into the correctly-labeled container.

The sum of the final terms is finally multiplied by the number of plants represented by the model input to yield the cost to the industry for personal protective clothing by establishments that supplied personal protective clothing to their employees but did so at the employees' expense and will now be required to provide the personal protective clothing at no expense to the employee after passage of the revised standard.

The total cost of personal protective equipment to the entire industry under the revised standard is the sum of 1) the cost to industry for personal protective clothing by establishments that did not supply personal protective clothing to their employees prior to the passage of the revised standard and 2) the cost to industry for personal protective clothing by establishments that supplied personal protective clothing to their employees but did so at the employees' expense (and will now be required to provide the personal protective clothing at no expense to the employee after passage of the revised standard).

## HYGIENE AREAS

The revised hexavalent chromium standard requires employers to provide clean change rooms when protective clothing and equipment is provided and to provide hand-washing facilities to employees who work in jobs where there is dermal exposure. The change rooms must be equipped with separate storage facilities for street clothes and for protective clothing and equipment. The cost for installing showers was also estimated as an option. These costs were determined by the following equations and variables:

### Capital Costs

$$\text{HNDWSHCAPCOST} = \text{HNDWSHCOST} * \#\text{HNDWSH} * \% \text{HNDWSHADD} * \#\text{PLANTS}$$

### Capital Charge Costs

$$\text{HNDWSHCAPCHG} = \text{HNDWSHCAPCOST} * \text{HNDWSHCRF} \text{ (where } n = \text{HNDWSHLIFE, } i = \text{DICRATE)}$$

### Capital Costs

$$\text{SHWRCAPCOST} = \text{SHWRCOST} * \#\text{SHWRS} * \% \text{SHWRADD} * \#\text{PLANTS}$$

### Capital Charge Costs

$$\text{SHWRCAPCHG} = \text{SHWRCAPCOST} * \text{SHWRCRF} \text{ (where } n = \text{SHWRLIFE, } i = \text{DISCRATE)}$$

### Capital Costs

$$\text{CHRMCAPCOST} = \text{CHRM COST} * \text{EMPEXPDERM} / \text{SHIFTS} * \% \text{CHRMADD} * \#\text{PLANTS}$$

### Capital Charge Costs

$$\text{CHRMCAPCHG} = \text{CHRMCAPCOST} * \text{CHRMCRF} \text{ (where } n = \text{CHRMLIFE, } i = \text{DISCRATE)}$$

### O&M Costs

$$\text{SHWRCHRMO\&MCOST} = [(\text{SHWRVAR} * \text{EMPEXPDERM}) + (\text{SHWRTIME}/60 * \text{NONSUPWAGE} * \text{EMPEXPDERM}) + (\text{JANTIME}/60 * \text{JANWAGE} * \#\text{SHWRS})] * \text{DAYS} * \% \text{SHWRADD} * \#\text{PLANTS}$$

### O&M Costs

$$\text{HNDWSHCHRMO\&MCOST} = [(\text{EMPEXPDERM} * \text{HNDWSHVAR} + (\text{JANTIMEHNDWSH}/60) * \#\text{HNDWSH} * \text{JANWAGE}] * \text{DAYS} * \% \text{HNDWSH} * \#\text{PLANTS}$$

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Variables

%CHRMADD	Percent of plants requiring additional change room facilities
%HNDWSH	Percent of plants requiring additional hand washing units
%SHWRADD	Percent of plants requiring additional showers and employee showering
#HNDWSH	Number of hand washing units required per plant
#PLANTS	Number of plants represented by the model plant
#SHWRS	Number of additional shower heads needed per plant
CHRMCAPCHG	Annualized capital charge for CHRMCAPCOST
CHRMCAPCOST	Capital cost of change room facilities
CHRMCOST	Cost per employee for change room facilities
CHRMCRF	Capital recovery factor for CHRMCAPCOST
CHRMLIFE	Useful life, in years, of change room facilities
DAYS	Number of operating days per year per plant
DISCRATE	Discount rate
EMPEXPDERM	Total number of employees at the plant with dermal exposure
HNDWSHCAGCHG	Annualized capital charge for HNDWSHCAPCOST
HNDWSHCAPCOST	Capital cost of hand washing facilities
HNDWSHCOST	Cost of a hand washing unit
HNDWSHCRF	Capital recovery factor for HNDWSHCOST
HNDWSHLIFE	Useful life, in years, of hand washing units
HNDWSHCHRMOMCOST	Annual O&M cost for hand washing units and change rooms
HNDWSHVAR	Variable cost, per hand washing unit (soap, water, etc.)
SHWRCHRMOMCOST	Annual O&M cost for showers and change rooms
JANTIME	Daily janitorial and maintenance time, in minutes, per showerhead
JANTIMEHNDWSH	Daily janitorial and maintenance time, in minutes, per hand washing unit
JANWAGE	Janitorial wage rate, \$/hour
NONSUPWAGE	Nonsupervisory wage rate, \$/hour
SHIFTS	Number of work shifts per plant
SHWRCAPCHG	Annualized capital charge for SHWRCAPCOST
SHWRCAPCOST	Capital cost of showers
SHWRCOST	Cost per showerhead
SHWRCRF	Capital recovery factor for SHWRCAPCOST
SHWRLIFE	Useful life, in years, of showers
SHWRTIME	Time, in minutes, to shower per employee
SHWRVAR	Variable cost per shower (soap, clean towel, water, etc.)

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based

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on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The percent of establishments already having hygiene areas was estimated from the NIOSH report, "PPE Cost Survey, Final Report" (Eastern Research Group, Inc., June 23, 1999). Although this report does not contain data regarding hygiene areas, Shaw estimated that facilities that provide workers with PPE also provided workers with changing areas, showers, and handwashing facilities. The report did not provide any estimate of the percent of workers being supplied PPE and hygiene areas at the 2-digit SIC Code. However, the report did provide a differentiation between large and small establishments for industry overall. Therefore, Shaw estimated that the percent of workers supplied PPE and hygiene areas were independent of SIC and only dependent upon the size of the establishment.

The affected industry sectors were qualitatively characterized with respect to worker potential for inhalation, dermal, and inhalation/dermal exposures based on OSHA guidance and specific industry sector knowledge. Hygiene areas were invoked for industry sectors with potential for dermal exposure after engineering controls were implemented.

In the capital cost equation for showers (SHWRCAPCOST), a unit shower-head cost is SHWRCOST and is applied to every additional shower head that is needed at plants that do not have the required shower facilities in the baseline, represented by %SHWRADD. Fifty square feet of floor space per shower head are included. SHWRCOST also includes a building enclosure (painted concrete block), a building heater, and a water heater. The number of additional shower heads needed, #SHWRS, follows the specifications of 29 CFR 1910.141. A useful life of 10 years (SHWRLIFE = 10 years) and a discount rate of 7 percent (DISCRATE = 7%) and 3 percent are used in determining the annualized capital cost of showers (SHWRCAPCHG).

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A capital cost is calculated for change room facilities, (CHRMCAPCOST). The unit cost per employee is CHRMCOST. CHRMCOST includes lockers with separate storage facilities, a bench, and 10 square feet of floor space per locker. It also includes pro rate shares (based on floor space) of the costs of a building enclosure and building heater included in SHWRCAPCOST. This is based on the assumption that the change room and showers share the same building. The capital cost of change room facilities is annualized over a useful life of 10 years (CHRM LIFE = 10 years) using a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

A capital cost is calculated for hand washing units, (HNDWSHCAPCOST). The unit cost per unit is HNDWSHCOST. HNDWSH includes a utility basin, fixtures, and local pipe work. This is based on the assumption that the hand washing unit is built near existing hot and cold water lines. The capital cost of hand washing units is annualized over a useful life of 10 years (HNDWSH LIFE = 10 years) using a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

The annual O&M cost equation for showers and change rooms (SHWRCHRMO&MCOST ) considers the cost of worker time to shower and dry off (changing clothes is not considered because this is done anyway without showering) and the variable cost per shower for such items as soap, clean towels, and water. Incremental janitorial and maintenance time is also included. It is estimated that 7½ minutes are needed to shower and dry off (SHWR TIME = 7.5 minutes). This must be done once a day per employee (after each shift worked). The variable cost per shower (SHWRVAR) is estimated to be \$0.50. One minute per day of janitorial time (JANTIME = 1 minute) will be needed for each new shower head. The number of operating days that the workers handle products containing hexavalent chromium, therefore, requiring showering is captured by DAYS. The incidence of incremental showering is captured by %SHWRADD, which is also used for the incidence of new showers needed in the capital cost equation. Therefore, it is estimated that if showers exist in the baseline, they are being used to the extent required by the revised standard.

The annual O&M cost equation for hand washing units and change rooms (HNDWSHCHRMO&MCOST ) considers the variable cost associated with hand washing activities for such items as soap, water, etc. Incremental janitorial and maintenance time is also included (JANTIMEHNDWSH). This is estimated to be 10 minutes per hand washing unit. Everything in this equation is multiplied by the number of days per year (DAYS) that the employees contact hexavalent chromium, and therefore, require hand washing. The incidence of



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incremental hand washing is captured by %HNDWSH, which is also used for the incidence of new hand washing units needed in the capital cost equation. Therefore, it is estimated that if hand washing units exist in the baseline, they are being used to the extent required by the revised standard.

The cost analysis for the construction and maritime industries are conducted in a slightly different manner even though the requirements of the revised standard are essentially the same. The difference arises from the fact that construction sites are rarely in the same location for extended period of time, and therefore, the use of permanent fixtures and structures is not always feasible. This effects the costing for two items, the showers and change rooms.

The unit cost for shower facilities in construction industries increased to account for the fact that a mobile shower facility will be purchased by the employer for use at various construction sights. The second change is the for change areas. Rather than using a permanent structure, tents, chairs, and storage bins are used as a moveable change area for employees in the construction and maritime industry.

**HOUSEKEEPING**

The housekeeping provision of the revised hexavalent chromium standard calls for surfaces contaminated with hexavalent chromium to be vacuumed with HEPA-filtered (or an equally effective filtration method, i.e., wet cleaning methods) equipment. For this provision, there are associated capital and annual O&M costs. These costs to establishments that use HEPA vacuums only for the housekeeping requirements were determined by the following equations and variables:

Capital Cost

$$\text{HSKCAPCOST} = \# \text{PLANTSNEWHEPA} * \text{HEPACOST} * \# \text{HEPA}$$

O&M Cost

$$\text{HSKO\&MCOST} = ((\text{FILTCOST} * \# \text{HEPA} * \# \text{FILTS} * \# \text{PLANTSNEWHEPA}) + \text{HEPAO\&MFACT}) + (\% \text{NOTRCRA} * \# \text{BAGS} * \text{DISPOSALCOST} + (\# \text{PLANTSNEWHEPA} / (\# \text{PLANTS}) * \# \text{DAYS} * \text{JANTIMEHEPA} * \text{JANWAGE})) * \# \text{PLANTS}$$

Capital Charge Cost

$$\text{Capital Charge Cost} = \text{HSKCAPCOST} * \text{HEPACRF} \text{ (where } n = \text{HEPALIFE, } i = \text{DISCRATE)}$$

Total Annualized Cost of Housekeeping

$$\text{HSKCOST} = \text{HSKO\&MCOST} + \text{HSKCAPCHG}$$

Variables

#BAGS	Number of additional garbage bags required per establishment per year
#DAYS	Number of operating days per year
#FILTS	Annual number of replacement filters per HEPA vacuum
#HEPA	Number of additional HEPA vacuums required
#PLANTS	Number of plants represented by the model plant
#PLANTSNEWHEPA	Number of plants requiring new HEPA vacuums
%NOTRCRA	Percent of plants not disposing of chromium under RCRA
DISCRATE	Discount rate
DISPOSALCOST	Unit cost of garbage bags and disposal
FILTCOST	Unit cost of HEPA vacuum replacement filters
HEPACOST	Unit cost of HEPA vacuums
HEPACRF	Capital recovery factor for housekeeping
HEPALIFE	Useful life, in years, of a HEPA vacuum
HEPAO&MFACT	Annual O&M cost of HEPA vacuums as a percentage of capital cost (assumes 5% of capital)
HSKCAPCHG	Housekeeping capital charge
HSKCAPCOST	Total capital cost of housekeeping
HSKCOST	Total annualized housekeeping cost

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HSKO&MCOST	Total annualized O&M cost for housekeeping
JANTIMEHEPA	Janitorial time, in hours per day, to HEPA vacuum hexavalent chromium spills
JANWAGE	Janitorial wage rate, \$/hour

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The unit cost of a HEPA vacuum and filter is HEPACOST. The capital cost is calculated by multiplying HEPACOST by the number of new HEPA vacuums that are needed, #HEPA, and the number of plants that do not have the required equipment in the baseline, #PLANTSNEWHEPA. The capital cost is annualized using a useful life for HEPA vacuums of ten years (HEPALIFE = 10 years) and a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

The annual O&M cost followed from the need to replace filters and to operate and maintain the HEPA vacuums. Two replacement filters are estimated to be needed annually. The annual cost to operate and maintain HEPA vacuums is estimated as five percent of the capital cost (HEPAO&MFACT = 5%). In addition, disposal of chromium waste must occur in accordance with RCRA. This cost is determined by multiplying the amount of chromium waste generated (#BAGS) with the cost of proper disposal under RCRA (DISPOSALCOST), estimated to be \$500, with the percent of plants not disposing of chromium waste under RCRA (this percentage should always be zero in this cost analysis because the cost of disposal is incurred by RCRA not the revised chromium standard). In addition, a term is included for the labor cost of custodial personnel to clean hexavalent chromium spills. This term is the ratio of the number of plants requiring new HEPA vacuums to the number of plants represented by the model plant (#PLANTS NEWHEPA / #PLANTS) multiplied by the number of operating days per year, the

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daily janitorial time (JANTIMEHEPA) (in hours per day) to clean hexavalent chromium-containing spills with a HEPA vacuum, and the custodial wage rate (JANWAGE).

The construction and maritime industries were exempted from the housekeeping requirement in the original proposed regulation. In the event that HEPA filter vacuums are recommended for the construction or maritime industries to reduce worker exposure to hexavalent chromium, the HEPA filter vacuums are included in the engineering control section of that industry.

It is feasible in several industries to use wet methods entirely or wet methods in conjunction with HEPA vacuums to satisfy the housekeeping requirements set forth in the Revised Standard. These industries include Sections 10 (Plastic Colorant Producers and Users), 20 (Textile Dyeing), 21 (Colored Glass), and 22 (Printing). The cost equations for these sections were modified to include the costs associated with wet method cleaning. The cost equations for these industries are shown below.

Capital Cost

$$\text{HEPACAPCOST} = \# \text{PLANTSNEWHEPA} * \text{HEPACOST} * \# \text{HEPA} + \# \text{PLANTSMOP} * \# \text{MOPS} * \text{MOPBUCKCOST}$$

O&M Cost

$$\text{HSKO\&MCOST} = ((\text{FILTCOST} * \# \text{HEPA} * \# \text{FILTS} * \# \text{PLANTSNEWHEPA}) + \text{HEPAO\&MFACT}) + (\# \text{PLANTSMOP} * \# \text{MOPS} * \text{MOPCOST}) + (((\# \text{SPILLDAYS} * \text{SPILLCOST}) + (\text{JANTIMESPILL} * \text{JANWAGE} * \# \text{SPILLDAYS})) * \# \text{DAYS}) * \# \text{PLANTSMOP} + (\% \text{NOTRCRA} * \# \text{BAGS} * \text{DISPOSALCOST} + (\# \text{PLANTSNEWHEPA} / (\# \text{PLANTS}) * \# \text{DAYS} * \text{JANTIMEHEPA} * \text{JANWAGE})) * \# \text{PLANTS}$$

Capital Charge Cost

$$\text{HSKCAPCHG} = \text{HSKCAPCOST} * \text{HEPACRF} \text{ (where } n = \text{HEPALIFE, } i = \text{DISCRATE)}$$

Total Annualized Cost of Housekeeping

$$\text{HSKCOST} = \text{HSKO\&MCOST} + \text{HSKCAPCHG}$$

Variables

- #BAGS                    Number of additional garbage bags required per establishment per year
- #DAYS                    Number of operating days per year
- #FILTS                    Annual number of replacement filters per HEPA vacuum
- #HEPA                    Number of additional HEPA vacuums required
- #MOPS                    Number of additional mops and buckets required

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#PLANTS	Number of plants represented by the model plant
#PLANTSMOP	Number of plants requiring new mops and buckets
#PLANTSNEWHEPA	Number of plants requiring new HEPA vacuums
#SPILLDAYS	Number of wet spills per day
%NOTRCRA	Percent of plants not disposing of chromium under RCRA
DISCRATE	Discount rate
DISPOSALCOST	Unit cost of garbage bags and disposal
FILTCOST	Unit cost of HEPA vacuum replacement filters
HEPACAPCOST	Total capital cost of housekeeping
HEPACOST	Unit cost of HEPA vacuums
HEPACRF	Capital recovery factor for housekeeping
HEPALIFE	Useful life, in years, of a HEPA vacuum
HEPAO&MFACT	Annual O&M cost of HEPA vacuums as a percentage of capital cost (assumes 5% of capital)
HSKCAPCHG	Housekeeping capital charge
HSKCOST	Total annualized cost
HSKO&MCOST	Total annualized O&M cost for housekeeping
JANTIMEHEPA	Janitorial time, in hours per day, to HEPA vacuum hexavalent chromium spills
JANTIMESPILL	Janitorial Time to cleanup spill (hours)
JANWAGE	Janitorial wage rate, \$/hour
MOPBUCKCOST	Unit cost of mops and buckets
MOPCOST	Cost of mops
SPILLCOST	Cost of water per spill

With respect to cost incurred by the use of HEPA vacuums, the cost equations for industries that use a combination of wet methods and HEPA vacuums are identical to the cost equations for industries that use only HEPA vacuums for the housekeeping requirements in the revised standard. Therefore, the following discussion will only address the terms of the cost equations that relate to wet method cleanup only.

The capital cost of housekeeping (represented by HEPACAPCOST) was modified to include a second term that accounts for the capital spent for wet method cleaning equipment. The second term is the product of the number of plants that require new mops and buckets with the number of additional mops and buckets required at an establishment and the unit cost of mops and buckets. It is estimated that a mop will be a 16 oz. cotton cut end mop and the bucket will be a 35 qt. mop bucket and squeeze wringer.

The second term of the annual O&M cost of housekeeping (represented by HSKO&MCOST) addresses the purchase of new mops throughout the year. The cost is determined by multiplying the number of plants that require new mops and buckets by the number of additional mops and

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buckets required and the unit cost of a single mop. It is estimated that all establishments that required additional mops and buckets during the first year will only require additional mops in subsequent years.

The third term of the annual O&M cost of housekeeping (represented by HSKO&MCOST) addresses the cost of the additional water use and janitorial time for using wet methods to fulfill the housekeeping requirements of the Revised Standard. An average of water commodity charges in areas serviced by Cincinnati Water Works was used in conjunction with an estimate that 5 gallons of water would be required to clean any spills. The average water commodity charge is \$1.44/ccf. This yields cost of \$0.0096 per spill. This number was then multiplied by the number of spills that occur per day to yield the cost of water per day for cleaning spills. The cost of water per day for cleaning spills is then added to a quantity that represent janitorial time per to clean spills using wet methods. This quantity is determined by multiplying the number of spills that occur per day with the janitorial time required to cleanup spills and with the janitorial wage rate. The janitorial time to clean spills using wet methods is estimated to be  $\frac{1}{4}$  hour. The sum of the cost of janitorial time to clean spills per day and the cost of water to clean spills per day is then multiplied by the number of days the establishment operates per year and with the number of plant that require new mops and buckets to yield the combined cost of water for spill cleanup and employee time per year for the industry.

### **MEDICAL SURVEILLANCE**

The revised hexavalent chromium standards require employers to provide a “limited medical examination” to employees exposed to hexavalent chromium in an emergency, to employees with signs or symptoms of exposure to hexavalent chromium, and annually to employees exposed at or above the revised hexavalent chromium AL 30 days per year. Facilities with less than 30 days exposure to hexavalent chromium are not required to do medical surveillance.

The limited medical exam has the following requirements:

- 1) Detailed medical and work history, with emphasis on past, present, and anticipated future exposure to hexavalent chromium; any history of respiratory system dysfunction, asthma, dermatitis, skin ulceration, or nasal septum perforation; and smoking status and history
- 2) Physical examination assessing skin and respiratory tract
- 3) Any additional tests deemed appropriate by the examining physician.

The comprehensive medical exam requires these same elements, as well as the following (for employees with abnormal limited medical exam results):

- 1) Physical examination assessing the eyes and the respiratory, cardiovascular, renal, and gastrointestinal systems
- 2) Chromium in red blood cells testing
- 3) At the discretion of the examining physician, a 14" x 17" or reasonably standardized posterior-anterior chest x-ray
- 4) At the discretion of the examining physician, pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume at one second (FEV<sub>1</sub>)
- 3) Blood analysis of blood urea nitrogen and serum creatinine
- 4) Urinalysis including specific gravity, total proteins, amino acids, uric acid, pH, glucose, and a microscopic examination of centrifuged sediment

For both limited and comprehensive medical exams, employers are required to obtain from the examining physician a “written medical opinion” summarizing the results.

The medical surveillance provision has associated up-front and annual O&M costs. These costs were determined by the following equations and variables:

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Up-Front Costs

$$\text{MEDUFCOST} = (((\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM})) * \text{LIMFULLCOST}) + ((\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM})) * \text{LIMFULLTIME} * \text{NONSUPEWAGE}) + ((\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM})) * \%PREVABN * \text{COMPFULLCOST}) + ((\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM})) * \%PREVABN * \text{COMPFULLTIME} * \text{NONSUPEWAGE}) + (\text{POTEXEMP} * \text{MEDRECORD} * \text{CLWAGE})) * \#PLANTS$$

O&M Costs

$$\text{MEDO\&MCOST} = (((((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \text{LIMFULLCOST}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \text{LIMFULLTIME} * \text{NONSUPEWAGE}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * (\text{TRNOVER} / 2) * \text{COMPFULLCOST}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * (\text{TRNOVER} / 2) * \text{COMPFULLTIME} * \text{NONSUPEWAGE}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \text{TRNOVER} * (\text{COMPFULLTIME} * \text{NONSUPEWAGE} + \text{COMPFULLCOST}))) * (1 - \%BASEMED) + (((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \text{LIMPARTCOST} + (\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \text{LIMPARTTIME} * \text{NONSUPEWAGE}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * (\text{TRNOVER} / 2) * \text{COMPARTCOST} + (\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * (\text{TRNOVER} / 2) * \text{ADDMEDTIME} * \text{NONSUPEWAGE})) * \%BASEMED + (((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \%ALABN * \text{ADDMEDCOST}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \%ALABN * \text{ADDMEDTIME} * \text{NONSUPEWAGE}) + ((\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \%ALABN * \text{REASSESSTIME} * \text{SUPEWAGE}) + ((1 - \%TRANJOB) * (\text{LIMEMPPPEL} + \text{LIMEMPDERM}) * \%ALABN * \text{NONSUPEWAGE} * 8 * \text{MRPLEN}))) * \#PLANTS$$

Variables

#PLANTS	Number of plants represented by the model plant
%ALABN	Percent of employees exposed at or above the AL 30 days per year (and therefore requiring a limited or comprehensive medical exam) who will be found to have abnormal results
%BASEMED	Percent of plants with annual medical testing in the baseline
%DERMS&S	Percent of dermally exposed employees with "signs and symptoms"
%PREVABN	Percent of previously exposed employees who will be found to have abnormal exam results
%TRANJOB	Percent of plants that have jobs available for employees with abnormal exam results
ADDMEDCOST	Cost of additional medical testing after exam results are abnormal
ADDMEDTIME	Employee time, in hours, for additional medical testing after exam results are abnormal



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CLWAGE	Clerical Wage, \$/hr
COMPARTCOST	Cost of a partial comprehensive medical exam
COMPFULLCOST	Full cost of a comprehensive medical exam
COMPFULLTIME	Employee time, in hours, for a full comprehensive medical exam
COMPPARTTIME	Incremental employee time, in hours, for a partial medical exam
LIMEMPDERM	Number of employees above the AL requiring a limited medical exam b/c of dermal "signs and symptoms" after the implementation of engineering controls
LIMEMPPPEL	Number of employees requiring a limited medical exam b/c > AL after the implementation of engineering controls
LIMFULLCOST	Full cost of a limited medical exam
LIMFULLTIME	Employee time, in hours, for a full limited medical exam
LIMPARTCOST	Cost of a partial limited medical exam
LIMPARTTIME	Incremental employee time, in hours, for a partial limited medical exam
MEDO&MCOST	Total annualized O&M cost
MEDRECORD	Clerical time per employee, in hours, to establish detailed medical records
MEDUFCOST	Total up-front cost of medical surveillance
MRPLEN	Length of time medical removal protection benefits are required for employees that have abnormal exam results and cannot switch to a job that does not have exposure to hexavalent chromium in days
NONSUPEWAGE	Non-supervisory wage rate, \$/hr
POTEXEMP	Total number of potentially exposed employees above the AL and workers with "signs and symptoms" before the implementation of engineering controls.
REASSESSTIME	Supervisory time, in hours, for workplace reassessment after exam results are abnormal
SUPEWAGE	Supervisory wage rate, \$/hr
TRNOVER	Employee turnover rate

Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The percent of workers experiencing signs and symptoms of dermal exposure was estimated using data from "U.S. Department of Labor, Bureau of Labor Statistics, Occupational Injuries and Illnesses, Total Recordable Cases of Skin Disease, 2001". This data was available for 2-digit SIC Codes.

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The cost of a limited exam was estimated to be \$125, based on the cost of physical exams in Maryland (Professional Judgement, OSHA, 2005).

The industry turnover rate was estimated using data from "U.S. Department of Labor, Bureau of Labor Statistics, Job Openings and Labor Turnover Estimates, July 2002 – July 2003." The average monthly job turnover rate was calculated and multiplied by 12 to determine the annual rate. The annual job turnover rate for each industry is shown in Table III.3.

The up-front cost of medical surveillance (represented by MEDUFCOST) is the cost of providing medical surveillance to employees with exposure above the PEL prior to the implementation of engineering controls to lower employee exposures.

The first term in the up-front cost of medical surveillance is the cost of a full limited medical examination to all employees who are potentially exposed to airborne hexavalent chromium or who show signs and symptoms of exposure to hexavalent chromium. This cost is determined by multiplying the number of employees who are potentially exposed to airborne hexavalent chromium at levels higher than the AL by the cost of a full limited medical examination. The term,  $(\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPPDERM}))$ , represents the number of employees with potential exposure to hexavalent chromium at levels above the AL and employees with signs and symptoms of exposure to hexavalent chromium. The quantity,  $(\text{LIMEMPPPEL} + \text{LIMEMPPDERM})$ , is subtracted from POTEXEMP because, during the first year, the upfront cost of medical surveillance and the annual O&M cost are added together; subtracting the term  $(\text{LIMEMPPPEL} + \text{LIMEMPPDERM})$  from the up-front cost equation avoids double counting the employees represented by LIMEMPPPEL and LIMEMPPDERM.

The second term of the up-front medical surveillance cost equation is the cost of the employee time to receive the full limited medical examination. This cost is determined by multiplying the number of workers potentially exposed to airborne hexavalent chromium at levels higher than the AL by the amount of time required for an employee to undergo a full limited medical examination by the non-supervisory wage rate of the employee. Again, for reasons stated previously, the term,  $(\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPPDERM}))$ , represents the number of employees with potential exposure to hexavalent chromium at levels above the AL and employees with signs and symptoms of exposure to hexavalent chromium.

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The third term of the up-front medical surveillance cost equation is the cost of comprehensive medical examinations for employees who have abnormal medical exam results. This cost is determined by multiplying the number of employees who are potentially exposed to airborne hexavalent chromium at levels higher than the AL by the percentage of previously exposed employees who will be found to have abnormal test results (represented by %PREVABN) by the cost of a full comprehensive medical examination. The percentage of previously exposed employees who will be found to have abnormal test result is estimated to be 0.5 percent of exposed employees based on information provided by OSHA. Again, for reasons stated previously, the term,  $(\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM}))$ , represents the number of employees with potential exposure to hexavalent chromium at levels above the AL and employees with signs and symptoms of exposure to hexavalent chromium.

The fourth term of the cost equation for the up-front cost of medical surveillance is the cost of employee time to receive comprehensive medical examinations after the employee is found to have abnormal test results. This cost is determined by multiplying the number of employees who are potentially exposed to airborne hexavalent chromium at levels higher than the AL by the percentage of previously exposed employees who will be found to have abnormal test results (represented by %PREVABN) by the amount of time required for an employee to undergo a full comprehensive medical examination by the non-supervisory wage rate of the employee. Again, for reasons stated previously, the term,  $(\text{POTEXEMP} - (\text{LIMEMPPPEL} + \text{LIMEMPDERM}))$ , represents the number of employees with potential exposure to hexavalent chromium at levels above the AL and employees with signs and symptoms of exposure to hexavalent chromium.

The final term in the cost equation of the up-front cost of medical surveillance is the cost for plant personnel to prepare all information required by the revised standard to be provided to the physician or other licensed health care professional (PLHCP). This cost is determined by multiplying the number of employees who are potentially exposed to airborne hexavalent chromium at levels higher than the AL by the amount of clerical time required to prepare the information by the clerical wage rate for plant personnel.

All five terms are multiplied by the number of plants represented by the model input to determine the cost of up-front medical surveillance to the entire industry.

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The second type of cost associated with the revised standard are the annual O&M costs associated with employee medical surveillance.

The first cost associated with the annual O&M cost of medical surveillance is the cost associated with annual medical surveillance incurred by establishments that do not have annual medical surveillance for their employees in the baseline. This cost is represented by a large quantity multiplied by  $(1 - \%BASEMED)$ . Each term of this large equation will be discussed below.

The first cost contained in the first term is the cost of full limited medical examinations for employees in establishments that did not provide annual medical surveillance in the baseline. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by  $LIMEMPPEL + LIMEMPDERM$ ) with the cost of a full limited medical examination.

The second cost contained in the first term is the cost of employee time to receive a full limited medical examination for employees in establishments that did not provide annual medical surveillance in the baseline. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by  $LIMEMPPEL + LIMEMPDERM$ ) with the amount of time required to undergo a full limited medical examination by the non-supervisory wage rate of the employee.

The third cost contained in the first term is the cost of providing a chromium medical examination for employees at the termination of employment. It is estimated that, at the termination of employment, the employee will be provided a comprehensive medical examination. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by  $LIMEMPPEL + LIMEMPDERM$ ) with the quantity  $(TRNOVER/2)$  and the cost of a full comprehensive medical examination. The employee turnover rate is divided by two, because medical examinations must be provided at the termination of employment "...unless the last

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examination...was less than six months prior to the date of termination.” It has been estimated that half of the employee turnover occurs at the beginning of the year and the other half occurs at the end of the year. Therefore, based on this estimation at any time during the year, it has been greater than six months since their last medical examination for half of the employees that are leaving, and therefore, these employees require a medical examination.

The fourth cost contained in the first term is the cost of employee time for receiving a chromium medical examination for employees at the termination of employment. It is estimated that, at the termination of employment, the employee will be provided a comprehensive medical examination. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the quantity (TRNOVER/2) with the amount of time required to undergo a full comprehensive medical examination by the non-supervisory wage rate of the employee.

The fifth cost contained in the first term is the cost of providing a chromium medical examination to all employees at the beginning of employment and the cost of employee time to receive the examination. It is estimated that, at the beginning of employment, the employee will be provided a comprehensive medical examination. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the employee turnover rate and the quantity cost of a full comprehensive medical examination plus the amount of time required to undergo a full comprehensive medical examination times the non-supervisory wage rate of the employee. The employee turnover rate has been used because it has been estimated that the amount of employees hired throughout the year is equal to the number of employees that leave the establishment throughout the year.

The second cost associated with the annual O&M cost of medical surveillance is the cost associated with annual medical surveillance incurred by establishments that have annual medical surveillance for their employees in the baseline. This cost is represented by a large quantity multiplied by %BASEMED. Each term of this large equation will be discussed below.

The first cost contained in the second term is the incremental cost of partial limited medical examinations for employees in establishments that provided annual medical surveillance in the baseline. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPPEL + LIMEMPPDERM) with the cost of a partial limited medical examination.

The second cost contained in the second term is the incremental cost of employee time to receive a partial limited medical examination for employees in establishments that provided annual medical surveillance in the baseline. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPPEL + LIMEMPPDERM) with the amount of time required to undergo a partial limited medical examination by the non-supervisory wage rate of the employee.

The third cost contained in the second term is the incremental cost of providing a chromium medical examination to employees at the termination of employment. It is estimated that, at the termination of employment, the employee will be provided a comprehensive medical examination. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPPEL + LIMEMPPDERM) with the quantity (TRNOVER/2) and the cost of a partial comprehensive medical examination. Again, the employee turnover rate is divided by two for the same reasons as discussed previously.

The fourth cost contained in the second term is the incremental cost of employee time for receiving a chromium medical examination to employees at the termination of employment. It is estimated that, at the termination of employment, the employee will be provided a comprehensive medical examination. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination

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because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the quantity (TRNOVER/2) with the amount of time required to undergo a partial comprehensive medical examination by the non-supervisory wage rate of the employee.

The third term of the annual O&M cost of medical surveillance is the cost of additional medical testing for those employees who have abnormal medical examination results. Abnormal results will require additional medical testing "as deemed appropriate by the physician." This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the percentage of employees who will be found to have abnormal test results with the cost of additional medical testing. The percentage of employees who will be found to have abnormal test result is estimated to be 0.5 percent of exposed employees based on information provided by OSHA.

The fourth term is the cost of employee time for those employees who require additional medical testing because of abnormal test results. This cost is determined by multiplying of the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the percentage of employees who will be found to have abnormal test results with the amount of time required for additional medical testing with the non-supervisory wage rate of the employee.

The fifth term is the cost for a supervisor's reassessment of a work area after an employee's medical results have been shown to be abnormal. This reassessment is not prescribed under the revised standard, but rather, it is expected to be undertaken by any responsible employer. This cost is determined by multiplying the number of employees that require a limited medical exam because their exposure is above the AL after the implementation of engineering controls and those that require a limited medical examination because of dermal "signs and symptoms" after the implementation of engineering controls (represented by LIMEMPPEL + LIMEMPDERM) with the percentage of employees who will be found to have abnormal test results with the

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amount of time required for supervisory reassessment with the supervisory wage rate of the supervisor.

The final term is included in the cost equation but does not incur any cost under the current standard. This term accounts for the option that if deemed necessary by the examining physician, abnormal results may also require the employer to remove the employee from work--with "medical removal protection benefits" (e.g., same pay). The cost of this would depend in large part on whether there is an available job to which the employee can be transferred. The last bracket term in the annual O&M costs is associated with the cost of medical removal protection. The term, %TRANJOB, represents the percentage of plants in the industry/process sector with suitable jobs available to transfer for employees with abnormal exam results. The length for time that medical removal benefits are received (MRPLEN) is set to zero, to account for the fact that medical removal benefits are not required under the current standard (setting the length of time to zero forces the whole term to zero, thereby incurring no cost). This term has been left in the annual O&M cost equation in case there are any regulatory alternative options which would require the medical removal protection. The cost would then be incurred by simply changing the length of time that medical removal benefits are allowed.



## COMMUNICATION OF HAZARDS TO EMPLOYEES

The revised hexavalent chromium standards call for training for all employees who are potentially exposed to hexavalent chromium. The training should address, among other things, the health hazards of working with and being exposed to hexavalent chromium, measures being taken (as required by the revised standard) to protect workers, the proper use of respirators and other personal protective equipment, the medical surveillance program, and emergency procedures. The employer will provide additional training when training is necessary to ensure that each employee maintains an understanding of the safe use and handling of hexavalent chromium and when workplace changes result in an increase in employee exposure to hexavalent chromium.

Up-front and annual O&M costs are associated with elements of the provision that are incremental to training in the baseline and to training that is already required by the Hazard Communication Standard and state and local right-to-know laws. In addition, the revised standard requires warning signs to be posted to notify employees that they are about to enter a regulated area before they enter the regulated area. These costs were determined by the following equations and variables:

$$\text{COMMUF COST} = ((\text{POTEXPEMP} * \text{EMPTIMEINIT} * \text{NONSUPEWAGE}) + (\text{SUPTIMEINIT} * \text{SUPEWAGE}) + (\text{CLTIMEINIT} * \text{CLWAGE}) + (\text{POTEXPEMP} * \text{TRAINAIDCOST}) + (\text{POTEXPEMP} / \# \text{EMPSESSION} * \text{EMPTIMEINIT} * \text{BILINGWAGE})) * \# \text{PLANTS}$$

$$\text{COMMCAPCOST} = \% \text{ADDSIGN} * (\text{JCP EL} * \# \text{SIGNS}) * \text{SIGNCOST} * \# \text{PLANTS}$$

$$\begin{aligned} \text{COMMO\&MCOST} = & (\text{POTEXPEMP} * \text{TRNOVR} * \text{EMPTIMEINIT} * \text{NONSUPEWAGE} \\ & + \text{POTEXPEMP} / \# \text{EMPSESSION} * \text{TRNOVR} * \text{EMPTIMEINIT} * \\ & \text{BILINGWAGE}) + (((\text{POTEXPEMP}) - (\text{POTEXPEMP} * \\ & \text{TRNOVR})) * \text{EMPTIMEANN} * \text{NONSUPEWAGE} + \\ & (((\text{POTEXPEMP}) - (\text{POTEXPEMP} * \text{TRNOVR})) / \# \text{EMPSESSION}) \\ & * \text{EMPTIMEANN} * \text{BILINGWAGE}) + (\text{SUPTIMEANN} * \\ & \text{SUPEWAGE}) + (\text{CLTIMEANN} * \text{CLWAGE})) * (\% \text{ANNTRAIN}) + \\ & ((\text{POTEXPEMP}) * \text{TRAINAIDCOST})) * \# \text{PLANTS} \end{aligned}$$

$$\text{COMMCAPCHG} = \text{COMMCAPCCOST} * \text{SIGNCRF} \text{ (where } n = \text{SIGNLIFE, } i = \text{DISCRATE)}$$

$$\text{COMMCOST} = \text{COMMCAPCHG} + \text{COMMO\&MCOST}$$

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### Variables

#EMPSESSION	Number of potentially exposed employees per training session
#PLANTS	Number of plants represented by the model plant
#SIGNS	Number of warning signs for entering each regulated area
%ADDSIGN	Percent of plants requiring warning signs that employee is entering a regulated area signs
%ANNTRAIN	Percent of establishments that require annual training
BILINGWAGE	Bilingual trainer wage rate, \$/hour
CLTIMEANN	Annual clerical time, in hours, to prepare for annual training
CLTIMEINIT	Clerical time, in hours, for initial training
CLWAGE	Clerical wage rate, \$/hour
COMMCAPCHG	Capital charge
COMMCAPCOST	Total capital cost of communication of hazards
COMMCOST	Total annualized cost
COMMO&MCOST	Total annualized O&M cost
COMMUF COST	Total up-front cost of communication of hazards
DISCRATE	Discount rate
EMPTIMEANN	Employee time, in hours, for annual training
EMPTIMEINIT	Employee time, in hours, for initial training
JCEP	Number of job categories exposed above the PEL
POTEXPEMP	Number of workers potentially exposed to airborne hexavalent chromium and workers with dermal exposure
SIGNCOST	Unit cost of OSHA-regulation warning signs with mounting materials
SIGNCRF	Capital recovery factor for COMMCAPCOST
SIGNLIFE	Useful life, in years, of a warning sign
SNONSUPEWAGE	Non-supervisory wage rate, \$/hour
SUPEWAGE	Supervisory wage rate, \$/hour
SUPTIMEANN	Annual supervisory time, in hours, for initial and annual training
SUPTIMEINIT	Supervisory time, in hours, for initial training
TRAINAIDCOST	Cost per employee for training aids and materials
TRNOVR	Employee turnover rate

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

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The industry turnover rate was estimated using data from "U.S. Department of Labor, Bureau of Labor Statistics, Job Openings and Labor Turnover Estimates, July 2002 - July 2003". The average monthly job turnover rate was calculated and multiplied by 12 to determine the annual rate. The annual job turnover rate for each industry is shown in Table III.3.

The first type of cost induced by the revised standard is an up-front cost of training all employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium (represented by COMMUFCOST). The first term in this cost equation is the cost of employee time for initial training. This cost is determined by multiplying the number of employees who are exposed to airborne hexavalent chromium and those employees that have eye or skin contact with hexavalent chromium by the amount of employee time that is required to train an employee by the non-supervisory wage rate of the employee.

The second term in the up-front cost of training cost equation is the cost of supervisory time to prepare the initial training. This cost is determined by multiplying the amount of time required by a supervisor to prepare the initial training by the supervisory wage rate of the supervisor.

The third term the up-front cost of training cost equation is the cost of clerical time to prepare training aids and materials for the up-front training. This cost is determined by multiplying the amount of clerical time required to create training aids by the clerical wage rate of the employee.

The fourth term in the up-front cost of training cost equation is the cost of training materials for the employees who are undergoing initial training. This cost is determined by multiplying the number of employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium (represented by COMMUFCOST) by the cost of training materials per employee.

The fifth and final term in the up-front cost of training cost equation is the cost of a bilingual trainer to provide the training to the employees. This cost is determined by multiplying the quantity, employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium divided by the number of employees per training session, by the amount of employee time that is required to train an employee by the bilingual trainer wage rate.

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The five terms are then summed together and multiplied by the number of plants represented by the model input to determine the cost incurred by the entire industry sector for up-front training.

The second cost incurred is the cost of signs that an employee is about to enter a regulated area (represented by COMMCAPCOST). The method for determining this cost is identical to the methodology contained in the regulated areas section.

The third type of cost is the annual O&M costs (represented by COMMO&MCOST) incurred by establishments primarily as they hire new employees and are required to train them. This cost contains several terms and the terms are discussed below.

The first term in the annual O&M cost equation is the cost associated with providing initial training to new hires. This cost contains two components. The first component is the cost associated with employee time for the training of new hires. This cost is determined by multiplying the number of employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium by the turnover rate for that industry sector by the amount of time required to provide initial training to an employee by the non-supervisory wage rate of the employee. The second component is the cost associated with the bilingual trainer's time for initial training of new hires. This cost is determined by multiplying the quantity, the number of employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium by employee turnover divided by the number of employees per training session, by the amount of employee time required to train an employee by the bilingual trainer wage rate.

The third, fourth, fifth, and sixth terms are costs associated with the annual training of employees. Annual training is not required by the revised standard and is not a cost incurred by these cost models because the percentage of establishments that require annual training is set to zero. This cost is included simply for ease of determining costs associated with annual training as a possible regulatory alternative.

The seventh term is the cost of training materials. This cost is determined by multiplying the number of employees who are exposed to airborne hexavalent chromium and those that have eye or skin contact with hexavalent chromium by the cost of training materials per employee.

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All seven terms contained in the annual O&M cost equation are summed together and multiplied by the number of plants represented by the model input to determine the cost incurred by the entire industry sector for the annual O&M cost associated with the communication of hazards to employees.

The total annualized cost is determined by adding the capital charge cost of capital equipment to the annual O&M cost of the communication of hazards to employees.

## **RECORDKEEPING**

The revised hexavalent chromium standard has various requirements for recordkeeping: 1) records of all air monitoring for hexavalent chromium in the workplace shall be kept (general industry only); 2) records for each employee covered by medical surveillance will be established and maintained; and 3) a "certification record" will be prepared for all employees upon completion of training. Records on workers with dermal exposure will also be maintained. Although many plants no doubt currently maintain records, additional recordkeeping will probably be necessary to meet the specific requirements of the new standard. It is estimated that incremental recordkeeping requirements are the same at each model plant.

Information that is contained in the exposure monitoring records must be maintained in accordance with 29 CFR 1910.1020 and must include:

- 1) The monitoring date, duration, and results in terms of an 8-hour TWA for each sample collected,
- 2) Name, social security number, and job classification of the employees monitored, and all other employees whose exposures the monitoring is intended to represent,
- 3) Description of the sampling and analytical methods and evidence of their accuracy,
- 4) Type of respiratory protective device, if applicable, worn by the monitored employee, and
- 5) Notation of any other conditions that might have affected the monitoring results. The employer shall also keep a record of all assessments, corrective steps, and audits carried out in accordance with this standard.

Information that is contained in the medical surveillance records for the employees must be maintained in accordance with 29 CFR 1910.1020 and must include:

- 1) Name, social security number, job title, location within the plant or establishment, and description of their duties,
- 2) Copy of physician's written opinions and an explanation sheet for biological monitoring,
- 3) Copy of medical history and the results of any physical examination and all test results which are required to be provided,
- 4) Employee's medical symptoms that might be related to the hexavalent chromium, and

- 5) Copy of the information provided to the physician as required by the medical surveillance provision. The employer shall assure that these records are maintained for the duration of employment plus thirty years.

Information that is contained in the exposure monitoring records must include the following items: the identity of the person who was trained, the signature of the employer or the person who conducted the training, and the date the training was completed. The certification records shall be prepared at the completion of training and the records shall be kept on file for three years beyond the date of training of the employee.

There are capital and annual O&M costs associated with the provisions for recordkeeping. These costs were determined by the following equations and variables:

Capital Costs

$$\text{RECCAPCOST} = \text{FILECOST} \times (\text{EMPEXP}) \times \text{\#PLANTS}$$

Capital Charge Costs

$$\text{RECCAPCHG} = \text{RECCAPCOST} \times \text{FILECRF} \text{ (where } n = \text{FILELIFE, } i = \text{DISCRATE)}$$

O&M Costs

$$\text{RECO\&MCOST} = [\text{RECTIME} \times \text{CLWAGE} \times (\text{EMPEXP})] \times \text{\#PLANTS}$$

Variables

#PLANTS	Number of plants represented by the model plant
CLWAGE	Clerical wage rate, \$/hour
DISCRATE	Discount rate
EMPEXP	Total number of employees at the plant to airborne hexavalent chromium and employees exposed dermally
FILECOST	Cost per employee for computer file space
FILECRF	Capital recovery factor for RECCAPCOST
FILELIFE	Useful life, in years, of computer file space
RECCAPCHG	Annualized capital charge for RECCAPCOST
RECCAPCOST	Capital cost of recordkeeping
RECO&MCOST	Annual O&M cost of recordkeeping
RECTIME	Annual incremental clerical recordkeeping time per employee, in hours
SUPWAGE	Supervisory wage rate, \$/hour

Unit costs of variables (and their basis) used to estimate the costs of ancillary provisions for all industries are shown later in Table III.1. Cost estimates for these variables were estimated based on site visits, NIOSH HHE reports, OSHA IMIS data, engineering judgment based on previous

experience, and other data as presented in "Industry Profile, Exposure Profile, Technological Feasibility Evaluation, and Environmental Impact for Industries Affected by a Revised OSHA Standard for Hexavalent Chromium (General Industry, Construction, and Maritime Sectors)." Wage rates for all industry sectors were determined from U.S. Department of Labor, Bureau of Labor Statistics and are shown in Table III.2. Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.

The capital cost equation accounts for the rather minimal cost of additional file space for employees exposed above the action level and employees with dermal exposure. To get the capital charge, the capital cost is annualized over a useful life of ten years (FILELIFE = 10 years) at a discount rate of 7 percent (DISCRATE = 7%) and 3 percent.

In the annual O&M cost equation, it is estimated that 1½ hours of incremental clerical time will be needed annually to maintain and update records for every employee exposed above the action level (RECTIME = ½ hours) and for every employee with dermal exposure.

### ***Unit Costs of Ancillary Provisions***

The following tables show the unit costs of items associated with the costing of the ancillary provisions of the revised chromium standard. Table III.1 shows the base cost of the items, the source of the cost, and escalation factors used to convert the base cost to 2003 dollars. Table III.1 also lists the index used to escalate the base cost, if escalation was required to estimate the cost in 2003 dollars.

Table III.2 shows the loaded wage rates used for the individual industry sectors in the development of the total industry cost. These wage data were derived from 2001 Bureau of Labor Statistics wage rate data and have been adjusted to account for benefits, etc.

Table III.3 shows a summary of the estimated current industry sector practice with the revised hexavalent chromium standard ancillary provisions.



Table III.1. Unit Costs for All Industry Sectors (unless otherwise noted)

Cost Description	Basis	Base Cost	Escalation Factor (October 2003 Basis)	Index Used for Price Escalation	Unit Cost
Cost per hour for an outside industrial hygiene contractor	Estimate by In-house CIH	\$90.00	1	NONE	\$90.00
Cost of a personal sampling pump	Gilian 3500; Sensidyne, 16333 Bayvista Drive, Clearwater, FL 33760	\$680.00	1	NONE	\$680.00
Variable Cost per sample (e.g., laboratory analysis)	Estimate by In-house CIH	\$60.00	1	NONE	\$60.00
Flat Fee For Training Course	Estimate by In-house CIH	\$400.00	1	NONE	\$400.00
Cost of a calibration unit	GILBRATOR-2; Sensidyne, 16333 Bayvista Drive, Clearwater, FL 33760	\$1,075.00	1	NONE	\$1,075.00
Unit cost of OSHA-regulation warning signs with mounting materials	July 1993 EMMED Co, Inc. Catalog	\$3.03	1.2702	CPI - All items	\$3.84
Cost of materials per qualitative fit-testing	Banana Oil Fit Test Kit; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$0.07	1	NONE	\$0.07
Unit cost per worker for an air-supplied respirator	Allegro One-Worker Full Face Kit; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$1,473.33	1	NONE	\$1,473.33
Unit cost per employee for a full-face respirator	MSA Ultra Twin Full Face Respirator; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$243.00	1	NONE	\$243.00
Unit cost per employee for a half-mask respirator	MSA Comfro Classic Half-Mask Respirator; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$35.30	1	NONE	\$35.30
Cost of replacement cartridges (2 cartridges per mask)	MSA P100 Filter Cartridge; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$13.74	1	NONE	\$13.74

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Cost Description	Basis	Base Cost	Escalation Factor (October 2003 Basis)	Index Used for Price Escalation	Unit Cost
Unit cost per employee for a blasting helmet air-supplied respirator	Allegro Three Person Air Pump, Bullard 1/2" Hose, 100'L, Bullard Helmet w/ constant air flow; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$1,164.00	1	NONE	\$1,164.00
Cost of materials to clean one respirator	Respirator Cleaning/Storage Kit; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$1.86	1	NONE	\$1.86
Cost of PE coated Tyvek coveralls	KAPLER Poly-Coat Coveralls; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$6.60	1	NONE	\$6.60
Cost of Saranex coveralls	Tychem QC Coveralls; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$32.85	1	NONE	\$32.85
Cost of Tyvek coveralls	Tyvek Protective Wear Coveralls; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$4.50	1	NONE	\$4.50
Cost of bib aprons	Polypropylene Bib Apron; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$0.58	1	NONE	\$0.58
Cost of laundering uniforms for one employee per week	Aramark Cincinnati Representative	\$5.50	1	NONE	\$5.50
Cost of laundering lab coats for one employee per week	Aramark Cincinnati Representative	\$3.75	1	NONE	\$3.75
Cost of clear indirect vent goggles	Lab Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$6.00	1	NONE	\$6.00

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Cost Description	Basis	Base Cost	Escalation Factor (October 2003 Basis)	Index Used for Price Escalation	Unit Cost
Cost of clear lens safety glasses	Lab Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$5.00	1	NONE	\$5.00
Cost of grey lens safety glasses	Lab Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$5.00	1	NONE	\$5.00
Cost of lined nitrile gloves	Ansell Sol-Vex Flock Lined Nitrile Gloves; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$2.50	1	NONE	\$2.50
Cost of powder surgical nitrile gloves	N-Dex 4-mil powdered disposable Nitrile Lab Gloves; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$0.24	1	NONE	\$0.24
Cost of rough PVC gloves	BEST Super Flex PVC-Coated Gloves; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$4.10	1	NONE	\$4.10
Unit cost of change rooms per employee	Based upon Means Square Foot Costs, 1989	\$856.00	1.4742	CPI - All items	\$1,261.92
Cost per shower head	Based upon Means Square Foot Costs, 1989	\$3,590.00	1.4742	CPI - All items	\$5,292.39
Cost per hand washing facility	Glacier Bay 4 in Chrome Two Handle Bar Faucet, 40 in x 24in. White Double Bowl Utility Tub, 505 E. Kemper Rd., Cincinnati, OH 45246 --- Estimated Installation Cost	\$500.00	1	NONE	\$500.00
Variable cost per shower (soap, clean towel, water, etc.)	Estimate	\$0.50	1	NONE	\$0.50

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Cost Description	Basis	Base Cost	Escalation Factor (October 2003 Basis)	Index Used for Price Escalation	Unit Cost
Variable cost per hand washing facility (roll paper towels, liquid soap, water)	Kimberly-Clark OnePak Dispenser, WINDSOFT Bleached White Paper Roll Towels; The Betty Mills Company, 60 East 3rd Ave, Ste 201, San Mateo, CA 94401(2003)	\$0.06	1	NONE	\$0.06
Unit cost of HEPA vacuums (central)	CONSAD (1993) base price is 1991	\$1,580.00	1.4742	CPI - All items	\$2,329.24
Unit cost of HEPA vacuum replacement filters (central)	CONSAD (1993) base price is 1991	\$212.00	1.4742	CPI - All items	\$312.53
Unit cost of HEPA vacuums (portable)	Lowe's	\$140.00	1	NONE	\$140.00
Unit cost of HEPA vacuum replacement filters (portable)	Lowe's	\$35.00	1	NONE	\$35.00
Unit cost of garbage bags and disposal	Estimate -- Including RCRA disposal	\$500.00	1	NONE	\$500.00
Full cost of a comprehensive medical exam	1994 Quote from two hospitals. Bethesda Care, Cincinnati, OH and Abington Memorial Hospital, Willow Grove, PA	\$282.00	1.4211	CPI - Medical Care Services	\$400.76
Full cost of a limited medical exam	2003 cost of physical exams in Maryland (as directed by OSHA).	\$125.00	1	NONE	\$125.0
Cost of additional medical testing after exam results are abnormal	Estimated to be proportional to cost of limited medical exam (1994 Quote from two hospitals. Bethesda Care, Cincinnati, OH and Abington Memorial Hospital, Willow Grove, PA)	\$150.00	1.4211	CPI - Medical Care Services	\$213.17
Cost of a partial comprehensive medical exam	1994 Quote from two hospitals. Bethesda Care, Cincinnati, OH and Abington Memorial Hospital, Willow Grove, PA --Estimated half of comprehensive exam cost	\$141.00	1.4211	CPI - Medical Care Services	\$200.38

Cost Description	Basis	Base Cost	Escalation Factor (October 2003 Basis)	Index Used for Price Escalation	Unit Cost
Cost of a partial limited medical exam	1994 Quote from two hospitals. Bethesda Care, Cincinnati, OH and Abington Memorial Hospital, Willow Grove, PA. —Estimated half of additional medical testing after exam results are abnormal	\$75.00	1.4211	CPI - Medical Care Services	\$106.59
Cost per employee for training aids and materials	Estimate	\$2.00	1	NONE	\$2.00
Cost per employee for computer file space	Estimate	\$1.00	1	NONE	\$1.00
Cost of Medical History Questionnaire	OSHA. Preliminary Regulatory Impact and Regulatory Flexibility Analysis of the Proposed Respiratory Protection Standard. 1994.	\$25	1.4211	CPI - Medical Care Services	\$35.53
Cost of Medical Exam for Respirator Use	OSHA. Preliminary Regulatory Impact and Regulatory Flexibility Analysis of the Proposed Respiratory Protection Standard. 1994.	\$75	1.4211	CPI - Medical Care Services	\$106.58
Cost of Mop and Bucket	The Home Depot. Contico, 35qt Mop Bucket and Wringer. Wilen, 16oz Cotton Cut-End Mop	\$62.92	1	NONE	\$62.92
Cost of Mop	The Home Depot. Wilen, 16oz Cotton Cut-End Mop	\$2.90	1	NONE	\$62.92
Cost of Mobile Shower Unit (construction)	Ameri-can Engineering. Basic 828 Decontamination Trailer. 2003. 15886 Michigan Road, Argos, IN 46501	\$42,960	1	NONE	\$42,960
Cost of Change Area per employee (construction)	Estimate	\$720	1	NONE	\$720
Unit Cost of Cr(VI) hazard labels for glove disposal bags	Permanent Vinyl Custom Labels; Lab Safety Supply Catalog 2003, PO Box 1368, Janesville, WI 53547-1368	\$0.32	1	NONE	\$300

**Table III.2. Loaded Wage Rates for All Industry Sectors**

<b>Group</b>	<b>Non-Supervisory Wage Rate (\$/hour)</b>	<b>Supervisor Wage Rate (\$/hour)</b>	<b>Clerical Wage Rate (\$/hour)</b>	<b>Janitorial Wage Rate (\$/hour)</b>	<b>Bilingual Trainer Wage Rate (\$/hour)</b>
1	\$21.43	\$30.01	\$15.47	\$11.71	\$24.65
2	\$21.10	\$29.54	\$15.23	\$11.53	\$24.27
3	\$26.63	\$37.18	\$19.15	\$14.51	\$25.65
4	\$31.15	\$43.63	\$22.48	\$17.02	\$35.83
5	\$30.36	\$42.52	\$21.91	\$16.59	\$34.91
6	\$25.72	\$36.01	\$18.55	\$14.05	\$29.57
7	\$31.15	\$43.63	\$22.48	\$17.02	\$35.83
8	\$23.20	\$32.49	\$16.75	\$12.67	\$26.68
9	\$23.24	\$32.55	\$16.77	\$12.70	\$26.73
10	\$25.76	\$36.06	\$18.58	\$14.08	\$29.62
11	\$23.12	\$32.36	\$16.68	\$12.63	\$26.58
12	\$19.14	\$26.80	\$13.81	\$10.46	\$22.00
13	\$31.25	\$43.77	\$22.55	\$17.08	\$35.94
14	\$31.25	\$43.77	\$22.55	\$17.08	\$35.94
15	\$22.80	\$31.92	\$16.45	\$12.46	\$26.22
17	\$30.36	\$42.52	\$21.91	\$16.59	\$34.91
18	\$33.42	\$46.80	\$24.12	\$18.26	\$38.43
19	\$24.10	\$33.76	\$17.39	\$13.17	\$27.72
20	\$16.08	\$22.52	\$11.60	\$8.79	\$18.48
21	\$23.25	\$32.56	\$16.77	\$12.71	\$26.75
22	\$16.79	\$23.50	\$12.11	\$9.18	\$19.30
23	\$17.19	\$24.08	\$12.41	\$9.39	\$19.76
24	\$26.18	\$36.65	\$18.89	\$14.30	\$30.10
25	\$20.65	\$28.93	\$14.91	\$11.28	\$23.76
26	\$25.86	\$36.20	\$18.65	\$14.13	\$29.74
27	\$21.93	\$30.71	\$15.83	\$11.99	\$25.23
29	\$20.04	\$28.07	\$14.46	\$10.95	\$23.05
30	\$22.49	\$31.49	\$16.23	\$12.29	\$25.87
31	\$25.88	\$36.24	\$18.68	\$14.14	\$29.76
32	\$22.21	\$31.10	\$16.03	\$12.14	\$25.55

Source: U.S. Dept. of Labor, OSHA, Office of Regulatory Analysis.

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants that have not satisfied the initial monitoring		Percent of Plants that will continue to use an outside contractor for		Percent of plants not performing quarterly monitoring requirements	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1 Electroplating	25%	25%	100%	100%	100%	100%
2A Welding (general industry)	25%	25%	100%	90%	100%	100%
2B Welding (maritime industry)	75%	75%	90%	50%	100%	100%
2C Welding (construction industry)	25%	25%	100%	95%	100%	100%
2D Welding (government)	25%	25%	100%	95%	100%	100%
2A1 Welding (general industry - carbon steel)	75%	75%	90%	50%	100%	100%
2B1 Welding (maritime industry - carbon steel)	25%	25%	100%	95%	100%	100%
2C1 Welding (construction industry - carbon steel)	25%	25%	100%	95%	100%	100%
3A Painting (general industry - aerospace)	25%	25%	75%	25%	100%	100%
3A1 Painting (general industry - auto repair)	25%	25%	75%	25%	100%	100%
3A2 Painting (general industry - coil coating)	25%	25%	75%	25%	100%	100%
3B Painting (maritime industry)	25%	25%	90%	10%	100%	100%
3C Painting (construction industry)	25%	25%	50%	25%	100%	100%
3D Painting (government)	25%	25%	25%	25%	100%	100%
4 Chromate (chromite ore) production	N/A	100%	N/A	100%	N/A	100%
5 Chromate Pigment Producers	25%	25%	100%	100%	100%	100%
6 Chromated Copper Arsenate (CCA) Producers	N/A	N/A	N/A	100%	N/A	100%
7 Chromium Catalyst Producers	N/A	25%	N/A	20%	N/A	100%
8 Paint and Coatings Producers	25%	25%	75%	75%	100%	100%
9 Printing Ink Producers	100%	100%	90%	90%	100%	100%
10 Plastic Colorant Producers and Users	25%	25%	100%	100%	100%	100%
11 Plating Mixture Producers	75%	75%	80%	80%	100%	100%
12 Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
13 Chromium Material Producers	N/A	100%	N/A	100%	N/A	100%
14 Steel Mills (stainless)	75%	75%	90%	90%	100%	100%
14A Steel Mills (carbon)	75%	75%	90%	90%	100%	100%
14B reshaping (Alloy and Stainless)	75%	75%	90%	90%	100%	100%
15 Iron and Steel Foundries	25%	25%	90%	90%	100%	100%
16 Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants requiring additional warning signs for regulated areas		Percent of plants conducting annual respirator fit-testing in the baseline		Percent of the workers using air-supplied respirators	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
1 Electroplating	100%	100%	3%	29%	0.4%	0.7%
2A Welding (general industry)	100%	100%	2%	19%	0.6%	0.9%
2B Welding (maritime industry)	100%	100%	5%	45%	0.6%	1.0%
2C Welding (construction industry)	100%	100%	1%	12%	0.9%	1.4%
2D Welding (government)	100%	100%	1%	12%	0.9%	1.4%
2A1 Welding (general industry - carbon steel)	100%	100%	5%	45%	0.6%	1.0%
2B1 Welding (maritime industry - carbon steel)	100%	100%	1%	12%	0.9%	1.4%
2C1 Welding (construction industry - carbon steel)	100%	100%	1%	12%	0.9%	1.4%
3A Painting (general industry - aerospace)	100%	100%	2%	19%	0.6%	0.9%
3A1 Painting (general industry - auto repair)	100%	100%	2%	19%	0.6%	0.9%
3A2 Painting (general industry - coil coating)	100%	100%	2%	19%	0.6%	0.9%
3B Painting (maritime industry)	100%	100%	5%	45%	0.6%	1.0%
3C Painting (construction industry)	100%	100%	100%	100%	100%	100%
3D Painting (government)	100%	100%	100%	100%	100%	100%
4 Chromate (chromite ore) production	N/A	100%	N/A	63%	N/A	4.6%
5 Chromate Pigment Producers	100%	100%	7%	63%	2.9%	4.6%
6 Chromated Copper Arsenate (CCA) Producers	N/A	100%	N/A	63%	N/A	4.6%
7 Chromium Catalyst Producers	N/A	100%	N/A	63%	N/A	4.6%
8 Paint and Coatings Producers	100%	100%	7%	63%	2.9%	4.6%
9 Printing Ink Producers	100%	100%	7%	63%	2.9%	4.6%
10 Plastic Colorant Producers and Users	15%	15%	5%	46%	1.6%	2.5%
11 Plating Mixture Producers	100%	100%	7%	63%	2.9%	4.6%
12 Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
13 Chromium Material Producers	N/A	100%	N/A	44%	N/A	1.8%
14 Steel Mills (stainless)	100%	100%	5%	44%	1.1%	1.8%
14A Steel Mills (carbon)	100%	100%	5%	44%	1.1%	1.8%
14B reshaping (Alloy and Stainless)	100%	100%	5%	44%	1.1%	1.8%
15 Iron and Steel Foundries	100%	100%	5%	44%	1.1%	1.8%
16 Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A



Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No.	Sector	Percent of the workers using full-face respirators		Percent of the workers using half-mask respirators		Percent of the workers using blasting helmet air-supplied respirators	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1	Electroplating	0.6%	0.9%	1.1%	1.8%	0%	0%
2A	Welding (general industry)	1.1%	1.8%	0.9%	1.5%	0%	0%
2B	Welding (maritime industry)	1.9%	3.1%	1.1%	1.8%	0%	0%
2C	Welding (construction industry)	1.7%	2.7%	1.6%	2.5%	0%	0%
2D	Welding (government)	1.7%	2.7%	1.6%	2.5%	0%	0%
2A1	Welding (general industry - carbon steel)	1.9%	3.1%	1.1%	1.8%	0%	0%
2B1	Welding (maritime industry - carbon steel)	1.7%	2.7%	1.6%	2.5%	0%	0%
2C1	Welding (construction industry - carbon steel)	1.7%	2.7%	1.6%	2.5%	0%	0%
3A	Painting (general industry - aerospace)	1.1%	1.8%	0.9%	1.5%	0%	0%
3A1	Painting (general industry - auto repair)	1.1%	1.8%	0.9%	1.5%	0%	0%
3A2	Painting (general industry - coil coating)	1.1%	1.8%	0.9%	1.5%	0%	0%
3B	Painting (maritime industry)	1.9%	3.1%	1.1%	1.8%	0%	0%
3C	Painting (construction industry)	100%	100%	100%	100%	100%	100%
3D	Painting (government)	100%	100%	100%	100%	100%	100%
4	Chromate (chromite ore) production	N/A	8.1%	N/A	4.0%	N/A	0%
5	Chromate Pigment Producers	5.1%	8.1%	2.5%	4.0%	0%	0%
6	Chromated Copper Arsenate (CCA) Producers	N/A	8.1%	N/A	4.0%	N/A	0%
7	Chromium Catalyst Producers	N/A	8.1%	N/A	4.0%	N/A	0%
8	Paint and Coatings Producers	5.1%	8.1%	2.5%	4.0%	0%	0%
9	Printing Ink Producers	5.1%	8.1%	2.5%	4.0%	0%	0%
10	Plastic Colorant Producers and Users	2.9%	4.7%	1.5%	2.4%	0%	0%
11	Plating Mixture Producers	5.1%	8.1%	2.5%	4.0%	0%	0%
12	Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
13	Chromium Material Producers	N/A	3.8%	N/A	4.3%	N/A	0%
14	Steel Mills (stainless)	2.4%	3.8%	2.7%	4.3%	0%	0%
14A	Steel Mills (carbon)	2.4%	3.8%	2.7%	4.3%	0%	0%
14B	reshaping (Alloy and Stainless)	2.4%	3.8%	2.7%	4.3%	0%	0%
15	Iron and Steel Foundries	2.4%	3.8%	2.7%	4.3%	0%	0%
16	Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percentage of plants in the baseline that supplied coveralls or aprons		Percentage of plants in the baseline that supply eye protection		Percentage of plants in the baseline that supply gloves	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
1 Electroplating	100%	100%	100%	100%	100%	100%
2A Welding (general industry)	67%	67%	67%	67%	67%	67%
2B Welding (maritime industry)	0%	0%	0%	0%	0%	0%
2C Welding (construction industry)	0%	67%	0%	67%	0%	67%
2D Welding (government)	0%	67%	0%	67%	0%	67%
2A1 Welding (general industry - carbon steel)	0%	0%	0%	0%	0%	0%
2B1 Welding (maritime industry - carbon steel)	0%	67%	0%	67%	0%	67%
2C1 Welding (construction industry - carbon steel)	0%	67%	0%	67%	0%	67%
3A Painting (general industry - aerospace)	46%	67%	45%	67%	46%	67%
3A1 Painting (general industry - auto repair)	46%	67%	45%	67%	46%	67%
3A2 Painting (general industry - coil coating)	46%	67%	45%	67%	46%	67%
3B Painting (maritime industry)	46%	70%	45%	63%	46%	70%
3C Painting (construction industry)	100%	100%	100%	100%	100%	100%
3D Painting (government)	100%	100%	100%	100%	100%	100%
4 Chromate (chromite ore) production	N/A	100%	N/A	100%	N/A	100%
5 Chromate Pigment Producers	100%	100%	100%	100%	100%	100%
Chromated Copper Arsenate (CCA) Producers	N/A	67%	N/A	67%	N/A	67%
6 Chromium Catalyst Producers	N/A	80%	N/A	63%	N/A	70%
7 Paint and Coatings Producers	46%	70%	45%	63%	46%	70%
8 Printing Ink Producers	50%	67%	50%	67%	50%	67%
9 Plastic Colorant Producers and Users	46%	70%	45%	63%	46%	70%
10 Plating Mixture Producers	100%	100%	100%	100%	100%	100%
11 Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
12 Chromium Material Producers	N/A	70%	N/A	63%	N/A	70%
13 Steel Mills (stainless)	46%	70%	45%	63%	46%	70%
14A Steel Mills (carbon)	46%	70%	45%	63%	46%	70%
14B reshaping (Alloy and Stainless)	46%	70%	45%	63%	46%	70%
15 Iron and Steel Foundries	46%	70%	45%	63%	46%	70%
16 Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No.	Sector	Percentage of employers that will pay for coveralls or aprons		Percentage of employers that will pay for eye protection		Percentage of employers that will pay for gloves	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1	Electroplating	96.9%	96.9%	100.0%	100.0%	100.0%	100.0%
2A	Welding (general industry)	100%	100%	100%	100%	100%	100%
2B	Welding (maritime industry)	100%	100%	100%	100%	100%	100%
2C	Welding (construction industry)	100%	100%	100%	100%	100%	100%
2D	Welding (government)	100%	100%	100%	100%	100%	100%
2A1	Welding (general industry - carbon steel)	100%	100%	100%	100%	100%	100%
2B1	Welding (maritime industry - carbon steel)	100%	100%	100%	100%	100%	100%
2C1	Welding (construction industry - carbon steel)	100%	100%	100%	100%	100%	100%
3A	Painting (general industry - aerospace)	100.0%	100.0%	99.2%	99.2%	100.0%	100.0%
3A1	Painting (general industry - auto repair)	98.4%	98.4%	94.5%	94.5%	98.7%	98.7%
3A2	Painting (general industry - coil coating)	100.0%	100.0%	99.3%	99.3%	100.0%	100.0%
3B	Painting (maritime industry)	83.9%	83.9%	100.0%	100.0%	89.5%	89.5%
3C	Painting (construction industry)	88.1%	88.1%	99.0%	99.0%	87.8%	87.8%
3D	Painting (government)	88.1%	88.1%	99.0%	99.0%	87.8%	87.8%
4	Chromate (chromite ore) production	N/A	100.0%	N/A	100.0%	N/A	100.0%
5	Chromate Pigment Producers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
6	Chromated Copper Arsenate (CCA) Producers	N/A	100.0%	N/A	100.0%	N/A	100.0%
7	Chromium Catalyst Producers	N/A	100.0%	N/A	100.0%	N/A	100.0%
8	Paint and Coatings Producers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
9	Printing Ink Producers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
10	Plastic Colorant Producers and Users	99.8%	99.8%	99.6%	99.6%	99.5%	99.5%
11	Plating Mixture Producers	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
12	Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
13	Chromium Material Producers	N/A	99.8%	N/A	100.0%	N/A	100.0%
14	Steel Mills (stainless)	99.8%	99.8%	100.0%	100.0%	100.0%	100.0%
14A	Steel Mills (carbon)	99.8%	99.8%	100.0%	100.0%	100.0%	100.0%
14B	reshaping (Alloy and Stainless)	99.9%	99.9%	99.7%	99.7%	100.0%	100.0%
15	Iron and Steel Foundries	99.8%	99.8%	100.0%	100.0%	100.0%	100.0%
16	Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants requiring additional change rooms		Percent of plants requiring additional handwashing facilities		Percent of plants requiring new HEPA vacuums	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1 Electroplating	55%	10%	55%	10%	100%	100%
2A Welding (general industry)	55%	30%	55%	30%	0%	0%
2B Welding (maritime industry)	55%	30%	55%	30%	0%	0%
2C Welding (construction industry)	55%	30%	55%	30%	0%	0%
2D Welding (government)	55%	30%	55%	30%	0%	0%
2A1 Welding (general industry - carbon steel)	55%	30%	55%	30%	0%	0%
2B1 Welding (maritime industry - carbon steel)	55%	30%	55%	30%	0%	0%
2C1 Welding (construction industry - carbon steel)	55%	30%	55%	30%	0%	0%
3A Painting (general industry - aerospace)	55%	30%	55%	30%	100%	100%
3A1 Painting (general industry - auto repair)	55%	30%	55%	30%	100%	100%
3A2 Painting (general industry - coil coating)	55%	30%	55%	30%	100%	100%
3B Painting (maritime industry)	55%	30%	55%	30%	100%	100%
3C Painting (construction industry)	0%	0%	0%	0%	0%	0%
3D Painting (government)	0%	0%	0%	0%	0%	0%
4 Chromate (chromite ore) production	N/A	30%	N/A	30%	N/A	100%
5 Chromate Pigment Producers	55%	30%	55%	30%	100%	0%
6 Chromated Copper Arsenate (CCA) Producers	N/A	30%	N/A	30%	N/A	0%
7 Chromium Catalyst Producers	N/A	30%	N/A	30%	N/A	0%
8 Paint and Coatings Producers	55%	30%	55%	30%	40%	100%
9 Printing Ink Producers	55%	30%	55%	30%	100%	100%
10 Plastic Colorant Producers and Users	55%	30%	55%	30%	15%	6%
11 Plating Mixture Producers	55%	30%	55%	30%	100%	100%
12 Wood Preserving	N/A	N/A	N/A	N/A	N/A	N/A
13 Chromium Material Producers	N/A	30%	N/A	30%	N/A	100%
14 Steel Mills (stainless)	55%	30%	55%	30%	100%	100%
14A Steel Mills (carbon)	55%	30%	55%	30%	100%	100%
14B reshaping (Alloy and Stainless)	55%	30%	55%	30%	100%	100%
15 Iron and Steel Foundries	55%	30%	55%	30%	80%	80%
16 Chromium Dioxide Producers	N/A	N/A	N/A	N/A	N/A	N/A

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants with annual medical testing in the baseline		Percent of plants that have jobs available for employees with abnormal exam results		Current Turnover Rate (%)
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	
1 Electroplating	100%	100%	90%	90%	26.16
2A Welding (general industry)	0%	5%	50%	90%	27.24
2B Welding (maritime industry)	0%	5%	50%	90%	27.24
2C Welding (construction industry)	0%	5%	50%	75%	67.8
2D Welding (government)	0%	5%	50%	75%	67.8
2A1 Welding (general industry - carbon steel)	0%	5%	50%	90%	27.24
2B1 Welding (maritime industry - carbon steel)	0%	5%	50%	75%	67.8
2C1 Welding (construction industry - carbon steel)	0%	5%	50%	75%	67.8
3A Painting (general industry - aerospace)	50%	80%	50%	90%	27.24
3A1 Painting (general industry - auto repair)	50%	80%	50%	90%	27.24
3A2 Painting (general industry - coil coating)	50%	80%	50%	90%	27.24
3B Painting (maritime industry)	50%	80%	50%	90%	27.24
3C Painting (construction industry)	100%	100%	25%	95%	27.24
3D Painting (government)	100%	100%	0%	0%	67.8
4 Chromate (chromite ore) production	N/A	50%	N/A	100%	29.16
5 Chromate Pigment Producers	100%	100%	0%	50%	29.16
6 Chromated Copper Arsenate (CCA) Producers	N/A	100%	N/A	100%	29.16
7 Chromium Catalyst Producers	N/A	100%	N/A	100%	29.16
8 Paint and Coatings Producers	100%	100%	100%	100%	29.16
9 Printing Ink Producers	10%	80%	50%	100%	29.16
10 Plastic Colorant Producers and Users	100%	100%	100%	100%	29.16
11 Plating Mixture Producers	30%	50%	50%	100%	29.16
12 Wood Preserving	N/A	N/A	N/A	N/A	NA
13 Chromium Material Producers	N/A	100%	N/A	0%	26.16
14 Steel Mills (stainless)	30%	50%	50%	100%	26.16
14A Steel Mills (carbon)	30%	50%	50%	100%	26.16
14B reshaping (Alloy and Stainless)	30%	50%	50%	100%	26.16
15 Iron and Steel Foundries	10%	80%	50%	100%	26.16
16 Chromium Dioxide Producers	N/A	N/A	N/A	N/A	NA

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants that have not satisfied the initial monitoring		Percent of Plants that will continue to use an outside contractor for		Percent of plants not performing quarterly monitoring requirements	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
17	25%	25%	100%	100%	100%	100%
18	100%	N/A	100%	N/A	100%	N/A
19	75%	75%	100%	100%	100%	100%
20	75%	75%	90%	90%	100%	100%
21	75%	75%	90%	90%	100%	100%
21A	75%	75%	90%	90%	100%	100%
22	75%	75%	90%	90%	100%	100%
23	N/A	N/A	N/A	N/A	N/A	N/A
24	N/A	75%	N/A	90%	N/A	100%
24A	75%	75%	90%	90%	100%	100%
25	N/A	75%	N/A	90%	N/A	100%
26A	75%	75%	100%	100%	100%	100%
26B	75%	75%	100%	100%	100%	100%
26C	75%	75%	100%	100%	100%	100%
26D	75%	75%	100%	100%	100%	100%
27	75%	75%	90%	90%	100%	100%
27A	75%	75%	90%	25%	100%	100%
28	N/A	N/A	N/A	N/A	N/A	N/A
29	75%	75%	90%	90%	100%	100%
30	N/A	75%	N/A	100%	N/A	100%
31B	0%	0%	90%	90%	100%	100%
31C	75%	75%	90%	90%	100%	100%
31CG	75%	75%	90%	90%	100%	100%
31D	0%	0%	100%	100%	100%	100%
31DG	100%	100%	100%	100%	100%	100%
32A	75%	75%	90%	90%	100%	100%
32	75%	75%	90%	90%	100%	100%

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants requiring additional warning signs for regulated areas		Percent of plants conducting annual respirator fit-testing in the baseline		Percent of the workers using air-supplied respirators	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
17	46%	46%	7%	63%	2.9%	4.6%
18	100%	N/A	7%	N/A	2.9%	N/A
19	100%	100%	1%	8%	0.5%	0.8%
20	0%	0%	1%	11%	0.0%	0.0%
21	100%	100%	3%	24%	0.2%	0.3%
21A	100%	100%	3%	24%	0.2%	0.3%
22	100%	100%	0%	2%	0%	0%
23	N/A	N/A	N/A	N/A	N/A	N/A
24	N/A	100%	N/A	33%	N/A	2.4%
24A	100%	100%	100%	100%	100%	100%
25	N/A	100%	N/A	24%	N/A	0.3%
26A	100%	100%	1%	6%	0.1%	0.2%
26B	100%	100%	5%	45%	0.6%	1.0%
26C	100%	100%	1%	12%	0.9%	1.4%
26D	100%	100%	12%	12%	1.4%	1.4%
27	100%	100%	4%	41%	2.1%	3.3%
27A	100%	100%	4%	41%	2.1%	3.3%
28	N/A	N/A	N/A	N/A	N/A	N/A
29	100%	100%	3%	24%	0.2%	0.3%
30	N/A	100%	N/A	44%	N/A	1.8%
31B	100%	100%	1%	12%	0.9%	1.4%
31C	100%	100%	1%	12%	0.9%	1.4%
31CG	100%	100%	12%	12%	1.4%	1.4%
31D	100%	100%	1%	12%	0.9%	1.4%
31DG	100%	100%	12%	12%	1.4%	1.4%
32A	100%	100%	3%	24%	0.2%	0.3%
32	100%	100%	3%	24%	0.2%	0.3%

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of the workers using full-face respirators		Percent of the workers using half-mask respirators		Percent of the workers using blasting helmet air-supplied respirators		
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees	
17	Chromium Dye Producers	5.1%	8.1%	2.5%	4.0%	0%	0%
18	Chromium Sulfate Producers	5.1%	N/A	2.5%	N/A	0%	N/A
19	Chemical Distributors	0.0%	0.0%	0.9%	1.4%	0%	0%
20	Textile Dyeing	1.5%	2.4%	1.0%	1.6%	0%	0%
21	Colored Glass Producers	1.3%	2.1%	2.0%	3.2%	0%	0%
21A	Fiber, Flat, and Container Glass	1.3%	2.1%	2.0%	3.2%	0%	0%
22	Printing	0%	0%	0.2%	0.3%	0%	0%
23	Leather Tanning	N/A	N/A	N/A	N/A	N/A	N/A
24	Chromium Catalyst Users	N/A	4.1%	N/A	2.0%	N/A	0%
24A	Chromium Catalyst Users (Service)	2.6%	4.1%	1.3%	2.0%	0%	0%
25	Refractory Brick Producers	N/A	2.1%	N/A	3.2%	N/A	0%
26A	Woodworking (general industry)	0.4%	0.7%	0.8%	1.3%	0%	0%
26B	Woodworking (maritime industry)	1.9%	3.1%	1.1%	1.8%	0%	0%
26C	Woodworking (construction industry)	1.7%	2.7%	1.6%	2.5%	0%	0%
26D	Woodworking (government)	2.7%	2.7%	2.5%	2.5%	0%	0%
27	Solid Waste Incineration	2.4%	3.8%	2.1%	3.3%	0%	0%
27A	Incinerators (government)	2.4%	3.8%	2.1%	3.3%	0%	0%
28	Oil and Gas Well Drilling	N/A	N/A	N/A	N/A	N/A	N/A
29	Portland Cement Producers	1.3%	2.1%	2.0%	3.2%	0%	0%
30	Superalloy Producers and Users	N/A	3.8%	N/A	4.3%	N/A	0%
31B	Construction (Refractory Repair)	1.7%	2.7%	1.6%	2.5%	0%	0%
31C	Construction (Hazardous Waste Work)	1.7%	2.7%	1.6%	2.5%	0%	0%
31CG	Haz. Waste (government)	2.7%	2.7%	2.5%	2.5%	0%	0%
31D	Construction (Industrial Rehabilitation)	1.7%	2.7%	1.6%	2.5%	0%	0%
31DG	Industrial Rehab. (government)	2.7%	2.7%	2.5%	2.5%	0%	0%
32A	Ready-Mixed Concrete	1.3%	2.1%	2.0%	3.2%	0%	0%
32	Precast Concrete Products Producers	1.3%	2.1%	2.0%	3.2%	0%	0%



Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percentage of plants in the baseline that supplied coveralls or aprons		Percentage of plants in the baseline that supply eye protection		Percentage of plants in the baseline that supply gloves	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
17	100%	67%	100%	67%	100%	67%
18	33%	N/A	33%	N/A	33%	N/A
19	46%	70%	45%	63%	46%	70%
20	46%	70%	45%	63%	46%	70%
21	46%	70%	45%	63%	46%	70%
21A	46%	70%	45%	63%	46%	70%
22	46%	70%	45%	63%	46%	70%
23	N/A	N/A	N/A	N/A	N/A	N/A
24	N/A	70%	N/A	63%	N/A	70%
24A	100%	100%	100%	100%	100%	100%
25	N/A	67%	N/A	67%	N/A	67%
26A	46%	70%	45%	63%	46%	70%
26B	46%	70%	45%	63%	46%	70%
26C	46%	70%	45%	63%	46%	70%
26D	70%	70%	63%	63%	70%	70%
27	100%	100%	100%	100%	100%	100%
27A	100%	100%	100%	100%	100%	100%
28	N/A	N/A	N/A	N/A	N/A	N/A
29	46%	70%	45%	63%	46%	70%
30	N/A	70%	N/A	63%	N/A	70%
31B	46%	70%	45%	63%	46%	70%
31C	75%	100%	100%	100%	100%	100%
31CG	100%	100%	100%	100%	100%	100%
31D	46%	70%	45%	63%	46%	70%
31DG	70%	70%	63%	63%	70%	70%
32A	46%	70%	45%	63%	46%	70%
32	46%	70%	45%	63%	46%	70%

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percentage of employers that will pay for coveralls or aprons		Percentage of employers that will pay for eye protection		Percentage of employers that will pay for gloves	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
17	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
18	100.0%	N/A	100.0%	N/A	100.0%	N/A
19	100.0%	100.0%	100.0%	100.0%	98.8%	98.8%
20	97.5%	97.5%	97.6%	97.6%	98.6%	98.6%
21	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%
21A	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%
22	99.7%	99.7%	100.0%	100.0%	97.5%	97.5%
23	N/A	N/A	N/A	N/A	N/A	N/A
24	N/A	100.0%	N/A	100.0%	N/A	100.0%
24A	98.8%	98.8%	94.6%	94.6%	99.0%	99.0%
25	N/A	99.9%	N/A	100.0%	N/A	100.0%
26A	99.9%	99.9%	99.8%	99.8%	97.5%	97.5%
26B	83.9%	83.9%	99.1%	99.1%	89.5%	89.5%
26C	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
26D	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
27	97.0%	97.0%	100.0%	100.0%	98.9%	98.9%
27A	97.0%	97.0%	100.0%	100.0%	98.9%	98.9%
28	N/A	N/A	N/A	N/A	N/A	N/A
29	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%
30	N/A	99.8%	N/A	100.0%	N/A	100.0%
31B	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
31C	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
31CG	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
31D	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
31DG	98.5%	98.5%	97.8%	97.8%	84.9%	84.9%
32A	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%
32	99.9%	99.9%	100.0%	100.0%	100.0%	100.0%

Table III.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants requiring additional change rooms		Percent of plants requiring additional handwashing facilities		Percent of plants requiring new HEPA vacuums	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
17	55%	30%	55%	30%	100%	100%
18	55%	N/A	55%	N/A	60%	N/A
19	55%	30%	55%	30%	100%	100%
20	55%	30%	55%	30%	50%	40%
21	55%	30%	55%	30%	0%	0%
21A	55%	30%	55%	30%	100%	100%
22	55%	30%	55%	30%	0%	0%
23	N/A	N/A	N/A	N/A	N/A	N/A
24	N/A	30%	N/A	30%	N/A	100%
24A	55%	30%	55%	30%	100%	100%
25	N/A	30%	N/A	30%	N/A	83%
26A	55%	30%	55%	30%	100%	100%
26B	55%	30%	55%	30%	0%	0%
26C	55%	30%	55%	30%	0%	0%
26D	30%	30%	0%	0%	0%	0%
27	55%	30%	55%	30%	0%	0%
27A	55%	30%	55%	30%	0%	0%
28	N/A	N/A	N/A	N/A	N/A	N/A
29	55%	30%	55%	30%	80%	72%
30	N/A	30%	N/A	30%	N/A	28%
31B	55%	30%	55%	30%	0%	0%
31C	55%	30%	55%	30%	0%	0%
31CG	30%	30%	30%	30%	0%	0%
31D	55%	30%	55%	30%	0%	0%
31DG	30%	30%	30%	30%	0%	0%
32A	55%	30%	55%	30%	100%	100%
32	55%	30%	55%	30%	100%	100%

Table iii.3 Summary of Current Industry Sector Compliance with Revised Hexavalent Chromium Standard Ancillary Provisions

Section No. Sector	Percent of plants with annual medical testing in the baseline		Percent of plants that have jobs available for employees with abnormal exam results		Current Turnover Rate (%)
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	
17	100%	100%	0%	100%	29.16
18	100%	N/A	100%	N/A	29.16
19	0%	0%	50%	50%	26.64
20	10%	80%	50%	100%	29.16
21	10%	80%	50%	100%	29.16
21A	10%	80%	50%	100%	29.16
22	10%	80%	50%	100%	29.16
23	N/A	N/A	N/A	N/A	NA
24	N/A	80%	N/A	100%	26.16
24A	30%	80%	100%	100%	26.16
25	N/A	80%	N/A	100%	26.16
26A	0%	25%	0%	100%	26.16
26B	0%	25%	0%	100%	26.16
26C	50%	50%	0%	100%	67.8
26D	50%	50%	100%	100%	67.8
27	30%	50%	50%	100%	46.92
27A	30%	50%	50%	100%	46.92
28	N/A	N/A	N/A	N/A	NA
29	10%	80%	50%	100%	46.92
30	N/A	50%	N/A	100%	26.16
31B	50%	50%	100%	100%	67.8
31C	50%	50%	100%	100%	67.8
31CG	50%	50%	100%	100%	67.8
31D	50%	50%	100%	100%	67.8
31DG	50%	50%	100%	100%	67.8
32A	10%	80%	50%	100%	46.92
32	10%	80%	50%	100%	46.92

Table III.4 presents engineering control costs associated with the draft revised hexavalent chromium standard, classified by industry sector, job category, control technology, and revised PEL. Table III.4 also includes information on the number of exposed workers in the baseline exposure profile, classified in various exposure ranges, with a discount rate of 7 percent.

Table III.5 presents detailed engineering control costs associated with the draft revised hexavalent chromium standard, classified by industry sector, job category, and control technology. Table III.5 also includes information on capital costs, O&M costs, totalized annualized costs, and detailed design information (e.g., acfm, length of ductwork) for each type of control technology with a discount rate of 7 percent.

Table III.6 presents a summary of estimated compliance costs in general industry associated with various provisions of the draft revised standard with a discount rate of 7 percent.

Table III.7 presents a summary of estimated compliance costs in maritime associated with various provisions of the draft revised standard with a discount rate of 7 percent.

Table III.8 presents a summary of estimated compliance costs in the construction industry associated with various provisions of the draft revised standard with a discount rate of 7 percent.

Table III.9 presents a summary of estimated compliance costs associated with various provisions of the draft revised standard for governments (state and local) in the states that have State Plans which cover public employees with a discount rate of 7 percent.

Table III.10 presents a summary of total estimated compliance costs associated with various provisions of the draft revised standard for general industry (including maritime), construction, and governments (state and local) in the states that have State Plans which cover public employees with a discount rate of 7 percent.

Tables III.11 through III.22 present summaries of each of the regulatory provision costs by industry sector and establishment size with a discount rate of 7 percent. The following tables are provided:

Table Regulatory Provision

III.11 Total Regulatory Costs

- III.12 Engineering Control Costs
- III.13 Initial Exposure Monitoring Costs
- III.14 Periodic Exposure Monitoring Costs
- III.15 Respiratory Protection Costs
- III.16 Personal Protective Equipment Costs (not already supplied by industry)
- III.17 Personal Protective Equipment Costs (supplied, but not currently paid for by industry)
- III.18 Hygiene Area Costs
- III.19 Housekeeping Costs
- III.20 Medical Surveillance Costs
- III.21 Hazard Communication Costs
- III.22 Recordkeeping Costs

***Discount Rate***

The cost estimates supplied in Tables III.4 through III.10 were calculated using a discount rate of 7 percent. Additional cost estimates are shown in Tables III.23 through III.29 using a discount rate of 3 percent.

Table III.23 presents engineering control costs associated with the draft revised hexavalent chromium standard, classified by industry sector, job category, control technology, and revised PEL. Table III.23 also includes information on the number of exposed workers in the baseline exposure profile, classified in various exposure ranges, with a discount rate of 3 percent.

Table III.24 presents detailed engineering control costs associated with the draft revised hexavalent chromium standard, classified by industry sector, job category, and control technology. Table III.24 also includes information on capital costs, O&M costs, totalized annualized costs, and detailed design information (e.g., acfm, length of ductwork) for each type of control technology with a discount rate of 3 percent.

Table III.25 presents a summary of estimated compliance costs in general industry associated with various provisions of the draft revised standard with a discount rate of 3 percent. The estimated cost of the Primary Choice ranged from \$174,952,994 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$1,430,350,251 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 7 percent. The estimated cost of the Primary Choice ranged from \$172,296,077 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$1,397,984,532 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 3 percent.

Table III.26 presents a summary of estimated compliance costs in maritime associated with various provisions of the draft revised standard with a discount rate of 3 percent. The estimated cost of the Primary Choice ranged from \$12,981,969 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$81,422,419 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 7 percent. The estimated cost of the Primary Choice ranged from \$12,699,563 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$79,579,600 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 3 percent.

Table III.27 presents a summary of estimated compliance costs in the construction industry associated with various provisions of the draft revised standard with a discount rate of 3 percent. The estimated cost of the Primary Choice ranged from \$34,012,607 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$396,548,673 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 7 percent. The estimated cost of the Primary Choice ranged from \$32,911,437 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$373,765,825 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 3 percent.

Table III.28 presents a summary of estimated compliance costs associated with various provisions of the draft revised standard for governments (state and local) in the states that have State Plans which cover public employees with a discount rate of 3 percent. The estimated cost of the Primary Choice ranged from \$1,916,200 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$7,136,556 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 7 percent. The estimated cost of the Primary Choice ranged from \$1,884,021 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$6,936,645 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 3 percent.

Table III.29 presents a summary of total estimated compliance costs associated with various provisions of the draft revised standard for general industry, maritime, construction, and governments (state and local) in the states that have State Plans which cover public employees with a discount rate of 3 percent. The total estimated cost of the Primary Choice ranged from \$223,863,769 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$1,915,457,899 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 7 percent. The total estimated cost of the Primary Choice ranged from \$219,791,098 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$1,858,266,602 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$  calculated with a discount rate of 3 percent.

Tables III.30 through III.41 present summaries of each of the regulatory provision costs by industry sector and establishment size with a discount rate of 3 percent. The following tables are provided:

Table Regulatory Provision

- III.30 Total Regulatory Costs
- III.31 Engineering Control Costs
- III.32 Initial Exposure Monitoring Costs
- III.33 Periodic Exposure Monitoring Costs
- III.34 Respiratory Protection Costs
- III.35 Personal Protective Equipment Costs (not already supplied by industry)
- III.36 Personal Protective Equipment Costs (supplied, but not currently paid for by industry)
- III.37 Hygiene Area Costs
- III.38 Housekeeping Costs
- III.39 Medical Surveillance Costs
- III.40 Hazard Communication Costs
- III.41 Recordkeeping Costs

**III.2 Time Distribution of Costs**

The first year costs for each of the ancillary provisions and each of the industry sectors was estimated for each of the PELs. These first year costs are shown in Tables III.42 – III.57.

**III.3 Costs of Regulatory Alternatives**

This section discusses alternatives to the draft revised standard that OSHA is considering.

**Welding**

One possible engineering control available to reduce personal hexavalent chromium exposure during welding is to change from Shielded Metal Arc Welding (SMAW) to Gas Metal Arc Welding (GMAW). The baseline engineering controls estimate that 60 percent of SMAW can be converted to GMAW. A sensitivity analysis was performed for possible PELs of  $1 \mu\text{g}/\text{m}^3$  and  $5 \mu\text{g}/\text{m}^3$  to determine the cost of converting both 0 percent and 90 percent of SMAW to GMAW, respectively, in addition to the baseline control cost. Tables III.58 and III.59 present the estimated total annualized cost for all establishments (large, small, carbon, and stainless steel) for possible PELs of  $5 \mu\text{g}/\text{m}^3$  and  $1 \mu\text{g}/\text{m}^3$ , respectively, and the various substitution rates (0%, 60%, and 90%) at a discount rate of 7 percent.



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The total annualized cost for welding at a PEL of  $5 \mu\text{g}/\text{m}^3$  and a discount rate of 7% ranges from \$172,987,080 for 0 percent substitution of SMAW with GMAW to \$118,023,637 for 90 percent substitution of SMAW with GMAW. The total annualized cost for welding at a PEL of  $1 \mu\text{g}/\text{m}^3$  and a discount rate of 7% ranges from \$344,037,804 for 0 percent substitution of SMAW with GMAW to \$282,946,680 for 90 percent substitution of SMAW with GMAW.

The cost estimates in Tables III.58 and III.59 show that as the amount of SMAW equipment is replaced by GMAW equipment increases from 0 percent to 90 percent:

- The cost of engineering controls decreases because less expensive controls are required to meet the PEL.
- The cost of exposure monitoring decreases because workers are exposed to lower concentrations of hexavalent chromium because of better controls.
- The cost of respirator protection decreases because the welding emissions are better controlled and fewer respirators are required.
- The cost of medical surveillance decreases because fewer respirators are required.

**Steel Mills and Electroplating**

Steel mills sometimes coat the rolls of steel with zinc and other metals to improve the metal properties. These coating lines sometimes use hexavalent chromium chemicals and may be located within the steel mill facilities. When developing the cost estimates for electroplating and steel mills, these application groups were initially considered separately. A cost analysis was conducted to determine the effect of electroplating on steel mill costs.

The estimated compliance costs for all (large, small, carbon, and stainless steel) steel mills associated with various provisions of the draft revised standard with a discount rate of 7 percent (not including electroplating) ranged from \$3,117,664 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$83,379,740 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated compliance costs for all (large, small, carbon, and stainless steel) steel mills associated with various provisions of the draft revised standard with a discount rate of 7 percent (including electroplating) ranged from \$3,258,397 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$86,484,524 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated cost increased approximately 4.5 percent and 3.7 percent for PELs of  $20 \mu\text{g}/\text{m}^3$  to  $0.25 \mu\text{g}/\text{m}^3$ , respectively.

The estimated compliance costs for all (large, small, carbon, and stainless steel) steel mills associated with various provisions of the draft revised standard with a discount rate of 3 percent (not including electroplating) ranged from \$2,979,000 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$78,751,144 for

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a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated compliance costs for all (large, small, carbon, and stainless steel) steel mills associated with various provisions of the draft revised standard with a discount rate of 7 percent (including electroplating) ranged from \$3,125,771 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$81,811,641 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated cost increased approximately 4.9 percent and 3.9 percent for PELs of  $20 \mu\text{g}/\text{m}^3$  to  $0.25 \mu\text{g}/\text{m}^3$ , respectively.

### **Electroplating**

The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard with a discount rate of 7 percent ranged from \$32,028,753 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$596,490,307 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard with a discount rate of 3 percent ranged from \$31,108,335 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$587,909,524 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ .

The cost for an electroplating SECAL, no engineering controls (respirator use only), electroplating job shops, and chrome conversion coating were also determined apart from the entire electroplating application group.

### **SECAL (Separate Engineering Control Air Limit)**

A Separate Engineering Control Air Limits (SECAL) is an engineering control limit for certain processes in which the PEL cannot be achieved solely through engineering controls and work practices. A SECAL of  $5 \mu\text{g}/\text{m}^3$  was evaluated for the electroplating industry. In this analysis, engineering controls were used to control personal hexavalent chromium exposures down to  $5 \mu\text{g}/\text{m}^3$ . Below  $5 \mu\text{g}/\text{m}^3$ , air-purifying respirators were used to protect workers to the applicable PEL.

The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard (including a SECAL of  $5 \mu\text{g}/\text{m}^3$ ) with a discount rate of 7 percent ranged from \$53,204,598 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$331,128,014 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ . The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard (including a SECAL of  $5 \mu\text{g}/\text{m}^3$ ) with a discount rate of 3 percent ranged from \$52,295,577 for a PEL of  $20 \mu\text{g}/\text{m}^3$  to \$330,220,303 for a PEL of  $0.25 \mu\text{g}/\text{m}^3$ .

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### No Engineering Controls (Respirators Only)

In addition to the SECAL described above, the option of requiring no engineering controls was explored. In this option, air-purifying respirators were estimated for all workers exposed to hexavalent chromium above the revised PEL.

The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard (including no engineering controls) with a discount rate of 7 percent ranged from \$60,578,879 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$271,925,737 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ . The estimated compliance costs for the entire electroplating application group associated with various provisions of the draft revised standard (including no engineering controls) with a discount rate of 3 percent ranged from \$59,765,222 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$270,884,058 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ .

### Job Shops

The total cost for electroplating job shops was estimated as follows:

1. The number of job shops performing decorative plating, hard plating, anodizing, conversion coating, and combinations of these processes was determined from Table 1-4 of the electroplating profile. Based on the establishment distribution for job shops in Table 1-1 of the electroplating profile, these processes were distributed as 31% large establishments and 69% small establishments.
2. The exposure distribution in Table 1-9 of the exposure profile was used; however, several changes were made. All job shop platers and job shop chrome platers were kept. All captive shop platers and captive shop chrome platers were discarded. Thirty-four percent of the remaining workers (hard chrome, decorative chrome, anodizer, operator, help/operator, and conversion coater) were accounted for to match the number of workers shown in job shops in Table 1-1 of the electroplating profile.
3. The economic impact for job shops was not divided between several NAICS codes, because job shops are only NAICS code 332813.
4. The costing methodology proceeded as usual based on these plating lines and employees. The cost for a large individual job shop was the cost for all large job shops divided by the number of large job shops. The cost for a small individual job shop was calculated in a similar manner.

The number of plating lines at a typical job shop was estimated as follows:

1. Ten plating lines and three plating lines were estimated for each large and small plating establishment, respectively.

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2. The percent of job shops performing decorative plating, hard plating, anodizing, conversion coating, and combinations of these processes was determined from Table 1-4 of the electroplating profile.
3. The percent of job shops was multiplied by the number of plating lines (10 or 3). If a combination of plating techniques was listed in Table 1-4, the different plating techniques were divided equally between the different techniques.
4. The number of plating lines were added together (from the categories listed in Table 1-4) for each plating technique to provide the following estimate:

<u>Plating Lines</u>	<u>Large Job Shops</u>	<u>Small Job Shops</u>
Hard Chrome	2.1	0.6
Decorative Chrome	3.5	1.0
Anodizing	1.3	0.4
Conversion Coating	3.1	0.9

The estimated compliance costs for electroplating job shops associated with various provisions of the draft revised standard with a discount rate of 7 percent ranged from \$26,817,695 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$188,652,555 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ . The estimated compliance costs for electroplating job shops associated with various provisions of the draft revised standard with a discount rate of 3 percent ranged from \$26,331,885 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$181,565,868 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ .

*Chrome Conversion Coating*

The estimated compliance costs for chrome conversion coating associated with various provisions of the draft revised standard with a discount rate of 7 percent ranged from \$7,454,419 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$77,063,040 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ . The estimated compliance costs for chrome conversion coating associated with various provisions of the draft revised standard with a discount rate of 3 percent ranged from \$7,313,009 for a PEL of 20  $\mu\text{g}/\text{m}^3$  to \$76,083,309 for a PEL of 0.25  $\mu\text{g}/\text{m}^3$ .

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )											
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 2.0	2.0 to 5.0	5.0 to 10.0	10.0 to 20.0	20.0 to > 20.0			
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	0	200	424	139	1,261	496	69	0				
		Use of floating balls												
		Improve tank covers												
		Upgrade existing LEV to ACGIH standards												
		Cost of MACT Testing												
		Tank covers, floating balls, fume suppressants, etc.	0	529	881	0	88	44	132	176				
		Tank covers, floating balls, fume suppressants, etc.	0	833	740	185	370	570	355	278				
		Capotive Shop Chrome Plater	0	278	1,018	370	370	370	93	185				
		Job Shop Plater	0	3,365	6,083	416	1,409	924	671	732				
		Capotive Shop Plater	0	1,165	3,975	457	1,005	594	183	114				
		Anodizer	0	795	795	88	0	177	0	88				
		Operator	0	954	1,751	373	842	636	342	282				
		Helper/Other	0	990	3,975	0	688	765	347	173				
		Chrome Conversion	0	12,301	7,828	0	1,118	0	0	0				
		2A Welding (general industry)	SMAW	Local Exhaust Ventilation	4,690	0	0	0	3,670	2,447	6,525	3,059		
				Directional General Ventilation of a Confined Space										
				Increase general exhaust ventilation										
Replace SMAW with GMAW														
Improved maintenance of existing ventilation system														
Use stationary LEV - Articulating Welding Exhaust Duct														
Use stationary LEV (Downdraft Table)														
High-Velocity-Low-Volume System														
Controls combined with SMAW	6,878			449	0	3,589	2,392	150	1,047	449				
Use stationary LEV - Articulating Welding Exhaust Duct	3,579			0	0	952	0	0	0	0				
Improved Maintenance of existing LEV														
No controls required	1,812			0	0	0	0	0	0	0				
Install LEV by torch	204			0	0	0	45	23	0	195				
Replace existing plasma cutting gas with argon-hydrogen gas														
Install LEV by torch	390			0	0	0	0	0	63	0				
No controls required	2,718			0	0	0	0	0	0	0				
GMAW TIG	SMAW			Local Exhaust Ventilation	6,878	449	0	3,589	2,392	150	1,047	449		
		Directional General Ventilation of a Confined Space												
		Increase general exhaust ventilation												
		Replace SMAW with GMAW												
		Improved maintenance of existing ventilation system												
		Use stationary LEV - Articulating Welding Exhaust Duct												
		Use stationary LEV (Downdraft Table)												
		High-Velocity-Low-Volume System												
		Controls combined with SMAW	6,878	449	0	3,589	2,392	150	1,047	449				
		Use stationary LEV - Articulating Welding Exhaust Duct	3,579	0	0	952	0	0	0	0				
		Improved Maintenance of existing LEV												
		No controls required	1,812	0	0	0	0	0	0	0				
		Install LEV by torch	204	0	0	0	45	23	0	195				
		Replace existing plasma cutting gas with argon-hydrogen gas												
		Install LEV by torch	390	0	0	0	0	0	63	0				
		No controls required	2,718	0	0	0	0	0	0	0				
		SAW	Plasma Cutting	Local Exhaust Ventilation	6,878	449	0	3,589	2,392	150	1,047	449		
Directional General Ventilation of a Confined Space														
Increase general exhaust ventilation														
Replace SMAW with GMAW														
Improved maintenance of existing ventilation system														
Use stationary LEV - Articulating Welding Exhaust Duct														
Use stationary LEV (Downdraft Table)														
High-Velocity-Low-Volume System														
Controls combined with SMAW	6,878			449	0	3,589	2,392	150	1,047	449				
Use stationary LEV - Articulating Welding Exhaust Duct	3,579			0	0	952	0	0	0	0				
Improved Maintenance of existing LEV														
No controls required	1,812			0	0	0	0	0	0	0				
Install LEV by torch	204			0	0	0	45	23	0	195				
Replace existing plasma cutting gas with argon-hydrogen gas														
Install LEV by torch	390			0	0	0	0	0	63	0				
No controls required	2,718			0	0	0	0	0	0	0				
Plasma Welding	Resistance Welding			Local Exhaust Ventilation	6,878	449	0	3,589	2,392	150	1,047	449		
		Directional General Ventilation of a Confined Space												
		Increase general exhaust ventilation												
		Replace SMAW with GMAW												
		Improved maintenance of existing ventilation system												
		Use stationary LEV - Articulating Welding Exhaust Duct												
		Use stationary LEV (Downdraft Table)												
		High-Velocity-Low-Volume System												
		Controls combined with SMAW	6,878	449	0	3,589	2,392	150	1,047	449				
		Use stationary LEV - Articulating Welding Exhaust Duct	3,579	0	0	952	0	0	0	0				
		Improved Maintenance of existing LEV												
		No controls required	1,812	0	0	0	0	0	0	0				
		Install LEV by torch	204	0	0	0	45	23	0	195				
		Replace existing plasma cutting gas with argon-hydrogen gas												
		Install LEV by torch	390	0	0	0	0	0	63	0				
		No controls required	2,718	0	0	0	0	0	0	0				

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )							
			0.25	0.5	1	5	10	20		
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	\$555,716	\$555,716	\$436,634	\$0	\$0	\$0		
		Use of floating balls	\$52,450	\$52,450	\$41,210	\$0	\$0	\$0		
		improve tank covers	\$505,764	\$505,764	\$307,366	\$0	\$0	\$0		
		Upgrade existing LEV to ACGIH standards	\$164,904,516	\$65,476,793	\$58,201,594	\$31,525,863	\$14,550,398	\$7,275,199		
	Decorative Chrome	Job Shop Chrome Plater	Cost of MACT Testing	\$7,017,192	\$2,786,238	\$2,476,656	\$1,341,522	\$619,164	\$309,582	
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Tank covers, floating balls, fume suppressants, etc.							
			Dust controls while chromic acid flakes are added to tanks							
Installation of New LEV										
2A Welding (general industry)	SMAW	Local Exhaust Ventilation	\$71,284,600	\$64,772,200	\$48,891,100	\$25,793,800	\$12,928,300	\$5,196,300		
		Directional General Ventilation of a Confined Space								
		Increase general exhaust ventilation								
		Replace SMAW with GMAW								
		Improved maintenance of existing ventilation system								
		Use stationary LEV - Articulating Welding Exhaust Duct								
		Use stationary LEV (Downdraft Table)								
		High-Velocity-Low-Volume System								
		Controls combined with SMAW								
		Use stationary LEV - Articulating Welding Exhaust Duct								
		Improved Maintenance of existing LEV								
		No controls required								
		Install LEV by torch								
		Replace existing plasma cutting gas with argon-hydrogen gas								
Install LEV by torch										
No controls required										
GMAW TIG	SMAW	GMAW cost are included under SMAW								
		Use stationary LEV - Articulating Welding Exhaust Duct	\$1,806,800	\$1,806,800	\$0	\$0	\$0	\$0		
		Improved Maintenance of existing LEV	\$476,000	\$476,000	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		Install LEV by torch	\$283,500	\$283,500	\$283,500	\$235,200	\$212,100	\$212,100		
		Replace existing plasma cutting gas with argon-hydrogen gas	\$40,200	\$40,200	\$40,200	\$33,300	\$30,000	\$30,000		
		Install LEV by torch	\$132,300	\$132,300	\$132,300	\$132,300	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		Plasma Cutting	Plasma Welding	GMAW cost are included under SMAW						
				Use stationary LEV - Articulating Welding Exhaust Duct	\$1,806,800	\$1,806,800	\$0	\$0	\$0	\$0
				Improved Maintenance of existing LEV	\$476,000	\$476,000	\$0	\$0	\$0	\$0
				No controls required	\$0	\$0	\$0	\$0	\$0	\$0
				Install LEV by torch	\$283,500	\$283,500	\$283,500	\$235,200	\$212,100	\$212,100
				Replace existing plasma cutting gas with argon-hydrogen gas	\$40,200	\$40,200	\$40,200	\$33,300	\$30,000	\$30,000
Install LEV by torch	\$132,300			\$132,300	\$132,300	\$132,300	\$0	\$0		
No controls required	\$0			\$0	\$0	\$0	\$0	\$0		
Resistance Welding	Resistance Welding			GMAW cost are included under SMAW						
				Use stationary LEV - Articulating Welding Exhaust Duct	\$1,806,800	\$1,806,800	\$0	\$0	\$0	\$0
				Improved Maintenance of existing LEV	\$476,000	\$476,000	\$0	\$0	\$0	\$0
				No controls required	\$0	\$0	\$0	\$0	\$0	\$0
				Install LEV by torch	\$283,500	\$283,500	\$283,500	\$235,200	\$212,100	\$212,100
				Replace existing plasma cutting gas with argon-hydrogen gas	\$40,200	\$40,200	\$40,200	\$33,300	\$30,000	\$30,000
		Install LEV by torch	\$132,300	\$132,300	\$132,300	\$132,300	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		Chrome Conversion	Chrome Conversion	Local Exhaust Ventilation	\$325,668,187	\$38,770,022	\$38,770,022	\$126,129	\$0	\$0
				Directional General Ventilation of a Confined Space						
				Increase general exhaust ventilation						
				Replace SMAW with GMAW						
				Improved maintenance of existing ventilation system						
				Use stationary LEV - Articulating Welding Exhaust Duct						
Use stationary LEV (Downdraft Table)										
High-Velocity-Low-Volume System										
Controls combined with SMAW										
Use stationary LEV - Articulating Welding Exhaust Duct										
Improved Maintenance of existing LEV										
No controls required										
Install LEV by torch										
Replace existing plasma cutting gas with argon-hydrogen gas										
Install LEV by torch										
No controls required										

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to >20.0	
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	555	212	138	250	305	129	157	148
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Replace SMAW with pulsed arc GMAW welding unit								
		Use Portable LEV - Nedermann Filterbox								
		Fume Extractor Gun (FEG)								
		Controls combined with SMAW	1,113	432	243	405	487	55	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	423	158	25	19	6	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	5,605	1,251	1,869	1,717	1,088	153	153	784
	GMAW TIG FCAW	Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Replace 100%CO2 with 95%Argon/5%CO3								
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	58	58	0	29	160	72	0	43
		Install LEV by torch	0	113	55	0	0	0	0	0
		Use Portable LEV - Nedermann Filterbox	106	161	76	26	26	13	13	0
		Use moveable LEV - Articulating Welding Exhaust Duct	51	15	37	7	0	22	29	7
		Replace power source to convert unit to a plasma arc-cutting unit								
		No controls required	42	0	0	0	0	0	0	0
		No controls required	0	42	0	0	0	0	0	0
Plasma Cutting	Electron Torch Cutting									
	Thermal Spray Tungsten Carbide									
	SAW	1682	0	0	0	0	0	0	0	
	Grinding	84	126	0	0	0	0	0	0	
	Local Exhaust Ventilation	13,284	5,078	3,310	5,985	7,299	3,083	3,763	3,536	
	Directional General Ventilation of a Confined Space									
	Nedermann Filterbox									
	Welder training on proper position of LEV ducts									
	2 hour training course									
	Replace SMAW with GMAW									
GMAW Brazing Metallizing	Fume Extractor Gun (FEG)									
	Install LEV by torch	83	83	0	42	229	104	0	62	
	Replace existing plasma cutting gas with argon-hydrogen cutting gas									
	GMAW controls are included under SMAW	3,690	1,433	807	1,342	1,614	181	0	0	
	Nedermann Filterbox	0	0	0	0	0	0	4,534	0	
	No controls required	0	0	0	0	0	154	0	752	
	Local Exhaust Ventilation	207	79	52	93	114	48	59	55	
	Directional General Ventilation of a Confined Space									
	Nedermann Filterbox									
	Welder training on proper position of LEV ducts									
Plasma Cutting GMAW	Replace SMAW with GMAW									
	Install LEV by torch	1	1	0	1	3	2	0	1	
	Fume extractor gun	57	22	13	21	25	3	0	0	
	Replace short-circuit and other welding equipment with a pulsed arc									
	Nedermann Filterbox									
	Welder training on proper position of LEV ducts	0	0	0	0	0	0	0	72	
	Local Exhaust Ventilation	0	0	0	0	0	0	2	0	
	Local Exhaust Ventilation									
	Local Exhaust Ventilation									
	2D Welding (government industry)	SMAW	Local Exhaust Ventilation	207	79	52	93	114	48	59
Directional General Ventilation of a Confined Space										
Nedermann Filterbox										
Welder training on proper position of LEV ducts										
Replace SMAW with GMAW										
Install LEV by torch			1	1	0	1	3	2	0	1
Fume extractor gun			57	22	13	21	25	3	0	0
Replace short-circuit and other welding equipment with a pulsed arc										
Nedermann Filterbox										
Welder training on proper position of LEV ducts			0	0	0	0	0	0	0	72
Local Exhaust Ventilation	0	0	0	0	0	0	2	0		

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls						
			0.25	0.5	1	5	10	20	
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$9,181,305	\$6,691,372	\$3,160,113	\$1,143,422	\$640,206	\$392,709	
		Directional General Ventilation of a Confined Space							
		Use stationary LEV (Downdraft Table)							
		Use moveable LEV - Articulating Welding Exhaust Duct							
		Replace SMAW with pulsed arc GMAW welding unit							
		Use Portable LEV - Nederman Filterbox							
		Fume Extractor Gun (FEG)							
		Controls combined with SMAW							
		Use moveable LEV - Articulating Welding Exhaust Duct							
		Use moveable LEV - Articulating Welding Exhaust Duct							
	GMAW	Local Exhaust Ventilation							
		Directional General Ventilation of a Confined Space							
	TIG	Replace 100%CO2 with 95%Argon/5%CO3							
		Replace existing plasma cutting gas with argon-hydrogen cutting gas							
	FCAW	Install LEV by torch							
		Use Portable LEV - Nederman Filterbox							
	Plasma Cutting	Use moveable LEV - Articulating Welding Exhaust Duct							
		Replace power source to convert unit to a plasma arc-cutting unit							
	Electron Torch Cutting	No controls required							
		No controls required							
Thermal Spray Tungsten Carbide	No controls required								
	No controls required								
SAW	No controls required								
	No controls required								
Grinding	No controls required								
	No controls required								
2C Welding (construction industry)	SMAW	Local Exhaust Ventilation	\$73,722,757	\$60,755,494	\$38,022,943	\$14,683,198	\$11,006,183	\$6,747,925	
		Directional General Ventilation of a Confined Space							
		Nedermann Filterbox							
		Welder training on proper position of LEV ducts							
		2 hour training course							
		Replace SMAW with GMAW							
		Fume Extractor Gun (FEG)							
		Install LEV by torch							
		Replace existing plasma cutting gas with argon-hydrogen cutting gas							
		GMAW controls are included under SMAW							
Brazing	Nedermann Filterbox								
	No controls required								
Metallizing	No controls required								
	No controls required								
2D Welding (government industry)	SMAW	Local Exhaust Ventilation	\$1,306,757	\$1,184,579	\$343,628	\$69,860	\$9,380	\$0	
		Directional General Ventilation of a Confined Space							
		Nedermann Filterbox							
		Welder training on proper position of LEV ducts							
		Replace SMAW with GMAW							
		Install LEV by torch							
		Fume extractor gun							
		Replace short-circuit and other welding equipment with a pulsed arc							
		Nedermann Filterbox							
		Welder training on proper position of LEV ducts							
Local Exhaust Ventilation									
Plasma Cutting	Install LEV by torch								
	Fume extractor gun								
GMAW	Replace SMAW with GMAW								
	Welder training on proper position of LEV ducts								
Brazing	Nedermann Filterbox								
	Welder training on proper position of LEV ducts								
Metallizing	Local Exhaust Ventilation								
	Local Exhaust Ventilation								



Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers ( $\mu\text{g}/\text{m}^3$ )							
			Below LOD	LOD 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	>20.0
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	8,680	8,680	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Increase general exhaust ventilation								
		Replace SMAW with GMAW								
		Improved maintenance of existing ventilation system								
		Use stationary LEV - Articulating Welding Exhaust Duct								
		Use stationary LEV (Downdraft Table)								
		High-Velocity-Low-Volume System								
		Controls combined with SMAW	0	0	6,366	6,366	0	0	0	0
		No controls required	3,472	0	0	0	0	0	0	0
		No controls required	1,543	0	0	0	0	0	0	0
		Install LEV by torch	0	0	193	193	0	0	0	0
		Replace existing plasma cutting gas with argon-hydrogen gas								
		No controls required	366	0	0	0	0	0	0	0
No controls required	2,315	0	0	0	0	0	0	0		
Controls combined with SMAW	0	0	154	231	0	0	0	0		
Controls combined with other processes	0	1,233	1,233	8,544	7,333	3,678	0	0		
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	10	10	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Replace SMAW with pulsed arc GMAW welding unit								
		Use Portable LEV - Nederman Filterbox								
		Fume Extractor Gun (FEG)								
		Controls combined with SMAW	0	0	14	14	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	7	0	0	0	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	0	0	52	78	0	0	0	0
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Replace 100%CO2 with 95%Argon/5%CO3								
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	0	0	2	2	0	0	0	0
Install LEV by torch	2	0	0	0	0	0	0	0		
Use Portable LEV - Nederman Filterbox	0	0	2	2	0	0	0	0		
Use moveable LEV - Articulating Welding Exhaust Duct	0	0	1	1	0	0	0	0		
Replace power source to convert unit to a plasma arc-cutting unit										
No controls required	0	0	0	0	0	0	0	0		
No controls required	0	0	0	0	0	0	0	0		
No controls required	18	0	0	0	0	0	0	0		
No controls required	2	0	0	0	0	0	0	0		
Controls combined with other processes	0	23	23	160	137	69	0	0		
	SMAW	Local Exhaust Ventilation	0	0	10	10	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Replace SMAW with pulsed arc GMAW welding unit								
		Use Portable LEV - Nederman Filterbox								
		Fume Extractor Gun (FEG)								
		Controls combined with SMAW	0	0	14	14	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	7	0	0	0	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	0	0	52	78	0	0	0	0
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Replace 100%CO2 with 95%Argon/5%CO3								
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	0	0	2	2	0	0	0	0
Install LEV by torch	2	0	0	0	0	0	0	0		
Use Portable LEV - Nederman Filterbox	0	0	2	2	0	0	0	0		
Use moveable LEV - Articulating Welding Exhaust Duct	0	0	1	1	0	0	0	0		
Replace power source to convert unit to a plasma arc-cutting unit										
No controls required	0	0	0	0	0	0	0	0		
No controls required	0	0	0	0	0	0	0	0		
No controls required	18	0	0	0	0	0	0	0		
No controls required	2	0	0	0	0	0	0	0		
Controls combined with other processes	0	23	23	160	137	69	0	0		

Table iii.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )							
			0.25	0.5	1	5	10	20		
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Increase general exhaust ventilation								
		Replace SMAW with GMAW								
		Improved maintenance of existing ventilation system								
		Use stationary LEV - Articulating Welding Exhaust Duct								
		Use stationary LEV (Downdraft Table)								
		High-Velocity-Low-Volume System								
		Controls combined with SMAW								
		No controls required								
		No controls required								
		Install LEV by torch								
		Replace existing plasma cutting gas with argon-hydrogen gas								
		No controls required								
		No controls required								
Controls combined with SMAW										
Controls combined with other processes										
Confined Space										
			\$102,196,000	\$63,745,700	\$15,360,000	\$5,130,000	\$0	\$0	\$0	
			All SMAW and GMAW costs have been combined in this analysis							
			GMAW cost are included under SMAW							
			\$253,300	\$253,300	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$866,900	\$201,600	\$0	\$0	\$0	\$0	\$0	
			\$87,000	\$29,100	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			Controls combined with SMAW							
			Controls combined with other processes							
			\$805,308	\$706,838	\$405,116	\$109,082	\$0	\$0	\$0	
			All SMAW and GMAW costs have been combined in this analysis							
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
		Replace SMAW with pulsed arc GMAW welding unit								
		Use Portable LEV - Nederman Filterbox								
		Fume Extractor Gun (FEG)								
		Controls combined with SMAW								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Replace 100%CO2 with 95%Argon/5%CO3								
		Replace existing plasma cutting gas with argon-hydrogen cutting gas								
		Install LEV by torch								
		Use Portable LEV - Nederman Filterbox								
Use moveable LEV - Articulating Welding Exhaust Duct										
Replace power source to convert unit to a plasma arc-cutting unit										
No controls required										
No controls required										
No controls required										
No controls required										
Controls combined with other processes										
Confined Space										
			\$143,910	\$86,346	\$0	\$0	\$0	\$0	\$0	
			GMAW cost are included under SMAW							
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$143,910	\$86,346	\$0	\$0	\$0	\$0	\$0	
			All FCAW costs have been combined in this analysis							
			\$1,100	\$550	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$9,524	\$4,762	\$0	\$0	\$0	\$0	\$0	
			\$1,939	\$0	\$0	\$0	\$0	\$0	\$0	
			\$1,923	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
			Controls combined with other processes							

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	> 20.0	
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	21,360	21,360	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Niedermaier Filterbox								
		Welder training on proper position of LEV ducts								
		2 hour training course								
		Replace SMAW with GMAW								
		Fume Extractor Gun (FEG)								
		Local Exhaust Ventilation	0	0	0	0	0	0	0	0
		Directional General Ventilation of a Confined Space								
		GMAW controls are included under SMAW	0	0	4,375	4,375	0	0	0	0
3A Painting (general industry)	Spray Painter	Niedermaier Filterbox	0	0	0	0	0	0	0	
		No controls required	0	0	0	0	0	0	0	
		Controls combined with other processes	0	1,619	1,619	11,228	9,636	4,832	0	0
		Improved maintenance of existing ventilation system	274	657	247	288	874	321	490	760
3A2 Painting (coil coating)	Operator (coil coating)	Sander with integrated LEV and HEPA-filtered exhaust equipment								
		Replace existing HVLP/airless guns with electrostatic spray painting equipment								
		Use Hudson-type sprayer or brushes for application								
		Directional general ventilation of a confined space								
		Periodic inspection and maintenance of hanger flow-through ventilation								
		Increase spray booth air velocity to 100 ft/min								
		Use appropriately sized (larger) spray paint booth								
		Sander with integrated LEV and HEPA-filtered exhaust	955	492	608	492	116	116	0	116
		Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	772	129	0	176	94	0	0	0
		No controls required	390	0	0	0	0	0	0	0
3A1 Painting (auto body repair)	Spray Painter Sander	No controls required	0	217	2,173	0	217	435	869	435
		Sander with integrated LEV and HEPA-filtered exhaust (9)	0	8,191	12,410	0	0	2,730	1,489	0
3B Painting (maritime industry)	Spray Painter	Use spray gun with higher transfer efficiency (such as HVLP spray gun)	24	16	0	8	47	16	8	16
		Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)								
3C Painting (construction industry)	Abrasive Blaster Grinder/Sander	Improved maintenance of existing ventilation system								
		Sander with integrated LEV and HEPA-filtered exhaust	121	91	151	106	559	106	106	272
		No controls required	393	242	151	181	393	151	0	0
		No controls required								
3D Painting (government)	Spray painter Laborer	No controls required	4,891	4,402	1,141	1,966	1,630	1,141	326	815
		No controls required	1,793	3,587	0	7,337	3,587	0	0	0
		No controls required	0	100	600	0	0	100	0	0
3D Painting (government)	Spray painter Laborer	No controls required	1,222	1,100	285	489	407	285	81	204
		No controls required	448	896	0	1,833	896	0	0	0

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )							
			0.25	0.5	1	5	10	20		
2C1 Welding (construction industry (carbon steel))	SMAW	Local Exhaust Ventilation	\$132,540,205	\$78,669,044	\$19,849,127	\$6,628,674	\$0	\$0		
		Directional General Ventilation of a Confined Space								
		Nedermann Filterbox								
		Welder training on proper position of LEV ducts 2 hour training course								
		Replace SMAW with GMAW	\$0	\$0	\$0	\$0	\$0	\$0		
		Fume Extractor Gun (FEG)	\$0	\$0	\$0	\$0	\$0	\$0		
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		GMAW controls are included under SMAW								
		Nedermann Filterbox								
3A Painting (general industry)	Spray Painter	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		Controls combined with other processes								
		Improved maintenance of existing ventilation system	\$93,200	\$85,600	\$65,600	\$40,400	\$27,600	\$12,400		
		Sander with integrated LEV and HEPA-filtered exhaust	\$291,135	\$248,835	\$192,432	\$61,104	\$32,802	\$14,001		
		Replace existing HVLPAirless guns with electrostatic spray painting equipment	\$2,514,184	\$2,282,784	\$1,993,072	\$953,077	\$663,364	\$424,169		
		Use Hudson-type sprayer or brushes for application	\$40,530	\$40,530	\$40,530	\$20,610	\$16,350	\$4,260		
		Directional general ventilation of a confined space	\$900	\$900	\$900	\$900	\$900	\$0		
		Periodic inspection and maintenance of hangar flow-through ventilation	\$22,400	\$22,400	\$22,400	\$22,400	\$22,400	\$0		
		Increase spray booth air velocity to 100 ft/min	\$20,300	\$20,300	\$20,300	\$20,300	\$0	\$0		
		Use appropriately sized (larger) spray paint booth	\$37,600	\$37,600	\$37,600	\$0	\$0	\$0		
3A2 Painting (coil coating)	Operator (coil coating)	Sander with integrated LEV and HEPA-filtered exhaust	\$434,422	\$252,009	\$104,409	\$69,606	\$34,803	\$34,803		
		Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	\$290,000	\$290,000	\$92,800	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		Maintenance (coil coating)								
		3A1 Painting (auto body repair)	Spray Painter Sander	Use appropriately sized (larger) spray paint booth (6)	\$21,318,700	\$10,639,125	\$10,639,125	\$9,457,000	\$7,092,750	\$2,364,250
				Sander with integrated LEV and HEPA-filtered exhaust (9)	\$18,279,340	\$1,241,340	\$1,241,340	\$1,241,340	\$438,120	\$0
				Use spray gun with higher transfer efficiency (such as HVLPA spray gun)	\$5,211	\$5,211	\$3,387	\$1,563	\$938	\$625
				Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	\$295,042	\$259,374	\$234,441	\$109,429	\$84,496	\$59,563
				Improved maintenance of existing ventilation system	\$6,173	\$6,173	\$5,651	\$2,608	\$1,565	\$0
				Sander with integrated LEV and HEPA-filtered exhaust	\$156,643	\$130,093	\$95,579	\$26,550	\$0	\$0
No controls required	\$0			\$0	\$0	\$0	\$0	\$0		
No controls required	\$0			\$0	\$0	\$0	\$0	\$0		
Abrasive Blaster Grinder/Sander										
No controls required	\$0			\$0	\$0	\$0	\$0	\$0		
3B Painting (maritime industry)	Spray Painter	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
3C Painting (construction industry)	Spray painter Laborer Traffic Painters	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
3D Painting (government)	Spray painter Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers ( $\mu\text{g}/\text{m}^3$ )								
			Below LOD	0.25 to LOD	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0	
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	1	39	11	13	1	0	0	0	
		Upgrade LEV and use closed sample collection containers									
		Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	0	7	0	5	9	0	0	0	
	Packaging Workers	Ventilation leader to two railcars	0	32	2	6	2	0	0	0	
		Use portable LEV	0	11	11	0	0	0	0	0	
		Fume Hood									
		No controls required	0	0	0	0	4	0	1	1	
	5 Chromate Pigment Producers	Drying/Blending/Packaging Operator	Install a dust collection spill hopper for 50 pound bag tube packing machine	0	0	0	0	2	0	1	3
			Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit								
		Maintenance Worker Laborer	Install an air replacement system to provide building make up air	0	0	0	1	0	0	1	4
Retrofit open-cab forklift to closed-cab with HEPA filtered air			0	0	0	0	3	0	0	3	
Laboratory Technician Wastewater Treatment Operator		No controls required	0	0	0	0	5	2	0	2	
		Install ventilated sample collection boxes	0	0	0	0	0	2	2	2	
Manager/Supervisor Proprietary Process Operator		No controls required	0	0	0	0	2	1	1	3	
		Install dust tight covers on existing conveyors	0	0	0	0	0	0	0	3	
Dispersion Operator		No controls required	0	0	0	0	0	0	0	3	
		No controls required									
6 Chromated Copper Arsenate (CCA) Producers	Production Operator	No controls required	0	0	0	5	5	5	0	0	
		No controls required	0	6	0	0	0	0	0	0	
	CCA Truck Loader Warehouse Operator	No controls required	0	3	0	0	0	0	0	0	
		No controls required	0	3	0	0	0	0	0	0	

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )					
			0.25	0.5	1	5	10	20
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	\$210,120	\$210,120	\$0	\$0	\$0	\$0
		Upgrade LEV and use closed sample collection containers	\$10,520	\$10,520	\$0	\$0	\$0	\$0
		Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	\$105,080	\$105,080	\$0	\$0	\$0	\$0
Packaging Workers Maintenance workers Other Exposed Workers	Packaging Workers Maintenance workers Other Exposed Workers	Ventilation loader to two railcars	\$264,857	\$264,857	\$264,857	\$0	\$0	\$0
		Use portable LEV	\$314	\$314	\$0	\$0	\$0	\$0
		Fume Hood	\$3,000	\$0	\$0	\$0	\$0	\$0
5 Chromate Pigment Producers	Strike Tank Operator Drying/Blending/Packaging Operator  Maintenance Worker Laborer Laboratory Technician Wastewater Treatment Operator Manager/Supervisor Proprietary Process Operator Dispersion Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Install a dust collection spiii hopper for 50 pound bag lube packing machine	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
		Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit	\$3,333	\$3,333	\$3,333	\$0	\$0	\$0
		Install an air replacement system to provide building make up air	\$34,267	\$34,267	\$34,267	\$34,267	\$34,267	\$34,267
		Retrofit open-cab forklift to closed-cab with HEPA filtered air	\$800	\$800	\$800	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Install ventilated sample collection boxes	\$2,400	\$2,400	\$2,400	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Install dust tight covers on existing conveyors	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
6 Chromated Copper Arsenate (CCA) Producers	Production Operator Production Supervisor CCA Truck Loader Warehouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )										
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0			
7 Chromium Catalyst Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	0	0	0	1	19	2	2	2	10		
	Dry Process Operator	Improve existing side draft LEV at 55-gallon loading station Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	0	0	0	2	5	0	20	8			
	Screening Operator	Upgrade flat deck screening equipment to ACGIH standard	0	2	4	8	0	2	0	0			
	Quality Control Inspector	No controls required	0	15	0	0	0	0	0	0			
	Dry Mix Operator	No controls required	0	52	0	0	0	0	0	0			
	Process Control Operator	No controls required	0	12	0	0	0	0	0	0			
	Control Room Operator	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	0	0	3	0	0	0	0	0			
	Forming Operator	No controls required	0	0	0	0	9	0	0	0			
	Team Leader	No controls required	0	0	6	0	0	0	0	0			
	Lead Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	0	0	0	0	1	1	2	0			
	Floor Person	Increase air supply and general exhaust ventilation Replace manually-unloaded filter press with automatic pressure filter equipment	0	0	4	5	18	2	1	1			
	Warehouse Operator	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	0	16	8	0	0	0	0	0			
	Maintenance Person	No controls required	0	30	0	15	15	0	0	0			
Solid Waste Handler	No controls required	0	0	0	0	4	4	4	0				
8 Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	400	75	38	38	150	0	21	479			
	Packager	Partially enclosed drum opening/ dumping station	0	600	0	0	0	0	0	0			
	Shipping/receiving Technician	No controls required	0	384	0	0	0	0	0	0			
	Laboratory Chemist/Technician	No controls required	0	384	0	0	0	0	0	0			
9 Printing Ink Producers	Batch Weigher	No controls required	4	0	0	17	47	0	0	0			
	Mill Operator	No controls required	4	4	0	0	8	0	0	0			
	Utility Worker	No controls required	6	0	0	0	6	0	0	0			
	Maintenance Worker	No controls required	0	0	3	0	0	0	0	0			
	Production Supervisor	No controls required	13	0	0	0	0	0	0	0			
10 Plastic Colorant Producers and Users	Dry Color Handler	No controls required	0	0	0	0	232	35	58	23			
	Wet Mill Operator	No controls required	0	15	15	0	0	0	0	0			
	Dry Color Blender/packager	No controls required	0	0	0	0	18	1	6	15			
	Production Supervisor	No controls required	37	0	0	0	0	0	0	37			

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
7 Chromium Catalyst Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Dry Process Operator	Improve existing side draft LEV at 55-gallon loading station	\$7,600	\$7,600	\$7,600	\$7,600	\$7,600	\$7,600	\$2,171
		Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	\$1,520,735	\$1,520,735	\$1,520,735	\$1,520,735	\$1,520,735	\$1,520,735	\$563,235
	Screening Operator	Upgrade flat deck screening equipment to ACGIH standard	\$14,000	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Quality Control Inspector	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Dry Mix Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
	Process Control Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Control Room Operator	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	\$15,000	\$0	\$0	\$0	\$0	\$0
	Forming Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Team Leader	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
	Lead Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	\$152,868	\$152,868	\$152,868	\$152,868	\$152,868	\$152,868	\$56,618
		Increase air supply and general exhaust ventilation	\$12,375	\$12,375	\$12,375	\$12,375	\$12,375	\$12,375	\$0
Floor Person	Replace manually-unloaded filter press with automatic pressure filter equipment	\$53,647	\$53,647	\$53,647	\$53,647	\$53,647	\$53,647	\$0	
	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	\$80,129	\$80,129	\$80,129	\$80,129	\$80,129	\$80,129	\$0	
Warehouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Maintenance Person	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Solid Waste Handler	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
8 Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	\$1,647,043	\$1,220,583	\$925,341	\$277,880	\$277,880	\$259,752	
	Packager	Partially enclosed drum opening/ dumping station	\$5,552,501	\$4,199,309	\$3,244,556	\$751,833	\$751,833	\$701,979	
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Shipping/receiving Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Laboratory Chemist/Technician	No controls required	\$0	\$0	\$0	\$0	\$0	
9 Printing Ink Producers	Batch Weigher	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Mill Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Utility Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Production Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
10 Plastic Colorant Producers and Users	Dry Color Handler	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Wet Mill Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Dry Color Blender/packager	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
	Production Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	



Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers ( $\mu\text{g}/\text{m}^3$ )									
			Below LOD	LOD	0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	20.0 to 50.0	> 20.0
11 Plating Mixture Producers	Blender/Mixer Operator-Dry	Partially enclosed drum opening/ dumping station	0	0	0	0	0	22	0	0	0	0
		Totally enclosed automated bag slitter and dumping station										
		Totally enclosed ventilated drum-dumping station										
		Barrel and bag filling stations with effective ventilation systems										
Blender/Mixer Operator-Liquid	Laboratory Chemist	Partially enclosed manual drum filling station	0	0	80	0	0	0	0	0	0	0
		Totally enclosed automated drum dumping station	0	16	0	0	0	0	0	0	0	0
		No controls required										
12	Wood Preserving	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
13 Chromium Material Producers	Leach Operator Ager Operator Lower-cell-room Operator Cell Assembler Cell Operator Plate Hooker  Plater Stripper Mill Operator Blender Operator Briquetting Operator Furnace Loader Furnace Operator VG Picker Brick Layer Shipper Bagger	Strahman valves and ventilated sample box	0	0	0	8	0	0	0	0	0	0
		Covers and tank head space ventilation on ager tanks	0	0	0	0	0	4	0	0	0	0
		Cell covers to completely cover the cell and improved LEV	0	0	0	0	4	0	0	0	0	0
		Enclosed, ventilated cell-component cleaning room or enclosure	0	0	0	0	0	4	0	0	0	0
		Cell covers to completely cover the cell and improved LEV	0	0	0	0	4	0	0	0	0	0
		Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	0	0	0	0	0	0	0	5	0	0
		Install Booth around chromic acid tank with remote hoist controls										
		No controls required	0	0	0	0	9	0	0	0	0	0
		No controls required	2	2	0	0	0	0	0	0	0	0
		No controls required	0	1	0	0	0	0	0	0	0	0
		No controls required	0	1	0	0	0	0	0	0	0	0
		No controls required	3	0	0	0	0	0	0	0	0	0
		No controls required	3	0	0	0	0	0	0	0	0	0
No controls required	3	0	0	0	0	0	0	0	0	0		
No controls required	3	0	0	0	0	0	0	0	0	0		
No controls required	3	0	0	0	0	0	0	0	0	0		
No controls required	2	1	1	1	0	0	0	0	0	0		

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
11	Plating Mixture Producers	Blender/Mixer Operator-Dry	Partially enclosed drum opening/ dumping station	\$211,200	\$211,200	\$211,200	\$0	\$0	\$0
			Totally enclosed automated bag slitter and dumping station	\$154,000	\$0	\$0	\$0	\$0	\$0
			Totally enclosed ventilated drum-dumping station	\$144,000	\$0	\$0	\$0	\$0	\$0
			Barrel and bag filling stations with effective ventilation systems	\$3,000	\$0	\$0	\$0	\$0	\$0
			Barrel stations with effective ventilation systems	\$9,000	\$0	\$0	\$0	\$0	\$0
			Partially enclosed manual drum filling station	\$104,000	\$0	\$0	\$0	\$0	\$0
			Totally enclosed automated drum dumping station	\$139,000	\$0	\$0	\$0	\$0	\$0
Laboratory Chemist	No controls required		\$0	\$0	\$0	\$0	\$0	\$0	
12	Wood Preserving	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Not Applicable							
13	Chromium Material Producers	Leach Operator	\$200	\$0	\$0	\$0	\$0	\$0	\$0
		Agar Operator	\$15,100	\$15,100	\$15,100	\$0	\$0	\$0	
		Lower-cell-room Operator	\$0	\$0	\$0	\$0	\$0	\$0	
		Cell Assembler	\$700	\$700	\$700	\$0	\$0	\$0	
		Cell Operator	Engineering costs accounted for in other job categories.						
		Plate Hooker	\$6,400	\$6,400	\$6,400	\$6,400	\$0	\$0	
		Plater Stripper	\$1,700	\$1,700	\$1,700	\$0	\$0	\$0	
		Mill Operator	\$0	\$0	\$0	\$0	\$0	\$0	
		Blender Operator	\$0	\$0	\$0	\$0	\$0	\$0	
		Briquetting Operator	\$0	\$0	\$0	\$0	\$0	\$0	
		Furnace Loader	\$0	\$0	\$0	\$0	\$0	\$0	
		Furnace Operator	\$0	\$0	\$0	\$0	\$0	\$0	
		VG Picker	\$0	\$0	\$0	\$0	\$0	\$0	
Brick Layer	\$0	\$0	\$0	\$0	\$0	\$0			
Shipper	\$0	\$0	\$0	\$0	\$0	\$0			
Bagger	No controls required		\$0	\$0	\$0	\$0	\$0		

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers ( $\mu\text{g}/\text{m}^3$ )									
			Below LOD	LOD 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	>20.0		
14 Steel Mills (stainless)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	0	0	206	206	0	0	0	0	0	0
		No controls required	0	832	214	214	0	0	0	0	0	0
		Direct-Shell Evacuation Control Collection (DEC) Collection System	391	0	203	297	672	0	0	0	0	0
	Crane Operator Continuous Casting Operator Rolling-Mill Operator	Change to Bottom-Pour Method from Lip and Pour Method										
		Ladle LEV with traveling cantilevered exhaust hood	0	254	0	121	639	0	0	0	0	0
		Periodic inspection and maintenance of furnace LEV	0	233	233	0	0	0	0	0	0	0
		Substitute lip pour ladle with bottom-pour ladle with LEV	868	108	542	145	145	0	0	0	0	0
	Welders	Retrofit Crane Cab with HEPA-filtered air										
		Annual Maintenance	0	49	0	158	317	49	463	183		
	Steel Conditioning Operator	Install HEPA Filtration in the Operator Control Room										
		Replace SMAW with GMAW Fume Extractor Gun (FEG)	0	0	1023	0	511	0	0	0	0	0
	Perform Maintenance on Grinding Station Booth Ventilation and LEV	0	0	0	0	0	0	0	0	0	0	
	Upgrade existing ventilation hood exhaust air flow rates											
14A Steel Mills (carbon)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	0	651	651	0	0	0	0	0	0	
		No controls required	2,635	678	678	0	0	0	0	0	0	
		Direct-Shell Evacuation Control Collection (DEC) Collection System	1,236	643	940	2,126	0	0	0	0	0	
	Crane Operator Continuous Casting Operator Rolling-Mill Operator	Change to Bottom-Pour Method from Lip and Pour Method										
		Ladle LEV with traveling cantilevered exhaust hood										
		Periodic inspection and maintenance of furnace LEV	803	0	385	2,022	0	0	0	0	0	
		Substitute lip pour ladle with bottom-pour ladle with LEV	738	738	0	0	0	0	0	0	0	
	Welders	Retrofit Crane Cab with HEPA-filtered air	3,092	1,718	458	458	0	0	0	0	0	
		Annual Maintenance										
	Steel Conditioning Operator	Install HEPA Filtration in the Operator Control Room	0	154	502	1,004	154	1,467	579			
		Replace SMAW with GMAW Fume Extractor Gun (FEG)	0	3,255	0	1,603	0	0	0	0	0	
	Perform Maintenance on Grinding Station Booth Ventilation and LEV	0	0	0	0	0	0	0	0	0		
	Upgrade existing ventilation hood exhaust air flow rates											
14B Reshaping	Raw Material Handler Laborer Crane Operator	No controls required	0	0	35	35	0	0	0	0	0	
		Periodic inspection and maintenance of furnace LEV	128	16	80	21	21	0	0	0	0	
		Retrofit Crane Cab with HEPA-filtered air	0	43	0	21	108	0	0	0	0	
	Rolling-Mill/Forging Operator	Install HEPA Filtration in the Operator Control Room	147	18	92	25	25	0	0	0	0	
		Annual Maintenance										
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	0	0	175	0	86	0	0	0	0	
	Upgrade existing ventilation hood exhaust air flow rates											

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
14 Steel Mills (stainless)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Direct-Shell Evacuation Control Collection (DEC) Collection System	\$6,503,920	\$6,503,920	\$6,503,920	\$6,503,920	\$6,503,920	\$6,503,920	
	Crane Operator Continuous Casting Operator Rolling-Mill Operator	Change to Bottom-Pour Method from Lip and Pour Method	\$127,879	\$127,879	\$0	\$0	\$0	\$0	\$0
		Ladle LEV with traveling cantilevered exhaust hood	\$495,941	\$495,941	\$0	\$0	\$0	\$0	\$0
		Periodic inspection and maintenance of furnace LEV	\$5,121	\$5,121	\$0	\$0	\$0	\$0	\$0
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$351,611	\$0	\$0	\$0	\$0	\$0	\$0
		Retrofit Crane Cab with HEPA-filtered air	\$406,447	\$406,447	\$341,736	\$0	\$0	\$0	\$0
		Annual Maintenance	\$74,690	\$0	\$0	\$0	\$0	\$0	\$0
	Welders	Annual Maintenance	\$50,898	\$0	\$0	\$0	\$0	\$0	\$0
		Install HEPA Filtration in the Operator Control Room	\$54,286	\$54,286	\$10,796	\$0	\$0	\$0	\$0
		Replace SMAW with GMAW	\$62,793	\$62,793	\$62,793	\$42,627	\$39,321	\$11,642	
	Steel Conditioning Operator	Fume Extractor Gun (FEG)	\$256,588	\$256,588	\$256,588	\$0	\$0	\$0	\$0
Perform Maintenance on Grinding Station Booth Ventilation and LEV		\$44,841	\$44,841	\$44,841	\$0	\$0	\$0	\$0	
		Upgrade existing ventilation hood exhaust air flow rates	\$201,288	\$0	\$0	\$0	\$0	\$0	
14A Steel Mills (carbon)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	\$0	\$0	\$0	\$0	\$0	\$0	
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Direct-Shell Evacuation Control Collection (DEC) Collection System	\$19,418,249	\$19,418,249	\$19,418,249	\$19,418,249	\$19,418,249	\$19,418,249	
	Crane Operator Continuous Casting Operator Rolling-Mill Operator	Change to Bottom-Pour Method from Lip and Pour Method	\$863,868	\$863,868	\$0	\$0	\$0	\$0	\$0
		Ladle LEV with traveling cantilevered exhaust hood	\$3,350,251	\$3,350,251	\$0	\$0	\$0	\$0	\$0
		Periodic inspection and maintenance of furnace LEV	\$34,594	\$34,594	\$0	\$0	\$0	\$0	\$0
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$1,540,937	\$0	\$0	\$0	\$0	\$0	\$0
		Retrofit Crane Cab with HEPA-filtered air	\$1,218,448	\$1,023,557	\$0	\$0	\$0	\$0	\$0
		Annual Maintenance	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Welders	Annual Maintenance	\$40,710	\$0	\$0	\$0	\$0	\$0	\$0
		Install HEPA Filtration in the Operator Control Room	\$32,147	\$32,147	\$0	\$0	\$0	\$0	\$0
		Replace SMAW with GMAW	\$132,442	\$132,442	\$132,442	\$123,171	\$34,856	\$0	
	Steel Conditioning Operator	Fume Extractor Gun (FEG)	\$527,840	\$527,840	\$527,840	\$0	\$0	\$0	\$0
Perform Maintenance on Grinding Station Booth Ventilation and LEV		\$104,537	\$104,537	\$0	\$0	\$0	\$0	\$0	
		Upgrade existing ventilation hood exhaust air flow rates	\$0	\$0	\$0	\$0	\$0	\$0	
14B Reshaping	Raw Material Handler Laborer Crane Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Periodic inspection and maintenance of furnace LEV	\$29,877	\$6,140	\$3,070	\$0	\$0	\$0	
		Retrofit Crane Cab with HEPA-filtered air	\$445,655	\$445,655	\$373,107	\$0	\$0	\$0	
	Steel Conditioning Operator	Install HEPA Filtration in the Operator Control Room	\$64,204	\$64,204	\$15,816	\$0	\$0	\$0	
		Annual Maintenance	\$53,649	\$0	\$0	\$0	\$0	\$0	
		Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$63,997	\$63,997	\$63,997	\$0	\$0	\$0	
		Upgrade existing ventilation hood exhaust air flow rates	\$133,459	\$0	\$0	\$0	\$0		

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )														
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	>20.0							
15 Iron and Steel Foundries	Molders	No controls required	2,669	4,016	1,335	2,669	1,335	0	0	0	0	0	0	0	0	0	
	Furnace Operator	Install LEV in the form of hoods over the furnace	0	1,083	359	143	143	0	0	0	0	0	0	0	0	0	
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	0	0	383	256	891	0	0	0	0	0	0	0	0	0	
	Pourers	No controls required	0	1,584	0	0	0	0	0	0	0	0	0	0	0	0	
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	0	0	0	0	396	0	0	0	0	0	0	0	0	0	
	Torch Cutter/Gouger	Install enclosed booths for manual blasting	0	0	99	198	0	198	0	198	99	198	0	0	0	0	
	Welder	Install a moveable hood and an HVLV fume exhaust system	0	0	223	445	0	445	0	445	223	445	0	0	0	0	
	Grinder Operator	Install a moveable hood and an HVLV fume exhaust system	648	3,888	648	0	1,296	0	0	0	0	0	0	0	0	0	
		Grinding wheel hood	Downdraft Ventilation Booth with Air Shower														
		Laborer	HVLV Grinders No controls required	867	1,304	434	867	434	0	0	0	0	0	0	0	0	0
16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
17 Chromium Dye Producers	Color Maker	No controls required	0	0	0	0	11	0	11	0	1	4	0	0	0	0	
	Drying/Blending/Packaging Operator	No controls required	0	0	0	0	9	0	9	0	3	18	0	0	0	0	
	Maintenance Worker	No controls required	0	0	0	0	2	0	2	0	2	6	0	0	0	0	
	Laborer	No controls required	0	0	0	0	10	0	10	0	0	10	0	0	0	0	
	Laboratory Technician	No controls required	0	0	0	0	5	2	5	2	0	2	0	0	0	0	
	Wastewater Treatment Operator	No controls required	0	0	0	0	0	3	0	3	0	3	0	0	0	0	
	Manager/Supervisor	No controls required	0	0	0	0	3	1	3	1	1	5	0	0	0	0	
18 Chromium Sulfate Producers	Reactor Operators	No controls required	0	3	0	0	3	0	3	0	0	0	0	0	0	0	
	Railcar Operators	No controls required	0	5	0	0	0	0	0	0	0	0	0	0	0	0	
19 Chemical Distributors	Shipping	No controls required	3,572	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blender	No controls required	3,963	0	3,963	0	0	0	0	0	0	0	0	0	0	0	
	Dyer	No controls required	13,384	2,741	0	0	0	0	0	0	0	0	0	0	0	0	
20 Textile Dyeing	Maintenance Worker	No controls required	645	645	0	0	0	0	0	0	0	0	0	0	0	0	
	Lab Assistant	Install a moveable canopy hood connected to a dust collector	3	2	0	0	2	0	2	0	0	0	0	0	0	0	
	Batch Mixer	No controls required	43	0	0	0	0	0	0	0	0	0	0	0	0	0	
21 Colored Glass Producers	Furnace Worker	No controls required	245	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Batch Operator	HEPA Filtration in Control Room	70	250	37	0	37	37	37	37	37	0	0	0	0	0	
21A Fiber, Flat, and Container Glass	Furnace Operator	HEPA Filtration in Control Room	373	989	81	0	113	32	32	32	0	0	0	0	0	0	
	EP/Baghouse Operator	No controls required	36	36	0	0	0	0	0	0	0	0	0	0	0	0	
	Forehearth Operator	HEPA Filtration in Control Room	110	428	0	0	110	0	0	0	0	0	0	0	0	0	
	Hot End/Maintenance	No controls required	0	1665	0	0	456	0	456	0	0	160	0	0	0	0	
22 Printing	Printer	No controls required	5,700	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Mixer	No controls required	200	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Shipper	No controls required	700	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
15 Iron and Steel Foundries	Molders	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Furnace Operator	Install LEV in the form of hoods over the furnace	\$2,632,344	\$1,276,663	\$539,031	\$0	\$0	\$0	\$0
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	\$1,026,000	\$769,165	\$597,494	\$0	\$0	\$0	\$0
	Pourers	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	\$188,100	\$188,100	\$188,100	\$0	\$0	\$0	\$0
	Torch Cutter/Gouger	Install enclosed booths for manual blasting	\$39,600	\$39,600	\$39,600	\$0	\$0	\$0	\$0
	Welder	Install a moveable hood and an HVLV fume exhaust system	\$987,367	\$987,367	\$705,533	\$423,700	\$282,467	\$0	\$0
	Grinder Operator	Install a moveable hood and an HVLV fume exhaust system	\$329,175	\$329,175	\$235,125	\$141,075	\$94,050	\$0	\$0
		Grinding wheel hood	\$5,400	\$3,600	\$3,600	\$0	\$0	\$0	\$0
		Downdraft Ventilation Booth with Air Shower	\$199,800	\$154,800	\$154,800	\$0	\$0	\$0	\$0
	HVLV Grinders	\$10,800	\$7,200	\$7,200	\$0	\$0	\$0	\$0	
	Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17 Chromium Dye Producers	Color Maker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Drying/Blending/Packaging Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Laboratory Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Wastewater Treatment Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Manager/Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
18 Chromium Sulfate Producers	Reactor Operators	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Railcar Operators	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
19 Chemical Distributors	Shipping	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Blender	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Dyer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
20 Textile Dyeing	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Lab Assistant	Install a moveable canopy hood connected to a dust collector	\$1,939	\$1,939	\$1,939	\$0	\$0	\$0	\$0
	Batch Mixer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21 Colored Glass Producers	Furnace Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Batch Operator	HEPA Filtration in Control Room	\$21,888	\$16,416	\$16,416	\$10,944	\$5,472	\$0	\$0
21A Fiber, Flat, and Container Glass	Furnace Operator	HEPA Filtration in Control Room	\$54,720	\$37,620	\$37,620	\$13,680	\$6,840	\$0	\$0
	EP/Baghouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Forehearth Operator	HEPA Filtration in Control Room	\$23,256	\$23,256	\$23,256	\$0	\$0	\$0	\$0
	Hot End/Maintenance	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22 Printing	Printer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Mixer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shipper	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )											
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0	N/A			
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
23	Leather Tanning	Not Applicable	0	119	231	119	119	119	0	0	0	0	0	
24	Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	38	28	11	15	10	10	0	0	0	0	0	
		Process Operators, all Catalyst Plants except Phillips Polyethylene Plants	0	22	43	22	22	22	0	0	0	0	0	
25	Refractory Brick Producers	Field Technician	0	119	231	119	119	119	0	0	0	0	0	
		Cleaner	0	6	0	0	0	0	0	0	0	0	0	
		Crusher Operator	0	12	0	0	0	0	0	0	0	0	0	
		Pressman	0	12	0	0	0	0	0	0	0	0	0	
		Batchman	3	9	3	3	0	0	0	0	0	0	0	
		Mold Filler	0	6	0	0	0	0	0	0	0	0	0	
		Brick Loader	0	9	0	9	0	0	0	0	0	0	0	
		Grinder Operator	6	0	0	0	0	0	0	0	0	0	0	
		Saw Operator	6	0	0	0	0	0	0	0	0	0	0	
		Engineering Intern	6	0	0	0	0	0	0	0	0	0	0	
26	Woodworking	Construction	4,651	0	4,651	0	3,100	0	1,550	0	0	0	0	
		Maritime	239	80	0	0	0	0	0	0	0	0	0	
		General Industry	334	0	0	0	0	0	0	54	0	0	0	
		Government	40	0	40	0	27	0	14	0	0	0	0	
27	Solid Waste Incineration	Install central HEPA-filtered vacuum	0	0	0	0	0	0	0	0	0	0	0	
		Improve LEV at workstation	0	0	0	0	0	0	0	0	0	0	0	
		No controls required	239	80	0	0	0	0	0	54	0	0	0	
		Install central HEPA-filtered vacuum	334	0	0	0	0	0	0	0	0	0	0	
		Improve LEV at workstation	40	0	40	0	27	0	14	0	0	0	0	
		Install central HEPA-filtered vacuum	0	0	0	0	0	0	0	0	0	0	0	
		Improve LEV at workstation	0	0	0	0	0	0	0	0	0	0	0	
		Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	296	0	149	296	0	0	0	0	0	0	0	0
		No controls required	451	0	0	0	0	0	0	0	0	0	0	0
		Operator	225	0	113	113	0	0	0	0	0	0	0	0
27	Solid Waste Incineration	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	217	0	0	73	0	0	0	0	0	0	0	
		Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	112	0	112	0	0	0	0	0	0	0	0	
27	Solid Waste Incineration	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	64	0	64	0	0	0	0	0	0	0	0	
		Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	64	0	64	0	0	0	0	0	0	0	0	

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
23	Leather Tanning	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24	Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants Process Operators, all Catalyst Plants except Phillips Polyethylene Plants Field Technician	\$115,324	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	Cleaner Crusher Operator Pressman Batchman Mold Filler Brick Loader Grinder Operator Saw Operator Engineering Intern	\$0 \$0 \$0 \$19,082 \$0 \$3,249 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$9,541 \$0 \$3,249 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0
26	Woodworking	Construction Maritime General Industry Government	\$4,469,240 \$1,241,482 \$0 \$15,977 \$72,298 \$19,934	\$2,234,380 \$496,529 \$0 \$15,977 \$36,595 \$8,033	\$2,234,380 \$496,529 \$0 \$15,977 \$36,595 \$8,033	\$744,793 \$0 \$0 \$0 \$12,496 \$0	\$744,793 \$0 \$0 \$0 \$12,496 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0
27	Solid Waste Incineration	Laborer Shredder/Heavy Equipment Operator Maintenance Mechanic/ Maintenance Helper Boiler Operator/Assistant Operator Maintenance Electrician Truck Operator (ash hauling)	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0 \$0



Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )														
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0							
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	14	0	6	14	0	0	0	0	0	0	0	0	0	0	0
	Shredder/Heavy Equipment Operator	No controls required	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maintenance Mechanic/Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	11	0	5	5	0	0	0	0	0	0	0	0	0	0	0
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	10	0	0	4	0	0	0	0	0	0	0	0	0	0	0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28 Oil and Gas Well Drilling	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
30 Superalloy Producers	Melt Specialist	No controls required	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reclaim Weigh Operator	No controls required	0	0	72	0	0	0	0	0	0	0	0	0	0	0	0
	EAF Operator	No controls required	0	48	0	0	0	0	0	0	0	0	0	0	0	0	0
	VIM/AIM Furnace Operator	No controls required	84	56	28	0	0	0	0	0	0	0	0	0	0	0	0
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	0	36	0	17	90	0	0	0	0	0	0	0	0	0	0
	Refining Unit Operator	No controls required	236	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Floor Person	No controls required	400	400	0	0	0	0	0	0	0	0	0	0	0	0	0
	Welder	Portable LEV	30	0	0	0	0	0	0	0	0	0	0	0	10	0	0
	Inert Screener	Replace SMAW with GMAW	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Laboratory Technician	No controls required	86	58	0	0	0	0	0	0	0	0	0	0	0	0	0
	Machine Operator	No controls required	262	26	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maintenance Worker	No controls required	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	156	104	0	156	520	52	52	52	0	0	0	0	0	0
Hazardous Waste Site Worker		No controls required	910	230	73	0	0	0	0	0	0	0	0	0	0	0	0
Industrial Rehabilitation		No controls required	1,684	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 Construction (government)	Hazardous Waste Site Worker	No controls required	509	129	41	0	0	0	0	0	0	0	0	0	0	0	0
	Industrial Rehabilitation	No controls required	101	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total			121,522	85,249	115,769	104,638	62,957	27,759	25,154	15,382							

Table III.4 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls							
			0.25	0.5	1	5	10	20		
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Shredder/Heavy Equipment Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Oil and Gas Well Drilling	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Portland Cement Producers	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	30 Superalloy Producers	Melt Specialist	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Reclaim Weigh Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
EAF Operator		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
VIM/AIM Furnace Operator		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Crane Operator		Retrofit Crane Cab with HEPA-filtered air	\$51,300	\$51,300	\$43,092	\$0	\$0	\$0	\$0	
Refining Unit Operator		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Floor Person		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Welder		Portable LEV	\$10,800	\$10,800	\$10,800	\$10,800	\$10,800	\$10,800	\$0	
Inert Screener		Replace SMAW with GMAW	\$2,700	\$2,700	\$2,700	\$0	\$0	\$0	\$0	
Laboratory Technician		No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
31 Construction	Machine Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	\$495,000	\$495,000	\$396,000	\$66,000	\$33,000	\$0	\$0	
	Hazardous Waste Site Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
31 Construction (government)	Industrial Rehabilitation	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Hazardous Waste Site Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
32A Ready-Mix Concrete	Industrial Rehabilitation	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
	Industrial Rehabilitation	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total			\$1,011,793,069	\$466,012,632	\$274,563,256	\$114,228,662	\$55,266,244	\$27,254,895		

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
1	Electroplating				
	Hard Chrome	Use of chemical fume suppressants (per tank per year)	\$2,199	\$132	\$400
		Use of floating balls	\$208	\$12	\$42
		Improve tank covers	\$2,000	\$120	\$400
		Upgrade existing LEV to ACGIH standards	\$22,800	\$34,829	\$38,100
		Upgrade existing LEV to ACGIH standards	\$7,696	\$2,953	\$4,000
		Cost of MACT Testing	\$0	\$0	\$7,500
		Cost of MACT Testing	\$0	\$0	\$5,000
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Tank covers, floating balls, fume suppressants, etc.			See costs for Hard Chrome
		Dust controls while chromic acid flakes are added to tanks	\$1,000	\$60	\$200
		Installation of New LEV	\$38,000	\$8,048	\$63,000
		Installation of New LEV	\$12,826	\$4,921	\$6,600
2A	Welding (general industry)				
	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000
		Increase general exhaust ventilation	\$41,800	\$9,675	\$15,600
		Replace SMAW with GMAW	\$1,353	\$82	\$300
		Improved maintenance of existing ventilation system	\$0	\$378	\$400
		Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900
		Use stationary LEV (Downdraft Table)	\$11,400	\$2,530	\$4,200
		High-Velocity-Low-Volume System	\$4,963	\$800	\$1,600
	GMAW	Controls combined with SMAW	N/A	N/A	N/A
	TIG	Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605	\$896	\$1,900
		Improved Maintenance of existing LEV	\$660	\$385	\$500
	SAW	No controls required	N/A	N/A	N/A
	Plasma Cutting	Install LEV by torch	\$7,220	\$1,035	\$2,100
		Replace existing plasma cutting gas with argon-hydrogen gas	\$1,353	\$82	\$300
	Plasma Welding	Install LEV by torch	\$7,220	\$1,035	\$2,100
	Resistance Welding	No controls required	N/A	N/A	N/A

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions					Design Basis
			ACFM	Length of ductwork, feet	Room size	Other		
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	N/A	N/A	N/A	N/A	N/A	N/A
		Use of floating balls	N/A	N/A	N/A	N/A	N/A	N/A
		Improve tank covers	N/A	N/A	N/A	N/A	N/A	N/A
		Upgrade existing LEV to ACGIH standards	17,010	N/A	N/A	N/A	N/A	Large
		Upgrade existing LEV to ACGIH standards	3,360	N/A	N/A	N/A	N/A	small
		Cost of MACT Testing	N/A	N/A	N/A	N/A	N/A	large
		Cost of MACT Testing	N/A	N/A	N/A	N/A	N/A	small
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Dust controls while chromic acid flakes are added to tanks						
		Installation of New LEV						
Installation of New LEV								
			N/A	N/A	N/A	N/A	N/A	
			28,350	N/A	N/A	N/A	Large	
			5,600	N/A	N/A	N/A	small	
2A Welding (General Industry)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A	Froats and Mason Granger Tubaxial Fan
		Increase general exhaust ventilation	12,000cfmw	200	N/A	N/A	N/A	Donaldson Torit Truckline
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW
		Improve maintenance of existing ventilation system	N/A	N/A	N/A	N/A	N/A	N/A
		Use stationary LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	N/A	Stationary Nederman 5000
		Use stationary LEV (Downdraft Table)	N/A	N/A	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		High-Velocity-Low-Volume System	650	10	N/A	N/A	N/A	Lincob Electric Suction Heads High Vacuum SHM, SHFA, UNM, SMHT
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A	N/A
		Use stationary LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	N/A	Stationary Nederman 5000
		Improved Maintenance of existing LEV	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		Install LEV by torch	650	10	N/A	N/A	N/A	Van der Wall (1986), Nedermann Filtercart
		Replace existing plasma cutting gas with argon-hydrogen gas	N/A	N/A	N/A	N/A	N/A	Zone
		Install LEV by torch	650	10	N/A	N/A	N/A	Van der Wall (1986), Nedermann Filtercart
No controls required	N/A	N/A	N/A	N/A	N/A	N/A		

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000
		Use stationary LEV (Downdraft Table)	\$11,400	\$684	\$2,300
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900
		Replace SMAW with pulsed arc GMAW welding unit	\$9,500	\$570	\$1,900
	GMAW TIG FCAW	Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,400
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100
		Controls combined with SMAW	N/A	N/A	N/A
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900
	Plasma Cutting	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000
		Replace 100%CO2 with 95%Argon/5%CO3	\$1,353	\$82	\$300
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$300
		Install LEV by torch	\$7,220	\$433	\$1,500
Plasma Welding Oxy-fuel Cutting Air Carbon Arc Cutting/Gouging Electron Torch Cutting Thermal Spray Tungsten Carbide SAW Grinding	Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,400	
	Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900	
	Replace power source to convert unit to a plasma arc-cutting unit	\$9,500	\$570	\$1,900	
	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	
2C Welding (construction industry)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000
		Nedermann Filterbox	\$7,220	\$659	\$1,700
		Welder training on proper position of LEV ducts	\$0	\$0	\$0
		2 hour training course	\$0	\$0	\$0
	Plasma Cutting	Replace SMAW with GMAW	\$1,353	\$82	\$300
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100
		Install LEV by torch	\$7,220	\$1,035	\$2,100
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$300
		GMAW controls are included under SMAW	N/A	N/A	N/A
	GMAW Brazing Metallizing	Nedermann Filterbox	\$7,220	\$659	\$1,700
		No controls required	N/A	N/A	N/A
		Local Exhaust Ventilation	\$2,276	\$988	\$1,300
		Directional General Ventilation of a Confined Space	\$2,507	\$2,365	\$2,700
		Nedermann Filterbox	\$3,990	\$1,160	\$1,700
2D Welding (government industry)	Welder training on proper position of LEV ducts	\$0	\$0	\$0	
	2 hour training course	\$0	\$0	\$0	
	Replace SMAW with GMAW	\$1,353	\$82	\$300	
	Install LEV by torch	\$7,220	\$1,035	\$2,100	
	Fume extractor gun	\$5,411	\$325	\$1,100	
Brazing Metallizing	Replace short-circuit and other welding equipment with a pulsed arc	\$6,237	\$494	\$1,700	
	Nedermann Filterbox	\$3,990	\$240	\$800	
	Welder training on proper position of LEV ducts	\$0	\$0	\$0	
	2 hour training course	\$0	\$0	\$0	
	Local Exhaust Ventilation	\$2,276	\$0	\$300	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Assumptions	
							Design Basis	
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason/Granger Tubeaxial Fan	
		Use stationary LEV (Downdraft Table)	650	10	N/A	N/A	Downdraft Table/ACGIH VS-96-01	
		Use moveable LEV - Articulating Welding Exhaust Duct	1200	13	N/A	N/A	Stationary Nederman 5000	
		Replace SMAW with pulsed arc GMAW welding unit	N/A	N/A	N/A	N/A	GMAW inverter power source and matching wire feed	
		Use Portable LEV - Nederman Filterbox	N/A	N/A	N/A	N/A	Kura (1998) Nederman Filterbox	
		Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG High-Vacuum Exhaust Hose	
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A	
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000	
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000	
		Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason/Granger Tubeaxial Fan	
		Replace 100%CO2 with 95%Argon/5%CO3	N/A	N/A	N/A	N/A	(Hewitt and Hirst, 1993), Air Liquide	
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	Van der Wall (1986)	
		2C Welding (construction industry)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A
Directional General Ventilation of a Confined Space	14792			None	N/A	N/A	Frosts and Mason/Granger Tubeaxial Fan	
Nedermann Filterbox	1200			13	N/A	N/A	Kura (1998) Nederman Filterbox	
Welder training on proper position of LEV ducts	N/A			N/A	N/A	N/A	Additional training cost incurred under Communication	
2 hour training course	N/A			N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
Replace SMAW with GMAW	N/A			N/A	N/A	N/A	N/A	
Fume Extractor Gun (FEG)	650			10	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
Install LEV by torch	N/A			N/A	N/A	N/A	N/A	
Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A			N/A	N/A	N/A	Van der Wall (1986)	
GMAW controls are included under SMAW	N/A			N/A	N/A	N/A	N/A	
Nedermann Filterbox	1200			13	N/A	N/A	Kura (1998) Nederman Filterbox	
No controls required	N/A			N/A	N/A	N/A	N/A	
Local Exhaust Ventilation	1080			50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
Directional General Ventilation of a Confined Space	14792			None	N/A	N/A	Frosts and Mason/Granger Tubeaxial Fan	
Nedermann Filterbox	1200			13	N/A	N/A	Kura (1998) Nederman Filterbox	
Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication			
2 hour training course	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW			
Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A			
Fume Extractor Gun (FEG)	650	10	N/A	N/A	Hobart 175 amp MIG welder = GMAW			
Install LEV by torch	N/A	N/A	N/A	N/A	N/A			
Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	Van der Wall (1986)			
GMAW controls are included under SMAW	N/A	N/A	N/A	N/A	N/A			
Nedermann Filterbox	1200	13	N/A	N/A	Kura (1998) Nederman Filterbox			
No controls required	N/A	N/A	N/A	N/A	N/A			
2D Welding (government industry)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	Frosts and Mason/Granger Tubeaxial Fan	
		Nedermann Filterbox	1200	13	N/A	N/A	Kura (1998) Nederman Filterbox	
		Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication	
		2 hour training course	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	
		Install LEV by torch	Nedermann Filtercart	N/A	N/A	N/A	Van der Wall (1986)	
		Fume extractor gun	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG, High-Vacuum, Exhaust Hesse	
		Replace short-circuit and other welding equipment with a pulsed arc	N/A	N/A	N/A	N/A	Miller Pulse Arc GMAW	
		Nedermann Filterbox	1200	13	N/A	N/A	Kura (1998), Nederman Filterbox	
		Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication	
		2 hour training course	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
		Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost		
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500		
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000		
		Increase general exhaust ventilation	\$41,800	\$9,675	\$15,600		
		Replace SMAW with GMAW	\$1,353	\$82	\$300		
		Improved maintenance of existing ventilation system	\$0	\$378	\$400		
		Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900		
		Use stationary LEV (Downdraft Table)	\$11,400	\$2,530	\$4,200		
		High-Velocity-Low-Volume System	\$4,963	\$900	\$1,600		
		Controls combined with SMAW	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		Install LEV by torch	\$7,220	\$1,035	\$2,100		
		Replace existing plasma cutting gas with argon-hydrogen gas	\$1,353	\$82	\$300		
		Controls combined with other processes	N/A	N/A	N/A		
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500		
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000		
		Use stationary LEV (Downdraft Table)	\$11,400	\$684	\$2,300		
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900		
		Replace SMAW with pulsed arc GMAW welding unit	\$9,500	\$570	\$1,900		
		Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,400		
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100		
		Controls combined with SMAW	N/A	N/A	N/A		
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900		
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900		
		Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500		
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000		
		Replace 100%CO2 with 95%Argon/5%CO3	\$1,353	\$82	\$300		
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$300		
Plasma Cutting	GMAW TIG FCAW	Install LEV by torch	\$7,220	\$433	\$1,500		
		Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,400		
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,900		
		Replace power source to convert unit to a plasma arc-cutting unit	\$9,500	\$570	\$1,900		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		Controls combined with other processes	N/A	N/A	N/A		
		Plasma Welding Oxy-fuel Cutting Air Carbon Arc Cutting/Gouging Electron Torch Cutting Thermal Spray Tungsten Carbide SAW Grinding Confined Space	Plasma Cutting	Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000
				Replace 100%CO2 with 95%Argon/5%CO3	\$1,353	\$82	\$300
				Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$300
				Install LEV by torch	\$7,220	\$433	\$1,500
				Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,400
Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605			\$998	\$1,900		
Replace power source to convert unit to a plasma arc-cutting unit	\$9,500			\$570	\$1,900		
No controls required	N/A			N/A	N/A		
No controls required	N/A			N/A	N/A		
No controls required	N/A			N/A	N/A		
No controls required	N/A			N/A	N/A		
Controls combined with other processes	N/A			N/A	N/A		

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions				Design Basis	
			ACFM	Length of ductwork, feet	Room size	Other		
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)	
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	Froats and Mason Grainger Tubexial Fan	
		Increase general exhaust ventilation	12,000/cimw/200 elder		N/A	N/A	Donaldson Tort Truckline	
	GMAW TIG SAW Plasma Cutting	Replace SMAW with GMAW		N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
		Improved maintenance of existing ventilation system		N/A	N/A	N/A	N/A	
		Use stationary LEV - Articulating Welding Exhaust Duct		650	10	N/A	N/A	Stationary Nederman 5000
		Use stationary LEV (Downdraft Table)		N/A	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		High-Velocity-Low-Volume System		650	10	N/A	N/A	Lincoln Electric Suction Heads High Vacuum SHM, SHFA, UNIM, SMRT
		Controls combined with SMAW		N/A	N/A	N/A	N/A	N/A
	Plasma Welding Resistance Welding FCAW Confined Space	No controls required		N/A	N/A	N/A	N/A	
		No controls required		N/A	N/A	N/A	N/A	
		Install LEV by torch		650	10	N/A	N/A	Van der Wall (1986), Nedermann Filtercart
	2B1 Welding (marine industry) (carbon steel)	SMAW	Replace existing plasma cutting gas with argon-hydrogen gas	N/A	N/A	N/A	N/A	Van der Wall (1986), 10' x 24' Water Table Cutting Zone
No controls required				N/A	N/A	N/A	N/A	
No controls required				N/A	N/A	N/A	N/A	
GMAW TIG FCAW		Controls combined with SMAW		N/A	N/A	N/A	N/A	
		Controls combined with other processes		N/A	N/A	N/A	N/A	
		Local Exhaust Ventilation		\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)
Plasma Cutting		Directional General Ventilation of a Confined Space		\$14,792	None	N/A	N/A	Froats and Mason Grainger Tubexial Fan
		Use stationary LEV (Downdraft Table)		N/A	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		Use moveable LEV - Articulating Welding Exhaust Duct		650	10	N/A	N/A	Stationary Nederman 5000
		Replace SMAW with pulsed arc GMAW welding unit		N/A	N/A	N/A	N/A	GMAW inverter power source and matching wire feed
		Use Portable LEV - Nederman Filterbox		1200	13	N/A	N/A	Kura (1986) Nederman Filterbox
		Fume Extractor Gun (FEG)		N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG High-Vacuum Exhaust Hose
GMAW TIG FCAW		Controls combined with SMAW		N/A	N/A	N/A	N/A	
	Use moveable LEV - Articulating Welding Exhaust Duct		\$650	\$10	N/A	N/A	Stationary Nederman 5000	
	Use moveable LEV - Articulating Welding Exhaust Duct		\$650	\$10	N/A	N/A	Stationary Nederman 5000	
Plasma Cutting	Local Exhaust Ventilation		\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
	Directional General Ventilation of a Confined Space		\$14,792	None	N/A	N/A	Froats and Mason Grainger Tubexial Fan	
	Replace 100% CO2 with 95% Argon/5% CO3		N/A	N/A	N/A	N/A	Van der Wall (1986)	
	Replace existing plasma cutting gas with argon-hydrogen cutting gas		N/A	N/A	N/A	N/A	10' x 24' Water Table Cutting Zone	
	Install LEV by torch		Nedermann Filtercart		N/A	N/A	N/A	
	Use Portable LEV - Nederman Filterbox		\$1,200	\$13	N/A	N/A	Kura (1986), Nederman Filterbox	
Plasma Welding Oxy-fuel Cutting Air Carbon Arc Cutting/Gouging Electron Torch Cutting Thermal Spray Tungsten Carbide SAW Grinding Confined Space	Use moveable LEV - Articulating Welding Exhaust Duct		\$650	\$10	N/A	N/A	Stationary Nederman 5000	
	Replace power source to convert unit to a plasma arc-cutting unit		N/A	N/A	N/A	N/A	(Harris, Castner, 2002)	
	No controls required		N/A	N/A	N/A	N/A	N/A	
	No controls required		N/A	N/A	N/A	N/A	N/A	
	No controls required		N/A	N/A	N/A	N/A	N/A	
	Controls combined with other processes		N/A	N/A	N/A	N/A	N/A	



Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost				
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500				
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000				
		Niedermaier Filterbox	\$7,220	\$659	\$1,700				
		Welder training on proper position of LEV ducts	\$0	\$0	\$0				
		2 hour training course	\$0	\$0	\$0				
		Replace SMAW with GMAW	\$1,353	\$62	\$300				
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100				
		Local Exhaust Ventilation	\$2,962	\$1,029	\$1,500				
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$3,000				
		GMAW	N/A	N/A	N/A				
3A Painting (general industry)	Spray Painter	GMAW controls are included under SMAW	\$7,220	\$659	\$1,700				
		Niedermaier Filterbox	N/A	N/A	N/A				
		No controls required	N/A	N/A	N/A				
		Controls combined with other processes	N/A	N/A	N/A				
		Improved maintenance of existing ventilation system	\$0	\$378	\$400				
		Sander with integrated LEV and HEPA-filtered exhaust	\$1,375	\$63	\$300				
		Replace existing HVLP/airless guns with electrostatic spray painting equipment	\$12,600	\$756	\$2,600				
		Use Hudson-type sprayer or brushes for application	\$96	\$6	\$20				
		Directional general ventilation of a confined space	\$570	\$35	\$100				
		Periodic inspection and maintenance of hangar flow-through ventilation	\$0	\$378	\$400				
3A2 Painting (coil coating)	Operator (coil coating)	Increase spray booth air velocity to 100 f/min	\$12,826	\$1,826	\$2,600				
		Use appropriately sized (larger) spray paint booth	\$9,499	\$6,064	\$9,400				
		Sander with integrated LEV and HEPA-filtered exhaust	\$1,375	\$63	\$300				
		Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	\$19,371	\$9,827	\$11,600				
		No controls required	N/A	N/A	N/A				
		3A1 Painting (auto body repair)	Spray Painter Sander	Use appropriately sized (larger) spray paint booth (6)	\$15,200	\$2,769	\$4,900		
				Sander with integrated LEV and HEPA-filtered exhaust (9)	\$1,375	\$63	\$300		
				3B Painting (maritime industry)	Spray Painter	Use spray gun with higher transfer efficiency (such as HVLP spray gun)	\$950	\$58	\$200
						Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	\$2,445	\$146	\$500
						Improved maintenance of existing ventilation system	\$0	\$378	\$400
Sander with integrated LEV and HEPA-filtered exhaust	\$760					\$46	\$200		
No controls required	N/A					N/A	N/A		
No controls required	N/A					N/A	N/A		
3C Painting (construction industry)	Abrasive Blaster Grinder/Sander					No controls required	N/A	N/A	N/A
						No controls required	N/A	N/A	N/A
		No controls required	N/A			N/A	N/A		
		No controls required	N/A			N/A	N/A		
		3D Painting (government industry)	Spray painter Laborer	No controls required	N/A	N/A	N/A		
				No controls required	N/A	N/A	N/A		
				No controls required	N/A	N/A	N/A		
				No controls required	N/A	N/A	N/A		

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Assumptions								
Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Design Basis	
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)	
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	Froats and Mason Granger Tubaxial Fan	
		Nedermann Filterbox	1200	13	N/A	N/A	Kura (1998) Nedermann Filterbox	
		Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication	
		2 hour training course	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	
		Fume Extractor Gun (FEG)	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)	
		Local Exhaust Ventilation of a Confined Space	14792	None	N/A	N/A	Froats and Mason Granger Tubaxial Fan	
		Directional General Ventilation of a Confined Space	N/A	N/A	N/A	N/A	N/A	
		GMAW controls are included under SMAW	1200	13	N/A	N/A	Kura (1998) Nedermann Filterbox	
3A Painting (general industry)	Spray Painter	Nedermann Filterbox	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		Controls combined with other processes	N/A	N/A	N/A	N/A	N/A	N/A
		Improved maintenance of existing ventilation system	170 cfm	N/A	N/A	N/A	No makeup air/HEPA exhaust	6-inch rotary sander with integrated LEV
		Sander with integrated LEV and HEPA-filtered exhaust	N/A	N/A	N/A	N/A	N/A	Binks HVLP-electrostatic gun
		Replace existing HVLP/airless guns with electrostatic spray painting equipment	N/A	N/A	N/A	N/A	N/A	Hudson-type sprayer or professional paint brush and miscellaneous supplies
		Use Hudson-type sprayer or brushes for application	2000 cfm	None	existing	N/A	No makeup air/uses spray booth	NIOSH HHE (2001-0223) Venturi air horn (8)
		Directional general ventilation of a confined space	N/A	N/A	N/A	N/A	N/A	NIOSH HHE (2201-0223)
		Periodic inspection and maintenance of hangar flow-through ventilation	N/A	50	N/A	N/A	150 ft <sup>2</sup> cross section	Replace exhaust ductwork and fan
		Increase spray booth air velocity to 100 ft/min	12,600 cfm	14' x 9'	N/A	N/A	100 ft <sup>2</sup> min cross area	Cross Flow Paint Booth, 26 ft long x 14 ft wide x 9 ft high
3A1 Painting (auto body repair)	Assembler	Use appropriately sized (larger) spray paint booth	N/A	N/A	N/A	N/A	6-inch rotary sander with integrated LEV	
		Sander with integrated LEV and HEPA-filtered exhaust	N/A	N/A	N/A	N/A	Existing permanent total enclosure at the coil coating section of the line	
		Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		Maintenance (coil coating)	12,600 cfm	26.5' L x 14' W x 9' H	100 ft <sup>2</sup> min cross area	N/A	6-inch rotary sander with integrated LEV	
		Spray Painter	170 cfm	30' hose	N/A	N/A	No makeup air/HEPA exhaust	
		Sander	N/A	N/A	N/A	N/A	N/A	Assume establishment has conventional spray gun. Cost is for converting conventional to HVLP spray gun
		Spray Painter	N/A	N/A	N/A	N/A	N/A	gun
		Use spray gun with higher transfer efficiency (such as HVLP spray gun)	N/A	N/A	N/A	N/A	N/A	N/A
		3B Painting (maritime industry)	Abrasive Blaster Grinder/Sander	Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	N/A	N/A	N/A	N/A
Improved maintenance of existing ventilation system	N/A			N/A	N/A	N/A	N/A	
Sander with integrated LEV and HEPA-filtered exhaust	N/A			N/A	N/A	N/A	N/A	N/A
No controls required	N/A			N/A	N/A	N/A	N/A	N/A
No controls required	N/A			N/A	N/A	N/A	N/A	N/A
Spray painter	N/A			N/A	N/A	N/A	N/A	N/A
Laborer	N/A			N/A	N/A	N/A	N/A	N/A
Traffic Painter	N/A			N/A	N/A	N/A	N/A	N/A
Spray painter	N/A			N/A	N/A	N/A	N/A	N/A
Laborer	N/A			N/A	N/A	N/A	N/A	N/A
3C Painting (construction industry)	Spray painter Laborer Traffic Painter	No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		Spray painter	N/A	N/A	N/A	N/A	N/A	N/A
		Laborer	N/A	N/A	N/A	N/A	N/A	N/A
		Traffic Painter	N/A	N/A	N/A	N/A	N/A	N/A
		Spray painter	N/A	N/A	N/A	N/A	N/A	N/A
		Laborer	N/A	N/A	N/A	N/A	N/A	N/A
3D Painting (government industry)	Spray painter Laborer	No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		Spray painter	N/A	N/A	N/A	N/A	N/A	N/A
		Laborer	N/A	N/A	N/A	N/A	N/A	N/A
		Traffic Painter	N/A	N/A	N/A	N/A	N/A	N/A
		Spray painter	N/A	N/A	N/A	N/A	N/A	N/A
		Laborer	N/A	N/A	N/A	N/A	N/A	N/A

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	\$3,688,000	\$0	\$525,300
		Upgrade LEV and use closed sample collection containers	\$164,500	\$0	\$26,300
	Packaging Workers	Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	\$1,844,500	\$0	\$262,700
		Ventilation leader to two railcars	\$2,170,000	\$0	\$309,000
		Use portable LEV	\$3,980	\$560	\$1,100
	Maintenance workers Other Exposed Workers	Fume Hood	\$11,400	\$1,373	\$3,000
		Strike Tank Operator Drying/Blending/Packaging Operator	No controls required	N/A	N/A
	Install a dust collection spill hopper for 50 pound bag tube packing machine		\$3,800	\$454	\$1,000
	Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task.		\$22,860	\$1,748	\$5,000
	Install closed HVAC unit		\$79,571	\$14,379	\$25,700
Install an air replacement system to provide building make up air	\$3,800		\$228	\$800	
5 Chromate Pigment Producers	Maintenance Worker Laborer	Retrofit open-cab forklift to closed-cab with HEPA filtered air	N/A	N/A	N/A
		No controls required	\$846	\$276	\$400
	Laboratory Technician	Install ventilated sample collection boxes	\$3,800	\$228	\$800
		No controls required	N/A	N/A	N/A
	Wastewater Treatment Operator Manager/Supervisor	Install dust tight covers on existing conveyors	\$3,800	\$228	\$800
		No controls required	N/A	N/A	N/A
	Proprietary Process Operator Dispersion Operator	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
	Production Operator Production Supervisor	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
CCA Truck Loader Warehouse Operator	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	
6 Chromated Copper Arsenate (CCA) Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	\$0	\$0	\$0
		Improve existing side draft LEV at 55-gallon loading station	\$9,500	\$570	\$1,900
	Dry Process Operator	Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	\$946,200	\$56,772	\$191,500
		Upgrade flat deck screening equipment to ACGIH standard	\$2,679	\$1,005	\$1,400
	Screening Operator Quality Control Inspector	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
	Dry Mix Operator Process Control Operator	No controls required	N/A	N/A	N/A
		Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	\$1,467	\$88	\$300
	Control Room Operator	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
	Forming Operator Team Leader	No controls required	N/A	N/A	N/A
		Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	\$190,000	\$11,400	\$38,500
	Lead Person	Increase air supply and general exhaust ventilation	\$41,800	\$3,954	\$9,900
		Replace manually-unloaded filter press with automatic pressure filter equipment	\$95,000	\$5,700	\$19,200
	Floor Person	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	\$68,210	\$4,093	\$13,800
		No controls required	N/A	N/A	N/A
	Warehouse Operator Maintenance Person	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
Solid Waste Handler	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector		Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Design Basis		
4	Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	N/A	N/A	N/A	2 LEV Process	(Company M, 2003)		
			Upgrade LEV and use closed sample collection containers	N/A	N/A	N/A	1 LEV Process	(Company M, 2003)		
			Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	N/A	N/A	N/A	1 LEV Process	(Company M, 2003)		
		Packaging Workers	Ventilation loader to two railcars	N/A	N/A	N/A	N/A	N/A	(Company M, 2003)	
			Use portable LEV	650	10	N/A	N/A	N/A	Portable Nederman Filtercart with HEPA filter	
			Fume Hood	800	N/A	N/A	N/A	N/A	N/A	
			Other Exposed Workers	N/A	N/A	N/A	N/A	N/A	N/A	
		5	Chromate Pigment Producers	Strike Tank Operator Drying/Blending/Packaging Operator	No controls required	N/A	N/A	N/A	N/A	N/A
					Install a dust collection spill hopper for 50 pound bag tube packing machine	N/A	N/A	N/A	N/A	N/A
					Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit	N/A	N/A	N/A	N/A	N/A
Maintenance Worker	Install an air replacement system to provide building make up air			14000	400	56,000 sq ft	NA	NA	Direct gas fired air heating (6)	
	Retrofit open-cab forklift to closed-cab with HEPA filtered air			N/A	N/A	N/A	N/A	N/A	N/A	
	No controls required			N/A	N/A	N/A	N/A	N/A	N/A	
	Install ventilated sample collection boxes			N/A	N/A	N/A	N/A	N/A	Install sampling valves in ventilated enclosure/box	
Manager/Supervisor	No controls required			N/A	N/A	N/A	N/A	N/A	N/A	
	Install dust tight covers on existing conveyors			N/A	N/A	N/A	N/A	N/A	N/A	
	No controls required			N/A	N/A	N/A	N/A	N/A	N/A	
6	Chromated Copper Arsenate (CCA) Producers	Production Operator Production Supervisor CCA Truck Loader Warehouse Operator	No controls required	N/A	N/A	N/A	N/A	N/A		
			No controls required	N/A	N/A	N/A	N/A	N/A		
			No controls required	N/A	N/A	N/A	N/A	N/A		
		Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	N/A	N/A	N/A	N/A	N/A	N/A	
			Improve existing side draft LEV at 55-gallon loading station	N/A	N/A	N/A	N/A	N/A	VS-15-10 and VS-15-11 (Company R)	
			Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	N/A	N/A	N/A	N/A	N/A	N/A	
			Upgrade flat deck screening equipment to ACGIH standard	1200 cfm	N/A	3' x 8' screen area	Hood Opening is 6ft2	N/A	VS-99-01	
		Screening Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
			No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
			No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
Quality Control Inspector Dry Mix Operator Process Control Operator Control Room Operator	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	256	15	10' x 20' x 8'	N/A	N/A	2-1 (1), 4 to 12 air changes per hour, or 8 air changes per hour for control room			
	No controls required	N/A	N/A	N/A	N/A	N/A	N/A			
	No controls required	N/A	N/A	N/A	N/A	N/A	N/A			
Forming Operator Team Leader Lead Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	N/A	N/A	N/A	N/A	N/A	N/A			
	Increase air supply and general exhaust ventilation	12,000 cfm/person	200	N/A	N/A	N/A	Donaldson Tort Truckline (2)			
	Replace manually-articulated filter press with automatic pressure filter equipment	N/A	N/A	N/A	N/A	N/A	N/A			
7	Chromium Catalyst Producers	Floor Person	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	N/A	N/A	N/A	N/A	Automatic Drum Fill System (Four drums on a pallet) Turntable, Conveyor and Drum Fill, 10' Accumulation Conveyor		
			No controls required	N/A	N/A	N/A	N/A	N/A		
			No controls required	N/A	N/A	N/A	N/A	N/A		
		Warehouse Operator Maintenance Person Solid Waste Handler	No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
			No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
			No controls required	N/A	N/A	N/A	N/A	N/A	N/A	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
8	Paint and Coatings Producers	Improved LEV at Cr(VI) mixing tanks	\$23,667	\$1,456	\$4,800
		Partially enclosed drum opening/ dumping station	\$59,089	\$4,788	\$13,200
9	Printing Ink Producers	Package	N/A	N/A	N/A
		Shipping/receiving Technician	N/A	N/A	N/A
		Laboratory Chemist/Technician	N/A	N/A	N/A
		Batch Weigher	N/A	N/A	N/A
		Mill Operator	N/A	N/A	N/A
		Utility Worker	N/A	N/A	N/A
10	Plastic Colorant Producers and Users	Maintenance Worker	N/A	N/A	N/A
		Production Supervisor	N/A	N/A	N/A
		Dry Color Handler	N/A	N/A	N/A
11	Plating Mixture Producers	Wet Mill Operator	N/A	N/A	N/A
		Dry Color Blender/package	N/A	N/A	N/A
		Production Supervisor	N/A	N/A	N/A
		Blender/Mixer Operator-Dry Chrome	\$59,089	\$4,788	\$13,200
12	Wood Preserving	Partially enclosed drum opening/ dumping station	\$74,943	\$4,756	\$15,400
		Totally enclosed automated bag sifter and dumping station	\$43,510	\$2,776	\$9,000
		Totally enclosed ventilated drum-dumping station	\$800	\$213	\$300
		Barrel and bag filling stations with effective ventilation systems	\$800	\$213	\$300
		Barrel stations with effective ventilation systems	\$30,965	\$2,133	\$6,500
		Partially enclosed manual drum filling station	\$67,049	\$4,311	\$13,900
		Totally enclosed automated drum dumping station	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A

Table iii.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions				Design Basis
			ACFM	Length of ductwork, feet	Room size	Other	
8 Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	NA	20'	NA	N/A	Steel half tank cover with port attached to 8" flexible exhaust hose
		Partially enclosed drum opening/ dumping station	3600	20	6' x 8' x 8'	Includes dust collector and enclosure booth	Drum dumper (1), enclosure (2), VS-60-01, Mixer and Muller Hood, VS-15-20, Toxic Material Bag Opening
	Packager Shipping/receiving Technician Laboratory Chemist/Technician	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
9 Printing Ink Producers	Batch Weigher Mill Operator Utility Worker Maintenance Worker Production Supervisor	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
10 Plastic Colorant Producers and Users	Dry Color Handler Wet Mill Operator Dry Color Blender/packager Production Supervisor	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
11 Plating Mixture Producers	Blender/Mixer Operator-Dry-Chrome Process	Partially enclosed drum opening/ dumping station	3600	20	6' x 8' x 8'	Includes dust collector and enclosure booth	Drum dumper (1), enclosure (2), VS-60-01, Mixer and Muller Hood, VS-15-20, Toxic Material Bag Opening (8)
		Totally enclosed automated bag slitter and dumping station	600	20	NA	Integrated dust collector and bag compactor	Luxme automatic twin blade bag slitter with compactor, filter, fan (6)
		Totally enclosed ventilated drum-dumping station	1060	0	10' x 20' x 10'	N/A	VS-75-04, Large Drive-Through Spray Paint Booth (8)
		Barrel and bag filling stations with effective ventilation systems	1060	40	N/A	N/A	Barrel Filling -VS-15-01, Bag Filling - VS-15-02 (8)
		Barrel stations with effective ventilation systems	1060	40	N/A	N/A	Barrel Filling -VS-15-01
		Partially enclosed manual drum filling station	400	20	NA	Includes dust collector	Barrel Filling - VS-15-01, Option 4 (5)
		Totally enclosed automated drum dumping station	500	20	NA	Includes dust collector, auto net weigh filler	VS-15-01, Option 2 and 3 (8)
		No controls required	N/A	N/A	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A	N/A	N/A
12 Wood Preserving	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost	
13 Chromium Material Producers	Leach Operator	Strahman valves and ventilated sample box	\$846	\$50	\$200	
	Aggr Operator	Covers and tank head space ventilation on aggr tanks	\$73,989	\$4,583	\$15,100	
	Lower-cell-room Operator	Cell covers to completely cover the cell and improved LEV	\$78,713	\$4,723	\$15,900	
	Cell Assembler	Enclosed, ventilated cell-component cleaning room or enclosure	\$2,663	\$305	\$700	
	Cell Operator	Cell covers to completely cover the cell and improved LEV	\$78,713	\$4,723	\$15,900	
	Plate Hooker	Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	\$31,097	\$2,010	\$6,400	
	Plater Stripper	Install Booth around chromic acid tank with remote hoist controls	\$9,292	\$534	\$1,700	
	Mill Operator	No controls required	N/A	N/A	N/A	
	Blender Operator	No controls required	N/A	N/A	N/A	
	Briquetting Operator	No controls required	N/A	N/A	N/A	
	Furnace Loader	No controls required	N/A	N/A	N/A	
	Furnace Operator	No controls required	N/A	N/A	N/A	
	VG Picker	No controls required	N/A	N/A	N/A	
	Brick Layer	No controls required	N/A	N/A	N/A	
	Shipper	No controls required	N/A	N/A	N/A	
	Bagger	No controls required	N/A	N/A	N/A	
	14 Steel Mills (stainless)	Raw Material Handler	HEPA-filtered vacuum system	\$0	\$0	\$0
		Furnace Operator	No controls required	N/A	N/A	N/A
		Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	\$1,064,000	\$64,582	\$216,100
			Change to Bottom-Pour Method from Lip and Pour Method	\$47,500	\$2,850	\$9,600
		Ladle LEV with traveling cantilevered exhaust hood	\$190,500	\$11,582	\$37,300	
		Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$400	
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$76,000	\$4,560	\$15,400	
Crane Operator		Reinfort Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,900	
Continuous Casting Operator		Annual Maintenance	\$1,900	\$114	\$400	
Rolling-Mill Operator		Annual Maintenance	\$1,900	\$114	\$400	
Welders		Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,900	
		Replace SMAW with GMAW	\$1,353	\$82	\$300	
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100	
Steel Conditioning Operator		Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,900	
	Upgrade existing ventilation hood exhaust air flow rates	\$1,900	\$114	\$400		

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions			
			ACFM	Length of ductwork, feet	Room size	Other
13 Chromium Material Producers	Leach Operator Ager Operator Lower-cell-room Operator Cell Assembler Cell Operator Plate Hooker  Plater Stripper Mill Operator Blender Operator Briquetting Operator Furnace Loader Furnace Operator VG Picker Brick Layer Shipper Bagger	Strahman valves and ventilated sample box covers and tank head space ventilation on ager tanks Cell covers to completely cover the cell and improved LEV Enclosed, ventilated cell-component cleaning room or enclosure Cell covers to completely cover the cell and improved LEV Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks Install Booth around chromic acid tank with remote hoist controls No controls required No controls required No controls required No controls required No controls required No controls required No controls required No controls required No controls required No controls required No controls required No controls required	N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			N/A	N/A	N/A	N/A
			14 Steel Mills (Stainless)	Raw Material Handler  Furnace Operator Furnace Helper/Laborer  Crane Operator Continuous Casting Operator Rolling-Mill Operator  Welders  Steel Conditioning Operator	HEPA-filtered vacuum system  No controls required Direct-Shell Evacuation Control Collection (DEC) Collection System Change to Bottom-Pour Method from Lip and Pour Method Ladle LEV with traveling cantilevered exhaust hood Periodic inspection and maintenance of furnace LEV Substitute lip pour ladle with bottom-pour ladle with LEV Retrofit Crane Cab with HEPA-filtered air Annual Maintenance Annual Maintenance Install HEPA Filtration in the Operator Control Room Replaces SMAW with GMAW Fume Extractor Gun (FEG)  Perform Maintenance on Grinding Station Booth Ventilation and LEV Upgrade existing ventilation hood exhaust air flow rates	N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A
N/A	N/A	N/A				N/A

Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost

Hobart 175 amp MIG welder = GMAW (NIOSH, January, 1979), Lincoln Electric FEG High-Vacuum, Exhaust Hose



Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost	
14A Steel Mills (carbon)	Raw Material Handler	HEPA-filtered vacuum system	\$0	\$0	\$0	
	Furnace Operator	No controls required	N/A	N/A	N/A	
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DECC) Collection System	\$1,064,000	\$64,592	\$216,100	
		Change to Bottom-Pour Method from Lip and Pour Method	\$47,500	\$2,850	\$9,600	
		Ladle LEV with traveling cantilevered exhaust hood	\$190,500	\$11,582	\$37,300	
		Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$400	
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$76,000	\$4,560	\$15,400	
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,900	
	Continuous Casting Operator	Annual Maintenance	\$1,900	\$114	\$400	
	Rolling-Mill Operator	Annual Maintenance	\$1,900	\$114	\$400	
Welders		Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,900	
		Replace SMAW with GMAW	\$1,353	\$82	\$300	
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,100	
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,900	
14B Reshaping		Upgrade existing ventilation hood exhaust air flow rates	\$1,900	\$114	\$400	
	Raw Material Handler	No controls required	N/A	N/A	N/A	
	Laborer	Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$400	
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,900	
	Rolling-Mill/Forging Operator	Annual Maintenance	\$1,900	\$114	\$400	
		Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,900	
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,900	
		Upgrade existing ventilation hood exhaust air flow rates	\$1,900	\$114	\$400	
	15 Iron and Steel Foundries	Molders	No controls required	N/A	N/A	N/A
		Furnace Operator	Install LEV in the form of hoods over the furnace	\$38,000	\$9,868	\$14,300
Crane Operator		Retrofit crane cab with HEPA-filtered air supply	\$9,500	\$570	\$1,900	
Pourers		No controls required	N/A	N/A	N/A	
Shake-out and Abrasive Blasting Operators		Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	\$9,500	\$570	\$1,900	
		Install enclosed booths for manual blasting	\$1,860	\$118	\$400	
Torch Cutter/Gouger		Install a moveable hood and an HVLV fume exhaust system	\$6,605	\$998	\$1,900	
Welder		Install a moveable hood and an HVLV fume exhaust system	\$6,605	\$998	\$1,900	
Grinder Operator		Grinding wheel hood	\$476	\$29	\$100	
Laborer		Downdraft Ventilation Booth with Air Shower	\$20,900	\$1,290	\$4,300	
16 Chromium Dioxide Producers		HVLV Grinders	\$950	\$58	\$200	
		No controls required	N/A	N/A	N/A	
17 Chromium Dye Producers		Not Applicable	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	
18 Chromium Dye Producers	Color Maker	No controls required	N/A	N/A	N/A	
	Drying/Blending/Packaging Operator	No controls required	N/A	N/A	N/A	
	Maintenance Worker	No controls required	N/A	N/A	N/A	
	Laborer	No controls required	N/A	N/A	N/A	
	Laboratory Technician	No controls required	N/A	N/A	N/A	
	Wastewater Treatment Operator	No controls required	N/A	N/A	N/A	
	Manager/Supervisor	No controls required	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions				Design Basis
			ACFM	Length of ductwork, feet	Room size	Other	
14A Steel Mills (carbon)	Raw Material Handler	HEPA-filtered vacuum system					Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost
	Furnace Operator	No controls required	N/A	N/A	N/A	N/A	
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	N/A	N/A	N/A	N/A	
	Crane Operator	Change to Bottom-Pour Method from Lip and Pour Method	N/A	N/A	N/A	N/A	
		Ladle LEV with traveling canilvened exhaust hood	N/A	N/A	N/A	N/A	
		Periodic inspection and maintenance of furnace LEV	N/A	N/A	N/A	N/A	
		Substitute lip pour ladle with bottom-pour ladle with LEV	N/A	N/A	N/A	N/A	
	Continuous Casting Operator	Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	
	Rolling-Mill Operator	Annual Maintenance	N/A	N/A	N/A	N/A	
	Welders	Install HEPA Filtration in the Operator Control Room	N/A	N/A	N/A	N/A	
Replace SMAW with GMAW		N/A	N/A	N/A	N/A		
Steel Conditioning Operator	Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A		
	Perform Maintenance on Grinding Station Booth Ventilation and LEV	N/A	N/A	N/A	N/A		
14B Reshaping	Raw Material Handler	Upgrade existing ventilation hood exhaust air flow rates	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A		
	Crane Operator	Periodic inspection and maintenance of furnace LEV	N/A	N/A	N/A	N/A	
		Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	
	Rolling-Mill/Forging Operator	Annual Maintenance	N/A	N/A	N/A	N/A	
		Install HEPA Filtration in the Operator Control Room	N/A	N/A	N/A	N/A	
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	N/A	N/A	N/A	N/A	
		Upgrade existing ventilation hood exhaust air flow rates	N/A	N/A	N/A	N/A	
	15 Iron and Steel Foundries	Molders	No controls required	N/A	N/A	N/A	N/A
			Install LEV in the form of hoods over the furnace	11,000	N/A	N/A	N/A
Furnace Operator		Retrofit crane cab with HEPA-filtered air supply	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
Crane Operator		Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	N/A	N/A	N/A	N/A	
		Install enclosed booths for manual blasting	N/A	N/A	N/A	N/A	
Torch Cutter/Grinder		Install a moveable hood and an HVLV fume exhaust system	650	N/A	N/A	N/A	
		Install a moveable hood and an HVLV fume exhaust system	650	N/A	N/A	N/A	
Welder		Grinding wheel hood	N/A	N/A	N/A	N/A	
		Downdraft Ventilation Booth with Air Shower	1,000	N/A	N/A	N/A	
Grinder Operator	HVLV Grinders	N/A	N/A	N/A	N/A		
	No controls required	N/A	N/A	N/A	N/A		
Laborer	No controls required	N/A	N/A	N/A	N/A		
	Not Applicable	N/A	N/A	N/A	N/A		
Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	
	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	
17 Chromium Dye Producers	Color Maker	No controls required	N/A	N/A	N/A	N/A	
		Drying/Blending/Packaging Operator	N/A	N/A	N/A	N/A	
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
	Laboratory Technician	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
	Wastewater Treatment Operator	No controls required	N/A	N/A	N/A	N/A	
		Manager/Supervisor	N/A	N/A	N/A	N/A	

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
18 Chromium Sulfate Producers	Reactor Operators	No controls required	N/A	N/A	N/A
	Railcar Operators	No controls required	N/A	N/A	N/A
19 Chemical Distributors	Shipping	No controls required	N/A	N/A	N/A
20 Textile Dyeing	Blender	No controls required	N/A	N/A	N/A
	Dyer	No controls required	N/A	N/A	N/A
21 Colored Glass Producers	Maintenance Worker	No controls required	N/A	N/A	N/A
	Lab Assistant	Install a moveable canopy hood connected to a dust collector	\$6,605	\$998	\$1,900
	Batch Mixer	No controls required	N/A	N/A	N/A
	Furnace Worker	No controls required	N/A	N/A	N/A
21A Fiber, Flat, and Container Glass	Batch Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,900
	Furnace Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,900
	EP/Baghouse Operator	No controls required	N/A	N/A	N/A
	Forehearth Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,900
	Hot End/Maintenance	No controls required	N/A	N/A	N/A
22 Printing	Printer	No controls required	N/A	N/A	N/A
	Mixer	No controls required	N/A	N/A	N/A
	Shipper	No controls required	N/A	N/A	N/A
23 Leather Tanning	Not Applicable	Not Applicable	N/A	N/A	N/A
24 Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	Equip the catalyst vessel with exhaust ventilation to maintain the catalyst vessel under negative pressure when catalyst is loaded	\$15,248	\$1,140	\$3,300
	Process Operators, all Catalyst Plants except Phillips Polyethylene Plants	No controls required	N/A	N/A	N/A
	Field Technician	No controls required	N/A	N/A	N/A
25 Refractory Brick Producers	Cleaner	No controls required	N/A	N/A	N/A
	Crusher Operator	No controls required	N/A	N/A	N/A
	Pressman	No controls required	N/A	N/A	N/A
	Batchman	3 sided LEV enclosures	\$2,850	\$2,712	\$3,100
	Mold Filler	No controls required	N/A	N/A	N/A
	Brick Loader	Install overhead doors that open to the outside in kiln work area	\$1,781	\$107	\$400
26 Woodworking	Grinder Operator	No controls required	N/A	N/A	N/A
	Saw Operator	No controls required	N/A	N/A	N/A
	Engineering Intern	No controls required	N/A	N/A	N/A
Construction		Install HEPA-filtered vacuum	\$4,425	\$301	\$900
		Improve LEV at workstation	\$1,460	\$88	\$300
		No controls required	N/A	N/A	N/A
Maritime General Industry		Install HEPA-filtered vacuum	\$0	\$0	\$0
Government		Improve LEV at workstation	\$1,460	\$163	\$400
		Install HEPA-filtered vacuum	\$4,425	\$301	\$900
		Improve LEV at workstation	\$1,460	\$88	\$300

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology) Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions				
			ACFM	Length of ductwork, feet	Room size	Other	Design Basis
18 Chromium Sulfate Producers	Reactor Operators	No controls required	N/A	N/A	N/A	N/A	N/A
	Railcar Operators	No controls required	N/A	N/A	N/A	N/A	N/A
19 Chemical Distributors	Shipping	No controls required	N/A	N/A	N/A	N/A	N/A
	Blender	No controls required	N/A	N/A	N/A	N/A	N/A
20 Textile Dyeing	Dyer	No controls required	N/A	N/A	N/A	N/A	N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A	N/A
21 Colored Glass Producers	Lab Assistant	Install a moveable canopy hood connected to a dust collector	650	16.5'	N/A	N/A	N/A
	Batch Mixer	No controls required	N/A	N/A	N/A	N/A	N/A
	Furnace Worker	No controls required	N/A	N/A	N/A	N/A	N/A
21A Fiber, Flat, and Container Glass	Batch Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A	N/A
	Furnace Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A	N/A
	EP/Baghouse Operator	No controls required	N/A	N/A	N/A	N/A	N/A
	Forehearth Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A	N/A
22 Printing	Printer	No controls required	N/A	N/A	N/A	N/A	N/A
	Mixer	No controls required	N/A	N/A	N/A	N/A	N/A
	Shipper	No controls required	N/A	N/A	N/A	N/A	N/A
23 Leather Tanning	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A
24 Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	Equip the catalyst vessel with exhaust ventilation to maintain the catalyst vessel under negative pressure when catalyst is loaded	1380	30	N/A	N/A	Design similar to Company L
	Process Operators, all Catalyst Plants except Phillips Polyethylene Plants	No controls required	N/A	N/A	N/A	N/A	N/A
	Field Technician	No controls required	N/A	N/A	N/A	N/A	N/A
25 Refractory Brick Producers	Cleaner	No controls required	N/A	N/A	N/A	N/A	N/A
	Crusher Operator	No controls required	N/A	N/A	N/A	N/A	N/A
	Pressman	No controls required	N/A	N/A	N/A	N/A	N/A
	Batchman	3 sided LEV enclosures	4000 acfm	50'	N/A	N/A	N/A
	Mold Filler	No controls required	N/A	N/A	N/A	N/A	N/A
	Brick Loader	Install overhead doors that open to the outside in kiln work area	16'x16' industrial Sheet	Model 626	N/A	N/A	N/A
26 Woodworking	Grinder Operator	No controls required	N/A	N/A	N/A	N/A	N/A
	Saw Operator	No controls required	N/A	N/A	N/A	N/A	N/A
	Engineering Intern	No controls required	N/A	N/A	N/A	N/A	N/A
Maritime General Industry	Construction	Install HEPA-filtered vacuum	NA	100'	NA	NA	NA
	Maritime	Improve LEV at workstation	1200 fpm	100'	10 Ducts	1.5" Diameter	NA
	General Industry	No controls required	NA	NA	NA	NA	NA
Government	Government	Install HEPA-filtered vacuum	1200 fpm	100'	10 Ducts	1.5" Diameter	NA
	Government	Improve LEV at workstation	NA	100'	NA	NA	NA
	Government	Improve LEV at workstation	1200 fpm	100'	10 Ducts	1.5" Diameter	NA

Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
27 Solid Waste Incineration	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Shredder/Heavy Equipment Maintenance Mechanic/ Maintenance Helper	No controls required Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Shredder/Heavy Equipment Operator	No controls required	N/A	N/A	N/A
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
28 Oil and Gas Well Drilling	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Not Applicable	Not Applicable	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A
	Melt Specialist	No controls required	N/A	N/A	N/A
	Reclaim Weigh Operator	No controls required	N/A	N/A	N/A
	EAF Operator	No controls required	N/A	N/A	N/A
	VIM/AIM Furnace Operator	No controls required	N/A	N/A	N/A
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,900
	Refining Unit Operator	No controls required	N/A	N/A	N/A
	Floor Person	No controls required	N/A	N/A	N/A
	Welder	Portable LEV	\$5,548	\$368	\$1,200
	Inert Screener	Replace SMAW with GMAW	\$1,353	\$92	\$300
30 Superalloy Producers	Laboratory Technician	No controls required	N/A	N/A	N/A
	Machine Operator	No controls required	N/A	N/A	N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Assumptions	
							Design Basis	
27 Solid Waste Incineration	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Shredder/Heavy Equipment Maintenance Mechanic/ Maintenance Helper	No controls required Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Shredder/Heavy Equipment Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
28 Oil and Gas Well Drilling	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A
30 Superalloy Producers	Melt Specialist	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Reclaim Weigh Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	EAF Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	VIM/AM Furnace Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	N/A	N/A
	Refining Unit Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Floor Person	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Welder	Portable LEV	N/A	N/A	N/A	N/A	N/A	N/A
	Inert Screener	Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	Note: 175 amp MIG welder = GMAW
	Laboratory Technician	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Machine Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A	N/A	N/A

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	\$14,600	\$676	\$3,000
	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A
31 Construction (government)	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A

Table III.5 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 7%

Industry Sector	Job Category	Control Technology	Assumptions				Design Basis
			ACFM	Length of ductwork, feet	Room size	Other	
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	N/A	N/A	N/A	N/A	N/A
	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A	N/A	N/A
31 Construction (government)	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A	N/A	N/A
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A



## Abbreviations

ug/m <sup>3</sup>	micrograms per cubic meter
LOD	level of detection
PEL	permissible exposure limit
LEV	local exhaust ventilation
SMAW	shielded metal arc welding
GMAW	gas metal arc welding
TIG	tungsten inert gas
SAW	submerged arc welding
FCAW	flux cored arc welding
CO <sub>2</sub>	carbon dioxide
Ar	argon
HVLP	high volume, low pressure
ft/min	feet per minute
HEPA	high efficiency particulate air
HVAC	heating, ventilation, air-conditioning
ACGIH	American Conference of Governmental Industrial Hygienists
Cr(VI)	hexavalent chromium
DEC	direct-shell evacuation control
HVLV	high volume, low velocity

**Table III.6. Estimated Annualized Compliance Costs in General Industry Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 7%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$17,885,845	\$40,078,900	\$80,113,289	\$197,207,077	\$301,249,039	\$772,502,745
Initial Exposure Assessment	\$9,051,086	\$9,066,463	\$9,739,054	\$9,544,296	\$10,714,796	\$11,234,516
Periodic Monitoring	\$7,957,871	\$10,866,338	\$15,899,803	\$42,750,084	\$112,073,851	\$136,311,685
Respirator Protection	\$8,332,290	\$20,045,563	\$40,355,950	\$93,647,500	\$210,681,884	\$350,523,310
PPE (supplied prior to reg.)	\$2,741,750	\$2,740,529	\$2,740,529	\$2,740,524	\$2,720,911	\$2,706,277
PPE (not supplied prior to reg.)	\$81,151,496	\$80,075,116	\$80,075,116	\$80,053,313	\$80,047,877	\$79,892,611
Hygiene Areas	\$9,362,800	\$9,270,500	\$9,270,500	\$9,267,800	\$9,258,500	\$9,194,500
Housekeeping	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050
Medical Surveillance	\$2,725,453	\$4,109,707	\$7,392,060	\$12,462,112	\$22,306,680	\$31,764,965
Communication of Hazards	\$9,274,444	\$9,248,053	\$9,258,556	\$9,359,101	\$9,654,324	\$9,751,042
Recordkeeping	\$1,272,910	\$1,272,710	\$1,272,410	\$1,271,850	\$1,271,850	\$1,271,550
<b>Total Cost</b>	<b>\$174,952,994</b>	<b>\$211,970,928</b>	<b>\$281,314,317</b>	<b>\$483,500,708</b>	<b>\$785,176,761</b>	<b>\$1,430,350,251</b>

**Table III.7. Estimated Annualized Compliance Costs in Maritime Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 7%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$2,548,323	\$3,308,691	\$4,067,116	\$7,838,271	\$12,704,169	\$17,242,881
Initial Exposure Assessment	\$336,255	\$361,385	\$369,329	\$491,290	\$558,364	\$685,649
Periodic Monitoring	\$299,663	\$451,034	\$510,185	\$1,613,589	\$3,126,173	\$4,483,730
Respirator Protection	\$1,491,829	\$13,388,469	\$16,912,270	\$24,304,789	\$37,744,529	\$50,193,667
PPE (supplied prior to reg.)	\$1,220,626	\$1,220,626	\$1,220,626	\$1,220,626	\$1,220,626	\$1,052,893
PPE (not supplied prior to reg.)	\$5,661,140	\$5,661,140	\$5,661,140	\$5,661,140	\$5,661,140	\$5,154,231
Hygiene Areas	\$407,800	\$407,800	\$407,800	\$407,800	\$407,800	\$401,400
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$409,393	\$494,779	\$672,753	\$1,213,334	\$1,528,664	\$1,598,028
Communication of Hazards	\$545,840	\$545,840	\$545,940	\$546,540	\$548,140	\$548,840
Recordkeeping	\$61,100	\$61,100	\$61,100	\$61,100	\$61,100	\$61,100
<b>Total Cost</b>	<b>\$12,981,969</b>	<b>\$25,900,863</b>	<b>\$30,428,259</b>	<b>\$43,358,478</b>	<b>\$63,560,705</b>	<b>\$81,422,419</b>

**Table III.8. Estimated Annualized Compliance Costs in Construction Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 7%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$6,820,403	\$11,856,454	\$29,965,577	\$69,110,761	\$150,811,326	\$220,629,564
Initial Exposure Assessment	\$2,909,115	\$2,818,520	\$3,443,258	\$3,858,061	\$5,567,801	\$4,339,638
Periodic Monitoring	\$2,779,241	\$2,223,544	\$7,228,443	\$12,837,254	\$30,201,298	\$26,384,718
Respirator Protection	\$1,397,418	\$3,173,766	\$11,934,130	\$34,232,381	\$63,735,746	\$116,546,820
PPE (supplied prior to reg.)	\$1,293,887	\$1,244,297	\$1,244,297	\$1,194,707	\$1,194,707	\$1,014,309
PPE (not supplied prior to reg.)	\$6,592,356	\$5,995,559	\$5,995,559	\$5,398,761	\$5,398,761	\$550,721
Hygiene Areas	\$3,122,600	\$3,114,200	\$3,114,200	\$3,066,200	\$3,066,200	\$207,300
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$1,102,300	\$2,112,155	\$6,902,085	\$11,405,396	\$19,679,599	\$18,872,297
Communication of Hazards	\$7,287,787	\$7,287,987	\$7,288,387	\$7,290,087	\$7,292,487	\$7,295,807
Recordkeeping	\$707,500	\$707,500	\$707,500	\$707,500	\$707,500	\$707,500
<b>Total Cost</b>	<b>\$34,012,607</b>	<b>\$40,533,980</b>	<b>\$77,823,435</b>	<b>\$149,101,107</b>	<b>\$287,655,425</b>	<b>\$396,548,673</b>

**Table III.9. Estimated Annualized Compliance Costs in Government Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 7%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$324	\$22,200	\$82,680	\$407,147	\$1,248,098	\$1,417,879
Initial Exposure Assessment	\$234,037	\$241,697	\$264,036	\$310,650	\$408,805	\$529,741
Periodic Monitoring	\$263,839	\$309,286	\$856,365	\$1,095,086	\$1,898,241	\$2,753,377
Respirator Protection	\$23,503	\$26,879	\$152,939	\$168,817	\$247,840	\$384,229
PPE (supplied prior to reg.)	\$298,506	\$298,506	\$298,506	\$298,506	\$298,506	\$292,829
PPE (not supplied prior to reg.)	\$48,096	\$48,096	\$48,096	\$48,096	\$48,096	\$0
Hygiene Areas	\$108,200	\$108,200	\$108,200	\$108,200	\$108,200	\$77,500
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$107,701	\$72,289	\$175,705	\$340,914	\$644,933	\$682,147
Communication of Hazards	\$773,284	\$938,525	\$938,625	\$939,025	\$939,425	\$939,655
Recordkeeping	\$58,710	\$59,200	\$59,200	\$59,200	\$59,200	\$59,200
<b>Total Cost</b>	<b>\$1,916,200</b>	<b>\$2,124,878</b>	<b>\$2,984,352</b>	<b>\$3,775,641</b>	<b>\$5,901,344</b>	<b>\$7,136,556</b>

**Table III.10. Estimated Total Annualized Compliance Costs Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 7%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$27,254,895	\$55,266,244	\$114,228,662	\$274,563,256	\$466,012,632	\$1,011,793,069
Initial Exposure Assessment	\$12,530,493	\$12,488,064	\$13,815,677	\$14,204,297	\$17,249,766	\$16,789,545
Periodic Monitoring	\$11,300,614	\$13,850,201	\$24,494,795	\$58,296,013	\$147,299,563	\$169,933,510
Respirator Protection	\$11,245,040	\$36,634,677	\$69,355,289	\$152,353,487	\$312,409,999	\$517,648,026
PPE (supplied prior to reg.)	\$5,554,768	\$5,503,957	\$5,503,957	\$5,454,363	\$5,434,749	\$5,066,306
PPE (not supplied prior to reg.)	\$93,453,088	\$91,779,911	\$91,779,911	\$91,161,311	\$91,155,875	\$85,597,562
Hygiene Areas	\$13,001,400	\$12,900,700	\$12,900,700	\$12,850,000	\$12,840,700	\$9,880,700
Housekeeping	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050	\$25,197,050
Medical Surveillance	\$4,344,847	\$6,788,931	\$15,142,603	\$25,421,755	\$44,159,876	\$52,917,437
Communication of Hazards	\$17,881,354	\$18,020,404	\$18,031,507	\$18,134,752	\$18,434,375	\$18,535,343
Recordkeeping	\$2,100,220	\$2,100,510	\$2,100,210	\$2,099,650	\$2,099,650	\$2,099,350
<b>Total Cost</b>	<b>\$223,863,769</b>	<b>\$280,530,649</b>	<b>\$392,550,362</b>	<b>\$679,735,933</b>	<b>\$1,142,294,235</b>	<b>\$1,915,457,899</b>

Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$12,930,420	\$19,098,334	\$32,028,753	\$16,271,121	\$28,602,745	\$44,873,866
2A	Welding (general industry)	\$5,206,449	\$9,211,144	\$14,417,593	\$8,005,809	\$22,703,285	\$30,709,094
2B	Welding (maritime industry)	\$107,615	\$3,193,998	\$3,301,612	\$353,027	\$15,098,112	\$15,451,139
2C	Welding (construction industry)	\$5,547,883	\$5,859,302	\$11,407,186	\$8,591,665	\$9,668,242	\$18,259,907
2D	Welding (government)	\$0	\$349,153	\$349,153	\$0	\$363,165	\$363,165
2A1	Welding (general industry - carbon steel)	\$2,258,911	\$3,120,885	\$5,379,796	\$2,282,809	\$3,204,837	\$5,487,646
2B1	Welding (maritime industry - carbon steel)	\$82,511	\$116,713	\$199,224	\$82,511	\$118,688	\$201,199
2C1	Welding (construction industry - carbon steel)	\$2,247,005	\$1,437,432	\$3,684,437	\$2,316,936	\$1,648,866	\$3,965,802
3A	Painting (general industry - aerospace)	\$592,021	\$16,831,914	\$17,423,935	\$645,057	\$18,621,479	\$19,266,536
3A1	Painting (general industry - auto repair)	\$30,372,966	\$45,789,724	\$76,162,691	\$31,355,092	\$48,832,910	\$80,188,002
3A2	Painting (general industry - coil coating)	\$252,559	\$3,197,099	\$3,449,658	\$252,559	\$3,149,699	\$3,402,258
3B	Painting (maritime industry)	\$4,638,020	\$4,820,957	\$9,458,976	\$4,927,835	\$5,298,534	\$10,226,369
3C	Painting (construction industry)	\$2,730,583	\$1,485,664	\$4,216,247	\$3,787,781	\$1,745,053	\$5,532,834
3D	Painting (government)	\$0	\$1,158,554	\$1,158,554	\$0	\$1,381,065	\$1,381,065
4	Chromate (chromite ore) production	\$0	\$16,695	\$16,695	\$0	\$16,695	\$16,695
5	Chromate Pigment Producers	\$4,115	\$100,540	\$104,655	\$5,332	\$101,899	\$107,231
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$15,548	\$15,548	\$0	\$22,850	\$22,850
7	Chromium Catalyst Producers	\$0	\$821,864	\$821,864	\$0	\$1,862,163	\$1,862,163
8	Paint and Coatings Producers	\$3,452,437	\$1,848,785	\$5,301,222	\$3,480,082	\$1,822,046	\$5,302,128
9	Printing Ink Producers	\$28,144	\$15,506	\$43,649	\$28,144	\$15,506	\$43,649
10	Plastic Colorant Producers and Users	\$139,751	\$415,565	\$555,316	\$188,473	\$571,852	\$760,325
11	Plating Mixture Producers	\$15,194	\$27,477	\$42,672	\$15,194	\$27,477	\$42,672
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$9,222	\$9,222	\$0	\$16,691	\$16,691
14	Steel Mills (stainless)	\$77,215	\$913,317	\$990,532	\$77,237	\$574,916	\$652,153
14A	Steel Mills (carbon)	\$224,838	\$1,902,294	\$2,127,132	\$226,900	\$2,674,994	\$2,901,894
14B	reshaping (Alloy and Stainless)	\$171,974	\$209,198	\$381,172	\$171,974	\$209,198	\$381,172
15	Iron and Steel Foundries	\$633,804	\$2,033,029	\$2,666,832	\$633,804	\$2,529,889	\$3,163,693
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$12,281	\$144,383	\$156,665	\$13,622	\$160,458	\$174,081
18	Chromium Sulfate Producers	\$52,498	\$0	\$52,498	\$52,498	\$0	\$52,498

Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	5 ug/m <sup>3</sup> > 20 employees	< 20 employees	1 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$19,842,166	\$47,548,499	\$67,390,665	\$120,788,086	\$143,176,671
2A	Welding (general industry)	\$11,567,291	\$41,875,114	\$53,442,406	\$23,587,903	\$97,966,550
2B	Welding (maritime industry)	\$424,696	\$18,211,768	\$18,636,465	\$557,663	\$24,628,805
2C	Welding (construction industry)	\$17,299,064	\$22,179,327	\$39,478,391	\$33,517,162	\$76,633,376
2D	Welding (government)	\$0	\$979,421	\$979,421	\$0	\$1,242,797
2A1	Welding (general industry - carbon steel)	\$4,170,768	\$11,707,777	\$15,878,544	\$19,709,741	\$71,866,321
2B1	Welding (maritime industry - carbon steel)	\$86,769	\$325,765	\$412,533	\$197,978	\$2,190,544
2C1	Welding (construction industry - carbon steel)	\$6,897,716	\$7,197,585	\$14,095,301	\$21,144,345	\$43,171,500
3A	Painting (general industry - aerospace)	\$682,285	\$20,464,316	\$21,146,601	\$784,780	\$26,234,356
3A1	Painting (general industry - auto repair)	\$31,876,390	\$50,045,613	\$81,922,003	\$31,917,522	\$82,322,754
3A2	Painting (general industry - coil coating)	\$269,049	\$3,314,464	\$3,583,513	\$288,264	\$3,771,483
3B	Painting (maritime industry)	\$5,126,987	\$6,230,118	\$11,357,105	\$6,817,016	\$16,516,973
3C	Painting (construction industry)	\$4,054,075	\$2,235,064	\$6,289,139	\$9,952,258	\$13,601,688
3D	Painting (government)	\$0	\$1,548,310	\$1,548,310	\$0	\$2,050,144
4	Chromate (chromite ore) production	\$0	\$34,967	\$34,967	\$0	\$306,182
5	Chromate Pigment Producers	\$5,964	\$111,766	\$117,730	\$4,159	\$110,718
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$22,884	\$22,884	\$0	\$23,042
7	Chromium Catalyst Producers	\$0	\$1,947,307	\$1,947,307	\$0	\$2,672,101
8	Paint and Coatings Producers	\$3,526,159	\$1,896,910	\$5,423,070	\$5,411,636	\$8,509,009
9	Printing Ink Producers	\$61,187	\$37,628	\$98,814	\$122,320	\$248,683
10	Plastic Colorant Producers and Users	\$273,195	\$984,317	\$1,257,512	\$409,107	\$1,805,948
11	Plating Mixture Producers	\$25,066	\$50,901	\$75,966	\$68,237	\$254,692
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$26,979	\$26,979	\$0	\$53,114
14	Steel Mills (stainless)	\$106,069	\$2,669,108	\$2,775,177	\$1,727,007	\$9,111,625
14A	Steel Mills (carbon)	\$268,521	\$1,659,981	\$1,928,503	\$392,929	\$9,648,169
14B	reshaping (Alloy and Stainless)	\$260,408	\$412,077	\$672,485	\$304,166	\$1,015,724
15	Iron and Steel Foundries	\$1,768,995	\$8,491,331	\$10,260,326	\$1,495,495	\$8,759,909
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$18,576	\$209,071	\$227,648	\$21,500	\$269,144
18	Chromium Sulfate Producers	\$59,020	\$0	\$59,020	\$34,093	\$34,093



Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$38,062,919	\$151,519,736	\$189,582,655	\$596,490,307
2A	Welding (general industry)	\$32,984,924	\$109,586,518	\$142,571,442	\$160,211,033
2B	Welding (maritime industry)	\$969,567	\$40,242,188	\$41,211,755	\$54,271,643
2C	Welding (construction industry)	\$50,666,418	\$64,012,627	\$114,679,045	\$144,315,182
2D	Welding (government)	\$0	\$2,384,734	\$2,384,734	\$2,644,520
2A1	Welding (general industry - carbon steel)	\$55,609,655	\$147,324,374	\$202,934,029	\$346,966,937
2B1	Welding (maritime industry - carbon steel)	\$665,459	\$3,074,507	\$3,739,966	\$5,621,120
2C1	Welding (construction industry - carbon steel)	\$62,863,631	\$67,528,700	\$130,392,332	\$223,484,977
3A	Painting (general industry - aerospace)	\$885,390	\$29,882,388	\$30,767,778	\$37,524,077
3A1	Painting (general industry - auto repair)	\$35,794,443	\$56,641,342	\$92,435,785	\$118,597,755
3A2	Painting (general industry - coil coating)	\$316,764	\$3,475,806	\$3,792,570	\$3,888,276
3B	Painting (maritime industry)	\$7,587,970	\$10,998,858	\$18,586,828	\$21,486,400
3C	Painting (construction industry)	\$15,823,043	\$4,825,087	\$20,648,130	\$17,332,835
3D	Painting (government)	\$0	\$2,842,353	\$2,842,353	\$2,986,102
4	Chromate (chromite ore) production	\$0	\$676,919	\$676,919	\$1,064,918
5	Chromate Pigment Producers	\$4,159	\$203,458	\$207,616	\$269,530
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$35,424	\$35,424	\$176,847
7	Chromium Catalyst Producers	\$0	\$2,715,278	\$2,715,278	\$3,119,043
8	Paint and Coatings Producers	\$6,175,997	\$3,584,163	\$9,760,160	\$11,968,192
9	Printing Ink Producers	\$137,148	\$160,411	\$297,559	\$371,536
10	Plastic Colorant Producers and Users	\$413,921	\$1,418,662	\$1,832,583	\$2,121,996
11	Plating Mixture Producers	\$79,272	\$240,627	\$319,899	\$839,201
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$49,807	\$49,807	\$105,948
14	Steel Mills (stainless)	\$2,082,036	\$18,181,952	\$20,263,988	\$19,815,603
14A	Steel Mills (carbon)	\$6,511,571	\$47,179,006	\$53,690,577	\$63,564,137
14B	reshaping (Alloy and Stainless)	\$343,641	\$946,685	\$1,290,327	\$1,304,517
15	Iron and Steel Foundries	\$2,262,055	\$10,441,957	\$12,704,011	\$37,869,355
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$21,512	\$247,318	\$268,831	\$268,655
18	Chromium Sulfate Producers	\$34,093	\$0	\$34,093	\$52,124

Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)			
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>	
	< 20 employees	> 20 employees	Total	Total
19 Chemical Distributors	\$3,225,329	\$631,303	\$3,856,632	\$3,856,632
20 Textile Dyeing	\$1,054,382	\$3,115,890	\$4,170,272	\$4,170,272
21 Colored Glass Producers	\$21,380	\$20,801	\$42,180	\$42,180
21A Fiber, Flat, and Container Glass	\$47,471	\$978,995	\$1,026,466	\$1,041,277
22 Printing	\$364,668	\$483,317	\$847,985	\$847,985
23 Leather Tanning	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$746,548	\$746,548	\$815,748
24A Chromium Catalyst Users (Service)	\$29,833	\$159,863	\$189,715	\$245,072
25 Refractory Brick Producers	\$0	\$63,388	\$63,388	\$63,388
26A Woodworking (general industry)	\$473,597	\$801,075	\$1,274,672	\$903,350
26B Woodworking (maritime industry)	\$10,037	\$12,153	\$22,190	\$22,190
26C Woodworking (construction industry)	\$10,118,490	\$3,502,047	\$13,620,537	\$11,635,775
26D Woodworking (government)	\$0	\$162,446	\$162,446	\$129,369
27 Solid Waste Incineration	\$86,752	\$385,673	\$472,424	\$472,424
27A Incinerators (government)	\$0	\$42,722	\$42,722	\$42,722
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$114,579	\$114,579	\$85,316
31B Construction (Refractory Repair)	\$257,093	\$426,510	\$683,603	\$739,064
31C Construction (Hazardous Waste Work)	\$245,943	\$94,271	\$340,214	\$340,214
31CG Haz. Waste (government)	\$0	\$170,153	\$170,153	\$170,153
31D Construction (Industrial Rehabilitation)	\$12,414	\$48,030	\$60,445	\$60,445
31DG Industrial Rehab. (government)	\$0	\$33,233	\$33,233	\$38,466
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)	\$61,728,987	\$113,223,975	\$174,952,962	\$211,970,942
Total (Maritime Industry)	\$4,838,183	\$8,143,820	\$12,982,003	\$25,900,897
Total (Construction Industry)	\$21,159,411	\$12,853,256	\$34,012,668	\$40,534,041
Total (Government)	\$0	\$1,916,262	\$1,916,262	\$2,124,940
Total Industry	\$87,726,581	\$136,137,313	\$223,863,894	\$280,530,820

Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	Total		
19	Chemical Distributors	\$3,225,329	\$631,303	\$3,856,632	\$3,225,329	\$631,303	\$3,856,632
20	Textile Dyeing	\$1,054,382	\$3,115,890	\$4,170,272	\$1,054,382	\$3,115,890	\$4,170,272
21	Colored Glass Producers	\$21,414	\$36,279	\$57,693	\$21,414	\$19,158	\$40,571
21A	Fiber, Flat, and Container Glass	\$51,534	\$1,328,408	\$1,379,941	\$68,440	\$2,490,813	\$2,559,253
22	Printing	\$364,668	\$483,317	\$847,985	\$364,668	\$483,317	\$847,985
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$815,748	\$815,748	\$0	\$846,448	\$846,448
24A	Chromium Catalyst Users (Service)	\$40,465	\$280,272	\$320,737	\$40,970	\$303,478	\$344,448
25	Refractory Brick Producers	\$0	\$63,388	\$63,388	\$0	\$91,599	\$91,599
26A	Woodworking (general industry)	\$313,148	\$590,203	\$903,350	\$318,715	\$600,613	\$919,328
26B	Woodworking (maritime industry)	\$10,037	\$12,153	\$22,190	\$10,037	\$12,153	\$22,190
26C	Woodworking (construction industry)	\$13,126,996	\$3,416,019	\$16,543,015	\$11,697,301	\$2,176,174	\$13,873,475
26D	Woodworking (government)	\$0	\$205,342	\$205,342	\$0	\$161,502	\$161,502
27	Solid Waste Incineration	\$86,752	\$385,673	\$472,424	\$226,490	\$1,254,513	\$1,481,003
27A	Incinerators (government)	\$0	\$42,722	\$42,722	\$0	\$112,641	\$112,641
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$134,042	\$134,042	\$0	\$182,898	\$182,898
31B	Construction (Refractory Repair)	\$498,693	\$518,298	\$1,016,991	\$799,993	\$620,476	\$1,420,469
31C	Construction (Hazardous Waste Work)	\$245,943	\$94,271	\$340,214	\$245,943	\$94,271	\$340,214
31CG	Haz. Waste (government)	\$0	\$170,153	\$170,153	\$0	\$170,153	\$170,153
31D	Construction (Industrial Rehabilitation)	\$12,414	\$48,030	\$60,445	\$12,414	\$48,030	\$60,445
31DG	Industrial Rehab. (government)	\$0	\$38,466	\$38,466	\$0	\$38,466	\$38,466
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$79,938,799	\$201,375,532	\$281,314,331	\$113,987,848	\$369,512,879	\$483,500,727
Total (Maritime Industry)		\$5,648,489	\$24,779,803	\$30,428,293	\$7,582,693	\$35,775,819	\$43,358,512
Total (Construction Industry)		\$42,134,902	\$36,688,594	\$78,823,495	\$77,369,418	\$71,731,750	\$149,101,167
Total (Government)		\$0	\$2,984,414	\$2,984,414	\$0	\$3,775,703	\$3,775,703
Total Industry		\$127,722,189	\$264,828,344	\$392,550,533	\$198,939,959	\$480,796,151	\$679,736,109

Table III.11 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	Total		
19	Chemical Distributors	\$3,225,329	\$631,303	\$3,856,632	\$3,225,329	\$631,303	\$3,856,632
20	Textile Dyeing	\$1,496,586	\$5,127,591	\$6,624,177	\$2,216,700	\$7,778,938	\$9,995,638
21	Colored Glass Producers	\$21,414	\$19,158	\$40,571	\$21,414	\$34,459	\$55,873
21A	Fiber, Flat, and Container Glass	\$68,440	\$2,554,897	\$2,623,337	\$80,027	\$4,480,905	\$4,560,932
22	Printing	\$364,668	\$483,317	\$847,985	\$364,668	\$483,317	\$847,985
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$1,141,951	\$1,141,951	\$0	\$1,326,297	\$1,326,297
24A	Chromium Catalyst Users (Service)	\$41,779	\$329,931	\$371,710	\$42,131	\$368,281	\$410,412
25	Refractory Brick Producers	\$0	\$76,750	\$76,750	\$0	\$197,495	\$197,495
26A	Woodworking (general industry)	\$318,715	\$600,613	\$919,328	\$318,715	\$600,613	\$919,328
26B	Woodworking (maritime industry)	\$10,037	\$12,153	\$22,190	\$16,893	\$26,439	\$43,332
26C	Woodworking (construction industry)	\$16,225,501	\$3,726,789	\$19,952,291	\$6,429,845	\$1,825,310	\$8,255,155
26D	Woodworking (government)	\$0	\$267,874	\$267,874	\$0	\$129,412	\$129,412
27	Solid Waste Incineration	\$263,190	\$1,495,706	\$1,758,896	\$81,116	\$358,135	\$439,251
27A	Incinerators (government)	\$0	\$130,941	\$130,941	\$0	\$39,904	\$39,904
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$684,114	\$684,114	\$0	\$1,150,446	\$1,150,446
31B	Construction (Refractory Repair)	\$874,693	\$644,776	\$1,519,469	\$874,693	\$726,325	\$1,601,018
31C	Construction (Hazardous Waste Work)	\$293,467	\$110,307	\$403,774	\$1,055,402	\$443,720	\$1,499,122
31CG	Haz. Waste (government)	\$0	\$237,038	\$237,038	\$0	\$1,298,215	\$1,298,215
31D	Construction (Industrial Rehabilitation)	\$12,414	\$48,030	\$60,445	\$12,414	\$48,030	\$60,445
31DG	Industrial Rehab. (government)	\$0	\$38,466	\$38,466	\$0	\$38,466	\$38,466
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$187,519,619	\$597,657,161	\$785,176,780	\$245,977,692	\$1,184,372,583	\$1,430,350,276
	Total (Maritime Industry)	\$9,233,033	\$54,327,706	\$63,560,739	\$11,122,488	\$70,300,008	\$81,422,495
	Total (Construction Industry)	\$146,759,168	\$140,896,317	\$287,655,486	\$189,023,048	\$207,525,686	\$396,548,734
	Total (Government)	\$0	\$5,901,407	\$5,901,407	\$0	\$7,136,619	\$7,136,619
	Total Industry	\$343,511,821	\$798,782,590	\$1,142,294,411	\$446,123,228	\$1,469,334,895	\$1,915,458,123

Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		Total
1	Electroplating	\$598,897	\$6,985,885	\$7,584,781	\$1,197,793	\$13,971,769	\$15,169,562
2A	Welding (general industry)	\$1,188,000	\$4,250,400	\$5,438,400	\$2,869,000	\$10,301,400	\$13,170,400
2B	Welding (maritime industry)	\$63,352	\$2,424,783	\$2,488,135	\$100,038	\$3,121,654	\$3,221,692
2C	Welding (construction industry)	\$2,970,768	\$3,849,635	\$6,820,403	\$4,825,707	\$6,252,954	\$11,078,661
2D	Welding (government)	\$0	\$324	\$324	\$0	\$9,704	\$9,704
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$9,253	\$480,380	\$489,633	\$26,829	\$771,390	\$798,219
3A1	Painting (general industry - auto repair)	\$776,650	\$1,587,600	\$2,364,250	\$2,444,070	\$5,086,800	\$7,530,870
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0	\$0
3B	Painting (maritime industry)	\$38,004	\$22,184	\$60,188	\$54,683	\$32,315	\$86,999
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$36,867	\$36,867	\$0	\$36,867	\$36,867
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$622,024	\$622,024	\$0	\$1,681,203	\$1,681,203
8	Paint and Coatings Producers	\$947,630	\$14,100	\$961,731	\$989,176	\$40,538	\$1,029,714
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$702	\$10,940	\$11,642	\$702	\$38,620	\$39,321
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$2,063	\$32,794	\$34,856
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$376,517	\$376,517	\$0	\$564,775	\$564,775
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0

Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		Total
1	Electroplating	\$2,595,219	\$30,398,295	\$32,993,514	\$94,995,565	\$100,449,631	
2A	Welding (general industry)	\$5,696,700	\$20,497,900	\$26,194,600	\$38,587,100	\$49,347,100	
2B	Welding (maritime industry)	\$118,801	\$3,699,083	\$3,817,884	\$6,890,961	\$7,094,097	
2C	Welding (construction industry)	\$8,483,666	\$14,042,444	\$22,526,110	\$18,844,100	\$46,134,725	
2D	Welding (government)	\$0	\$70,184	\$70,184	\$362,519	\$362,519	
2A1	Welding (general industry - carbon steel)	\$1,117,500	\$4,012,500	\$5,130,000	\$3,349,500	\$15,360,000	
2B1	Welding (maritime industry - carbon steel)	\$2,381	\$106,701	\$109,082	\$9,239	\$405,116	
2C1	Welding (construction industry - carbon steel)	\$2,896,884	\$3,731,790	\$6,628,674	\$8,672,992	\$19,849,127	
3A	Painting (general industry - aerospace)	\$40,627	\$1,147,770	\$1,188,397	\$80,433	\$2,477,243	
3A1	Painting (general industry - auto repair)	\$3,429,940	\$7,288,400	\$10,698,340	\$3,818,265	\$11,880,465	
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$11,600	\$92,800	
3B	Painting (maritime industry)	\$78,090	\$62,060	\$140,150	\$177,314	\$339,058	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$264,857	\$264,857	
5	Chromate Pigment Producers	\$0	\$36,867	\$36,867	\$0	\$43,400	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	
7	Chromium Catalyst Producers	\$0	\$1,693,578	\$1,693,578	\$0	\$1,827,354	
8	Paint and Coatings Producers	\$989,176	\$40,538	\$1,029,714	\$2,908,177	\$4,169,897	
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	
11	Plating Mixture Producers	\$0	\$0	\$0	\$52,800	\$211,200	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$6,400	\$6,400	\$0	\$23,900	
14	Steel Mills (stainless)	\$1,078	\$41,549	\$42,627	\$1,631,398	\$7,220,674	
14A	Steel Mills (carbon)	\$7,288	\$115,883	\$123,171	\$39,070	\$660,282	
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$99,376	\$455,990	
15	Iron and Steel Foundries	\$0	\$940,658	\$940,658	\$373,900	\$2,570,484	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	

Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total		
		< 20 employees	0.5 ug/m <sup>3</sup> ≥ 20 employees	0.25 ug/m <sup>3</sup> > 20 employees			
1	Electroplating	\$6,052,963	\$102,220,149	\$19,143,291	\$108,273,112	\$479,686,662	\$498,829,953
2A	Welding (general industry)	\$14,843,900	\$52,669,100	\$16,266,800	\$67,513,000	\$57,758,600	\$74,025,400
2B	Welding (maritime industry)	\$312,950	\$11,191,872	\$414,212	\$11,504,822	\$15,401,896	\$15,816,108
2C	Welding (construction industry)	\$28,863,105	\$40,053,269	\$33,290,098	\$68,916,374	\$48,593,539	\$81,863,637
2D	Welding (government)	\$0	\$1,203,470	\$0	\$1,203,470	\$1,325,648	\$1,325,648
2A1	Welding (general industry - carbon steel)	\$14,006,600	\$50,223,100	\$22,446,300	\$64,229,700	\$80,696,900	\$103,143,200
2B1	Welding (maritime industry - carbon steel)	\$15,285	\$783,211	\$17,499	\$798,496	\$946,205	\$963,704
2C1	Welding (construction industry - carbon steel)	\$34,378,425	\$44,290,619	\$57,921,271	\$78,669,044	\$74,618,934	\$132,540,205
3A	Painting (general industry - aerospace)	\$90,549	\$2,900,410	\$100,347	\$2,990,959	\$3,354,325	\$3,454,672
3A1	Painting (general industry - auto repair)	\$3,818,265	\$8,062,200	\$10,997,840	\$11,880,465	\$28,600,200	\$39,598,040
3A2	Painting (general industry - coil coating)	\$46,400	\$243,600	\$46,400	\$290,000	\$243,600	\$290,000
3B	Painting (maritime industry)	\$203,055	\$197,796	\$232,484	\$400,851	\$230,585	\$463,069
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$590,891	\$0	\$590,891	\$593,891	\$593,891
5	Chromate Pigment Producers	\$0	\$43,400	\$0	\$43,400	\$43,400	\$43,400
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$1,827,354	\$0	\$1,827,354	\$1,856,354	\$1,856,354
8	Paint and Coatings Producers	\$3,672,062	\$1,747,829	\$4,759,628	\$5,419,891	\$2,439,917	\$7,199,544
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$52,800	\$158,400	\$236,800	\$211,200	\$527,400	\$764,200
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$23,900	\$0	\$23,900	\$24,100	\$24,100
14	Steel Mills (stainless)	\$1,790,663	\$6,167,153	\$1,836,787	\$7,957,816	\$6,799,516	\$8,636,303
14A	Steel Mills (carbon)	\$5,794,288	\$19,693,199	\$5,953,559	\$25,487,487	\$21,310,467	\$27,264,026
14B	reshaping (Alloy and Stainless)	\$120,043	\$459,953	\$144,019	\$579,996	\$646,822	\$790,842
15	Iron and Steel Foundries	\$590,087	\$3,166,982	\$1,099,825	\$3,757,069	\$4,568,760	\$5,668,585
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0

Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$12,312	\$12,312	\$12,312
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$595,915	\$148,879	\$744,793
27	Solid Waste Incineration	\$0	\$0	\$0	\$12,496	\$12,496
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$10,800	\$10,800
31B	Construction (Refractory Repair)	\$0	\$0	\$24,900	\$8,100	\$33,000
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$3,521,132	\$14,364,713	\$17,885,845	\$7,529,633	\$40,078,900
Total (Maritime Industry)		\$101,356	\$2,448,967	\$2,548,323	\$154,721	\$3,308,691
Total (Construction Industry)		\$2,970,768	\$3,849,635	\$6,820,403	\$5,446,522	\$11,856,454
Total (Government)		\$0	\$324	\$324	\$0	\$22,200
Total Industry		\$6,593,256	\$20,661,639	\$27,254,895	\$13,130,875	\$55,266,244



Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	
21	Colored Glass Producers	\$0	\$0	\$0	\$1,939	\$1,939	
21A	Fiber, Flat, and Container Glass	\$0	\$24,624	\$0	\$77,292	\$77,292	
22	Printing	\$0	\$0	\$0	\$0	\$0	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$0	
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0	
26A	Woodworking (general industry)	\$0	\$0	\$0	\$10,410	\$15,977	
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	
26C	Woodworking (construction industry)	\$595,915	\$148,879	\$2,185,020	\$545,888	\$2,730,908	
26D	Woodworking (government)	\$0	\$12,496	\$0	\$44,628	\$44,628	
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$10,800	\$0	\$56,592	\$56,592	
31B	Construction (Refractory Repair)	\$49,800	\$16,200	\$298,800	\$97,200	\$396,000	
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$13,877,528	\$66,235,762	\$80,113,289	\$168,622,925	\$197,207,077	
Total (Maritime Industry)		\$199,272	\$3,867,844	\$4,067,116	\$7,448,582	\$7,838,271	
Total (Construction Industry)		\$12,026,265	\$17,939,312	\$29,965,577	\$39,109,849	\$69,110,761	
Total (Government)		\$0	\$82,680	\$82,680	\$407,147	\$407,147	
Total Industry		\$26,103,064	\$88,125,598	\$114,228,662	\$215,588,503	\$274,563,256	

Table III.12 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total	
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	> 20 employees		
					0.25 ug/m <sup>3</sup> > 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$1,939	\$1,939	\$1,939	\$1,939
21A	Fiber, Flat, and Container Glass	\$0	\$77,292	\$77,292	\$0	\$99,864
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$115,324
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$12,790	\$12,790	\$0	\$22,331
26A	Woodworking (general industry)	\$5,567	\$10,410	\$15,977	\$5,567	\$15,977
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$2,185,020	\$545,888	\$2,730,908	\$4,569,191	\$5,710,722
26D	Woodworking (government)	\$0	\$44,628	\$44,628	\$0	\$92,231
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$64,800	\$64,800	\$0	\$64,800
31B	Construction (Refractory Repair)	\$373,500	\$121,500	\$495,000	\$373,500	\$495,000
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$50,884,187	\$250,364,851	\$301,249,039	\$83,037,162	\$689,465,583
Total (Maritime Industry)		\$531,290	\$12,172,879	\$12,704,169	\$664,195	\$17,242,881
Total (Construction Industry)		\$65,800,050	\$85,011,276	\$150,811,326	\$96,154,060	\$220,629,564
Total (Government)		\$0	\$1,248,098	\$1,248,098	\$0	\$1,417,879
Total Industry		\$117,215,527	\$348,797,104	\$466,012,632	\$179,855,417	\$1,011,793,069

Table III.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	≥ 20 employees	20 ug/m <sup>3</sup>	10 ug/m <sup>3</sup>	
1	Electroplating	\$930,834	\$937,437	\$1,868,271	\$1,868,271	\$1,868,271
2A	Welding (general industry)	\$915,873	\$946,999	\$1,862,872	\$1,862,872	\$1,862,872
2B	Welding (maritime industry)	\$26,687	\$32,323	\$59,010	\$59,010	\$59,010
2C	Welding (construction industry)	\$188,168	\$26,777	\$214,945	\$214,945	\$214,945
2D	Welding (government)	\$0	\$71,233	\$71,233	\$71,233	\$71,233
2A1	Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$2,385,283	\$2,385,283	\$2,385,283
2B1	Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$127,460	\$127,460	\$127,460
2C1	Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$306,615	\$306,615	\$306,615
3A	Painting (general industry - aerospace)	\$21,442	\$20,682	\$42,124	\$42,124	\$42,124
3A1	Painting (general industry - auto repair)	\$242,578	\$22,321	\$264,898	\$264,898	\$264,898
3A2	Painting (general industry - coil coating)	\$2,211	\$13,749	\$15,960	\$15,960	\$15,960
3B	Painting (maritime industry)	\$92,574	\$37,727	\$130,301	\$130,301	\$130,301
3C	Painting (construction industry)	\$172,527	\$56,470	\$228,997	\$228,997	\$228,997
3D	Painting (government)	\$0	\$27,923	\$27,923	\$27,923	\$27,923
4	Chromate (chromite ore) production	\$0	\$2,229	\$2,229	\$2,229	\$2,229
5	Chromate Pigment Producers	\$105	\$2,929	\$3,035	\$3,035	\$3,305
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,167	\$1,167	\$1,167	\$1,665
7	Chromium Catalyst Producers	\$0	\$9,057	\$9,057	\$9,057	\$7,861
8	Paint and Coatings Producers	\$35,682	\$22,700	\$58,382	\$58,382	\$55,150
9	Printing Ink Producers	\$5,926	\$3,673	\$9,599	\$9,599	\$9,599
10	Plastic Colorant Producers and Users	\$15,821	\$68,998	\$84,820	\$84,820	\$108,696
11	Plating Mixture Producers	\$1,295	\$2,012	\$3,308	\$3,308	\$3,308
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$3,947	\$3,947	\$3,947	\$4,459
14	Steel Mills (stainless)	\$7,232	\$87,615	\$94,847	\$94,847	\$94,847
14A	Steel Mills (carbon)	\$21,272	\$262,844	\$284,116	\$284,116	\$284,116
14B	reshaping (Alloy and Stainless)	\$11,951	\$24,955	\$36,906	\$36,906	\$36,906
15	Iron and Steel Foundries	\$39,365	\$273,844	\$313,208	\$313,208	\$334,964
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,519	\$15,081	\$16,599	\$16,599	\$18,436
18	Chromium Sulfate Producers	\$2,222	\$0	\$2,222	\$2,222	\$2,222

Table iii.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		<20 employees	>20 employees	Total	<20 employees	>20 employees	Total
1	Electroplating	\$930,834	\$937,437	\$1,868,271	\$930,834	\$937,437	\$1,868,271
2A	Welding (general industry)	\$915,873	\$946,999	\$1,862,872	\$915,873	\$946,999	\$1,862,872
2B	Welding (maritime industry)	\$26,687	\$32,323	\$59,010	\$26,687	\$32,323	\$59,010
2C	Welding (construction industry)	\$188,168	\$26,777	\$214,945	\$188,168	\$26,777	\$214,945
2D	Welding (government)	\$0	\$71,233	\$71,233	\$0	\$71,233	\$71,233
2A1	Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$2,385,283	\$1,115,592	\$1,269,691	\$2,385,283
2B1	Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$127,460	\$57,702	\$69,758	\$127,460
2C1	Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$306,615	\$266,401	\$40,214	\$306,615
3A	Painting (general industry - aerospace)	\$30,255	\$32,385	\$62,640	\$38,043	\$41,697	\$79,740
3A1	Painting (general industry - auto repair)	\$174,692	\$15,088	\$189,780	\$157,536	\$13,266	\$170,801
3A2	Painting (general industry - coil coating)	\$2,695	\$15,713	\$18,408	\$3,108	\$17,436	\$20,544
3B	Painting (maritime industry)	\$104,078	\$59,297	\$163,375	\$190,444	\$94,891	\$285,336
3C	Painting (construction industry)	\$344,761	\$113,606	\$458,367	\$1,140,196	\$260,297	\$1,400,493
3D	Painting (government)	\$0	\$53,594	\$53,594	\$0	\$102,657	\$102,657
4	Chromate (chromite ore) production	\$0	\$3,054	\$3,054	\$0	\$2,627	\$2,627
5	Chromate Pigment Producers	\$290	\$4,026	\$4,316	\$105	\$3,570	\$3,675
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,665	\$1,665	\$0	\$1,665	\$1,665
7	Chromium Catalyst Producers	\$0	\$13,742	\$13,742	\$0	\$18,084	\$18,084
8	Paint and Coatings Producers	\$39,996	\$25,405	\$65,401	\$35,155	\$22,358	\$57,513
9	Printing Ink Producers	\$9,315	\$5,439	\$14,753	\$6,880	\$4,029	\$10,909
10	Plastic Colorant Producers and Users	\$34,772	\$126,348	\$161,120	\$53,594	\$176,878	\$230,472
11	Plating Mixture Producers	\$2,491	\$3,878	\$6,369	\$1,295	\$2,012	\$3,308
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,659	\$4,659	\$0	\$4,858	\$4,858
14	Steel Mills (stainless)	\$9,468	\$105,625	\$115,093	\$8,058	\$92,726	\$100,784
14A	Steel Mills (carbon)	\$21,272	\$262,844	\$284,116	\$34,399	\$373,044	\$407,443
14B	reshaping (Alloy and Stainless)	\$21,932	\$43,009	\$64,940	\$13,859	\$39,292	\$53,151
15	Iron and Steel Foundries	\$157,082	\$721,265	\$878,347	\$64,907	\$368,012	\$432,919
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$2,230	\$21,217	\$23,448	\$2,586	\$25,887	\$28,473
18	Chromium Sulfate Producers	\$2,734	\$0	\$2,734	\$2,222	\$0	\$2,222

Table III.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. - Sector	Proposed Permissible Exposure Limit (PEL)					
	0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
	< 20 employees	> 20 employees	Total	Total		
1 Electroplating	\$930,834	\$937,437	\$1,868,271	\$930,834	\$937,437	\$1,868,271
2A Welding (general industry)	\$915,873	\$946,999	\$1,862,872	\$915,873	\$946,999	\$1,862,872
2B Welding (maritime industry)	\$26,687	\$32,323	\$59,010	\$26,687	\$32,323	\$59,010
2C Welding (construction industry)	\$188,168	\$26,777	\$214,945	\$188,168	\$26,777	\$214,945
2D Welding (government)	\$0	\$71,233	\$71,233	\$0	\$71,233	\$71,233
2A1 Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$2,385,283	\$1,115,592	\$1,269,691	\$2,385,283
2B1 Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$127,460	\$57,702	\$69,758	\$127,460
2C1 Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$306,615	\$266,401	\$40,214	\$306,615
3A Painting (general industry - aerospace)	\$53,021	\$65,474	\$118,495	\$58,075	\$65,474	\$123,549
3A1 Painting (general industry - auto repair)	\$374,619	\$35,918	\$410,536	\$544,090	\$28,215	\$572,306
3A2 Painting (general industry - coil coating)	\$2,211	\$13,749	\$15,960	\$2,880	\$16,454	\$19,334
3B Painting (maritime industry)	\$243,523	\$108,887	\$352,410	\$333,534	\$146,162	\$479,695
3C Painting (construction industry)	\$1,886,824	\$413,852	\$2,300,675	\$1,446,265	\$310,243	\$1,756,508
3D Painting (government)	\$0	\$181,164	\$181,164	\$0	\$192,369	\$192,369
4 Chromate (chromite ore) production	\$0	\$4,464	\$4,464	\$0	\$6,685	\$6,685
5 Chromate Pigment Producers	\$105	\$4,994	\$5,099	\$105	\$5,179	\$5,284
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$2,676	\$2,676	\$0	\$6,833	\$6,833
7 Chromium Catalyst Producers	\$0	\$22,541	\$22,541	\$0	\$28,791	\$28,791
8 Paint and Coatings Producers	\$35,155	\$22,358	\$57,513	\$36,607	\$23,270	\$59,877
9 Printing Ink Producers	\$5,926	\$5,083	\$11,009	\$13,601	\$6,834	\$20,434
10 Plastic Colorant Producers and Users	\$54,192	\$178,828	\$233,020	\$55,829	\$215,063	\$270,893
11 Plating Mixture Producers	\$2,491	\$3,878	\$6,369	\$2,491	\$3,878	\$6,369
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$4,659	\$4,659	\$0	\$6,481	\$6,481
14 Steel Mills (stainless)	\$25,058	\$229,864	\$254,922	\$20,915	\$158,205	\$179,120
14A Steel Mills (carbon)	\$54,190	\$381,345	\$435,534	\$60,810	\$443,549	\$504,360
14B reshaping (Alloy and Stainless)	\$16,365	\$44,162	\$60,526	\$15,909	\$31,234	\$47,143
15 Iron and Steel Foundries	\$157,082	\$784,538	\$941,620	\$157,082	\$1,020,699	\$1,177,782
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$2,586	\$25,887	\$28,473	\$2,586	\$25,887	\$28,473
18 Chromium Sulfate Producers	\$2,222	\$0	\$2,222	\$3,845	\$0	\$3,845

Table iii.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	10 ug/m <sup>3</sup>		20 ug/m <sup>3</sup>		Total	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
19	Chemical Distributors	\$443,847	\$58,823	\$443,847	\$58,823	\$502,670
20	Textile Dyeing	\$204,804	\$234,781	\$204,804	\$234,781	\$439,585
21	Colored Glass Producers	\$6,496	\$12,124	\$6,496	\$12,124	\$18,619
21A	Fiber, Flat, and Container Glass	\$1,207	\$28,801	\$1,236	\$29,328	\$30,564
22	Printing	\$108,126	\$48,987	\$108,126	\$48,987	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$84,556	\$0	\$84,556	\$84,408
24A	Chromium Catalyst Users (Service)	\$1,039	\$7,627	\$1,039	\$7,627	\$18,618
25	Refractory Brick Producers	\$0	\$14,484	\$0	\$14,484	\$14,484
26A	Woodworking (general industry)	\$31,133	\$58,760	\$26,263	\$49,577	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$9,126	\$10,359	\$19,485
26C	Woodworking (construction industry)	\$1,694,891	\$420,940	\$1,469,986	\$367,250	\$1,837,236
26D	Woodworking (government)	\$0	\$33,925	\$0	\$29,597	\$29,597
27	Solid Waste Incineration	\$33,376	\$264,965	\$33,376	\$264,965	\$298,340
27A	Incinerators (government)	\$0	\$16,688	\$0	\$16,688	\$16,688
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$44,303	\$0	\$42,068	\$42,068
31B	Construction (Refractory Repair)	\$3,211	\$1,050	\$5,703	\$1,848	\$7,551
31C	Construction (Hazardous Waste Work)	\$36,196	\$11,016	\$36,196	\$11,016	\$47,213
31CG	Haz. Waste (government)	\$0	\$51,035	\$0	\$51,035	\$51,035
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$977	\$274	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$0	\$33,233	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$4,200,947	\$4,850,139	\$4,166,577	\$4,899,886	\$9,066,463
Total (Maritime Industry)		\$186,089	\$150,166	\$205,950	\$155,434	\$361,385
Total (Construction Industry)		\$2,352,372	\$556,742	\$2,290,865	\$527,655	\$2,818,520
Total (Government)		\$0	\$234,037	\$0	\$241,697	\$241,697
Total Industry		\$6,739,408	\$5,791,085	\$6,663,392	\$5,824,672	\$12,488,064

Table III.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$443,847	\$58,823	\$502,670	\$443,847	\$58,823	\$502,670
20	Textile Dyeing	\$204,804	\$234,781	\$439,585	\$204,804	\$234,781	\$439,585
21	Colored Glass Producers	\$6,496	\$13,690	\$20,185	\$6,496	\$12,124	\$18,619
21A	Fiber, Flat, and Container Glass	\$1,264	\$33,500	\$34,764	\$1,691	\$34,809	\$36,501
22	Printing	\$108,126	\$48,987	\$157,113	\$108,126	\$48,987	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$94,408	\$94,408	\$0	\$98,779	\$98,779
24A	Chromium Catalyst Users (Service)	\$1,039	\$27,545	\$28,584	\$1,039	\$27,545	\$28,584
25	Refractory Brick Producers	\$0	\$14,484	\$14,484	\$0	\$17,189	\$17,189
26A	Woodworking (general industry)	\$26,263	\$49,577	\$75,840	\$26,263	\$49,577	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$19,485	\$9,126	\$10,359	\$19,485
26C	Woodworking (construction industry)	\$1,899,795	\$474,631	\$2,374,426	\$1,469,986	\$367,250	\$1,837,236
26D	Woodworking (government)	\$0	\$38,254	\$38,254	\$0	\$29,597	\$29,597
27	Solid Waste Incineration	\$33,376	\$264,965	\$298,340	\$45,777	\$333,861	\$379,638
27A	Incinerators (government)	\$0	\$16,688	\$16,688	\$0	\$22,895	\$22,895
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$42,068	\$42,068	\$0	\$44,161	\$44,161
31B	Construction (Refractory Repair)	\$30,519	\$9,920	\$40,440	\$37,966	\$12,341	\$50,307
31C	Construction (Hazardous Waste Work)	\$36,196	\$11,016	\$47,213	\$36,196	\$11,016	\$47,213
31CG	Haz. Waste (government)	\$0	\$51,035	\$51,035	\$0	\$51,035	\$51,035
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$1,251	\$977	\$274	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$33,233	\$0	\$33,233	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$4,296,738	\$5,442,316	\$9,739,054	\$4,222,090	\$5,322,206	\$9,544,296
Total (Maritime Industry)		\$197,593	\$171,736	\$369,329	\$283,959	\$207,331	\$491,290
Total (Construction Industry)		\$2,766,819	\$676,439	\$3,443,258	\$3,139,891	\$718,170	\$3,858,061
Total (Government)		\$0	\$264,036	\$264,036	\$0	\$310,650	\$310,650
Total Industry		\$7,261,150	\$6,554,527	\$13,815,677	\$7,645,939	\$6,558,357	\$14,204,297

Table iii.13 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$443,847	\$58,823	\$502,670	\$443,847	\$502,670
20	Textile Dyeing	\$243,289	\$262,146	\$505,434	\$316,997	\$637,532
21	Colored Glass Producers	\$6,496	\$12,124	\$18,619	\$6,496	\$20,185
21A	Fiber, Flat, and Container Glass	\$1,691	\$37,016	\$38,708	\$1,748	\$37,583
22	Printing	\$108,126	\$48,987	\$157,113	\$108,126	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$140,197	\$140,197	\$0	\$175,749
24A	Chromium Catalyst Users (Service)	\$1,039	\$27,545	\$28,584	\$1,039	\$28,584
25	Refractory Brick Producers	\$0	\$15,082	\$15,082	\$0	\$27,440
26A	Woodworking (general industry)	\$26,263	\$49,577	\$75,840	\$26,263	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$19,485	\$9,126	\$19,485
26C	Woodworking (construction industry)	\$2,114,700	\$528,322	\$2,643,022	\$1,469,986	\$1,837,236
26D	Woodworking (government)	\$0	\$42,582	\$42,582	\$0	\$29,597
27	Solid Waste Incineration	\$51,002	\$377,244	\$428,246	\$33,376	\$298,340
27A	Incinerators (government)	\$0	\$25,501	\$25,501	\$0	\$16,688
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$72,238	\$72,238	\$0	\$89,494
31B	Construction (Refractory Repair)	\$37,966	\$12,341	\$50,307	\$37,966	\$50,307
31C	Construction (Hazardous Waste Work)	\$39,087	\$11,899	\$50,986	\$132,486	\$172,775
31CG	Haz. Waste (government)	\$0	\$55,092	\$55,092	\$0	\$186,621
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$1,251	\$977	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$33,233	\$0	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,629,275	\$6,085,520	\$10,714,796	\$4,875,019	\$11,234,516
	Total (Maritime Industry)	\$337,037	\$221,327	\$558,364	\$427,048	\$685,649
	Total (Construction Industry)	\$4,534,122	\$1,033,679	\$5,567,801	\$3,542,249	\$4,339,638
	Total (Government)	\$0	\$408,805	\$408,805	\$0	\$529,741
	Total Industry	\$9,500,435	\$7,749,331	\$17,249,766	\$8,844,317	\$16,789,545



Table III.14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1 Electroplating	\$1,087,029	\$657,510	\$1,744,540	\$3,549,377	\$1,726,959	\$5,276,335
2A Welding (general industry)	\$2,101,613	\$2,456,198	\$4,617,810	\$1,972,376	\$1,921,163	\$3,893,539
2B Welding (maritime industry)	\$0	\$2,754	\$2,754	\$0	\$2,754	\$2,754
2C Welding (construction industry)	\$386,899	\$53,091	\$439,990	\$378,564	\$51,434	\$429,998
2D Welding (government)	\$0	\$147,631	\$147,631	\$0	\$146,938	\$146,938
2A1 Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1 Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1 Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A Painting (general industry - aerospace)	\$83,875	\$66,723	\$150,599	\$117,237	\$97,597	\$214,834
3A1 Painting (general industry - auto repair)	\$742,358	\$54,545	\$796,903	\$503,767	\$30,017	\$533,784
3A2 Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0	\$0
3B Painting (maritime industry)	\$237,904	\$59,004	\$296,909	\$357,543	\$90,736	\$448,279
3C Painting (construction industry)	\$605,910	\$95,625	\$701,535	\$1,514,904	\$239,019	\$1,753,924
3D Painting (government)	\$0	\$90,136	\$90,136	\$0	\$162,348	\$162,348
4 Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0
5 Chromate Pigment Producers	\$0	\$9,948	\$9,948	\$600	\$10,978	\$11,578
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$3,002	\$3,002
7 Chromium Catalyst Producers	\$0	\$17,067	\$17,067	\$0	\$9,863	\$9,863
8 Paint and Coatings Producers	\$11,921	\$7,547	\$19,468	\$0	\$0	\$0
9 Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10 Plastic Colorant Producers and Users	\$67,409	\$199,998	\$267,407	\$105,145	\$306,085	\$411,230
11 Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0	\$0
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$0	\$0	\$0	\$3,087	\$3,087
14 Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14A Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14B reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15 Iron and Steel Foundries	\$0	\$142,022	\$142,022	\$0	\$273,067	\$273,067
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$6,689	\$64,322	\$71,011	\$7,633	\$74,442	\$82,074
18 Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0

Table III. 14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total	1 ug/m <sup>3</sup>		Total
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees			< 20 employees	≥ 20 employees	
1	Electroplating	\$5,409,653	\$2,628,141	\$8,037,794	\$3,495,663	\$1,969,216	\$5,464,880			
2A	Welding (general industry)	\$1,066,969	\$1,038,934	\$2,105,903	\$6,490,012	\$6,260,069	\$12,750,082			
2B	Welding (maritime industry)	\$8,541	\$5,509	\$14,050	\$14,413	\$11,381	\$25,795			
2C	Welding (construction industry)	\$1,471,702	\$200,034	\$1,671,735	\$1,394,947	\$190,756	\$1,585,703			
2D	Welding (government)	\$0	\$559,456	\$559,456	\$0	\$517,391	\$517,391			
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$9,637,017	\$10,315,143	\$19,952,160			
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$78,549	\$278,471	\$357,020			
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$2,796,303	\$399,942	\$3,196,246			
3A	Painting (general industry - aerospace)	\$136,962	\$137,220	\$274,182	\$183,874	\$193,308	\$377,182			
3A1	Painting (general industry - auto repair)	\$333,444	\$10,978	\$344,421	\$230,100	\$0	\$230,100			
3A2	Painting (general industry - coil coating)	\$2,916	\$11,835	\$14,751	\$5,403	\$22,212	\$27,615			
3B	Painting (maritime industry)	\$307,200	\$188,934	\$496,135	\$827,434	\$403,340	\$1,230,774			
3C	Painting (construction industry)	\$1,643,376	\$439,789	\$2,083,165	\$6,434,742	\$1,323,397	\$7,758,139			
3D	Painting (government)	\$0	\$244,765	\$244,765	\$0	\$540,302	\$540,302			
4	Chromate (chromite ore) production	\$0	\$4,974	\$4,974	\$0	\$2,401	\$2,401			
5	Chromate Pigment Producers	\$1,115	\$16,552	\$17,667	\$0	\$13,808	\$13,808			
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3,002	\$3,002	\$0	\$3,002	\$3,002			
7	Chromium Catalyst Producers	\$0	\$45,282	\$45,282	\$0	\$71,440	\$71,440			
8	Paint and Coatings Producers	\$37,907	\$23,842	\$61,749	\$8,748	\$5,489	\$14,237			
9	Printing Ink Producers	\$20,411	\$10,635	\$31,046	\$5,746	\$2,144	\$7,890			
10	Plastic Colorant Producers and Users	\$181,559	\$545,448	\$727,007	\$294,936	\$949,818	\$1,144,755			
11	Plating Mixture Producers	\$7,204	\$11,235	\$18,439	\$0	\$0	\$18,439			
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0			
13	Chromium Material Producers	\$0	\$4,288	\$4,288	\$0	\$5,489	\$5,489			
14	Steel Mills (stainless)	\$13,465	\$108,489	\$121,954	\$4,974	\$30,789	\$35,763			
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$79,073	\$663,800	\$742,873			
14B	reshaping (Alloy and Stainless)	\$60,119	\$108,747	\$168,866	\$11,492	\$86,363	\$97,855			
15	Iron and Steel Foundries	\$709,082	\$2,837,101	\$3,546,183	\$153,857	\$709,254	\$863,111			
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0			
17	Chromium Dye Producers	\$10,978	\$101,285	\$112,263	\$13,122	\$129,415	\$142,537			
18	Chromium Sulfate Producers	\$3,087	\$0	\$3,087	\$0	\$0	\$3,087			

Table III.14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> ≥ 20 employees	0.25 ug/m <sup>3</sup> ≥ 20 employees	
1	Electroplating	\$15,463,873	\$8,121,278	\$23,585,152	\$18,850,560
2A	Welding (general industry)	\$8,651,013	\$8,347,644	\$16,998,657	\$22,888,342
2B	Welding (maritime industry)	\$100,562	\$94,856	\$195,418	\$301,978
2C	Welding (construction industry)	\$1,983,933	\$274,563	\$2,258,496	\$2,643,607
2D	Welding (government)	\$0	\$729,302	\$729,302	\$855,973
2A1	Welding (general industry - carbon steel)	\$28,911,051	\$30,945,429	\$59,856,479	\$79,808,639
2B1	Welding (maritime industry - carbon steel)	\$529,037	\$766,918	\$1,295,955	\$1,780,237
2C1	Welding (construction industry - carbon steel)	\$8,388,910	\$1,199,827	\$9,588,737	\$12,784,983
3A	Painting (general industry - aerospace)	\$274,096	\$336,531	\$610,627	\$641,073
3A1	Painting (general industry - auto repair)	\$1,537,717	\$136,448	\$1,674,165	\$2,648,596
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$20,326
3B	Painting (maritime industry)	\$1,147,156	\$487,644	\$1,634,800	\$2,401,515
3C	Painting (construction industry)	\$10,932,114	\$2,248,343	\$13,180,457	\$9,902,624
3D	Painting (government)	\$0	\$1,013,195	\$1,013,195	\$1,080,690
4	Chromate (chromite ore) production	\$0	\$13,465	\$13,465	\$26,844
5	Chromate Pigment Producers	\$0	\$22,384	\$22,384	\$23,499
	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0
6	Chromium Catalyst Producers	\$0	\$9,091	\$9,091	\$34,133
7	Chromium Material Producers	\$0	\$98,284	\$98,284	\$135,933
8	Paint and Coatings Producers	\$8,748	\$5,489	\$14,237	\$28,473
9	Printing Ink Producers	\$0	\$8,490	\$8,490	\$65,265
10	Plastic Colorant Producers and Users	\$298,538	\$861,568	\$1,160,106	\$1,388,234
11	Plating Mixture Producers	\$7,204	\$11,235	\$18,439	\$18,439
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,288	\$4,288	\$15,266
14	Steel Mills (stainless)	\$107,374	\$856,851	\$964,225	\$507,627
14A	Steel Mills (carbon)	\$198,282	\$713,799	\$912,082	\$1,326,656
14B	reshaping (Alloy and Stainless)	\$26,586	\$115,693	\$142,280	\$61,663
15	Iron and Steel Foundries	\$709,082	\$3,218,228	\$3,927,311	\$5,349,849
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$13,122	\$129,415	\$142,537	\$142,537
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$9,777

Table iii. 14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		10 ug/m <sup>3</sup>		20 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$515	\$22,470	\$22,984	\$686	\$25,643	\$26,329
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$59,347	\$59,347
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$8,319	\$59,948	\$68,267
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$29,331	\$55,317	\$84,647	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$1,294,495	\$323,409	\$1,617,905	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$26,072	\$26,072	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$13,465	\$13,465	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$14,923	\$4,888	\$19,811	\$29,931	\$9,691	\$39,622
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,190,740	\$3,767,131	\$7,957,871	\$6,265,140	\$4,601,198	\$10,866,338
	Total (Maritime Industry)	\$237,904	\$61,759	\$299,663	\$57,543	\$93,491	\$451,034
	Total (Construction Industry)	\$2,302,228	\$477,014	\$2,779,241	\$1,923,399	\$300,144	\$2,223,544
	Total (Government)	\$0	\$263,839	\$263,839	\$0	\$309,286	\$309,286
	Total Industry	\$6,730,872	\$4,569,742	\$11,300,614	\$8,546,082	\$5,304,119	\$13,850,201

Table III.14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		<20 employees	≥ 20 employees	<20 employees	≥ 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	
21	Colored Glass Producers	\$0	\$9,434	\$9,434	\$0	\$0	
21A	Fiber, Flat, and Container Glass	\$858	\$50,771	\$51,629	\$3,430	\$58,661	
22	Printing	\$0	\$0	\$0	\$0	\$0	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$59,347	\$59,347	\$0	\$85,676	
24A	Chromium Catalyst Users (Service)	\$16,552	\$119,981	\$136,534	\$16,552	\$119,981	
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$16,295	
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	
26C	Woodworking (construction industry)	\$2,588,991	\$646,819	\$3,235,810	\$0	\$0	
26D	Woodworking (government)	\$0	\$52,143	\$52,143	\$0	\$0	
27	Solid Waste Incineration	\$0	\$0	\$0	\$74,699	\$415,004	
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$37,392	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$12,607	
31B	Construction (Refractory Repair)	\$179,415	\$58,318	\$237,733	\$224,268	\$72,898	
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$8,012,282	\$7,887,521	\$15,899,803	\$20,708,700	\$22,041,384	
Total (Maritime Industry)		\$315,742	\$194,443	\$510,185	\$920,397	\$693,192	
Total (Construction Industry)		\$5,883,483	\$1,344,960	\$7,228,443	\$10,850,260	\$1,986,994	
Total (Government)		\$0	\$856,365	\$856,365	\$0	\$1,095,086	
Total Industry		\$14,211,506	\$10,283,289	\$24,494,795	\$32,479,357	\$25,816,656	
						\$58,296,013	

Table III. 14 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
19	Chemical Distributors	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$231,815	\$164,835	\$396,650	\$1,192,353
21	Colored Glass Producers	\$0	\$0	\$0	\$9,434
21A	Fiber, Flat, and Container Glass	\$3,430	\$71,955	\$75,385	\$68,610
22	Printing	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$335,159	\$335,159	\$549,307
24A	Chromium Catalyst Users (Service)	\$16,552	\$119,981	\$136,534	\$136,534
25	Refractory Brick Producers	\$0	\$3,602	\$3,602	\$78,044
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$3,883,486	\$970,228	\$4,853,715	\$0
26D	Woodworking (government)	\$0	\$78,215	\$78,215	\$0
27	Solid Waste Incineration	\$106,174	\$676,321	\$782,495	\$0
27A	Incinerators (government)	\$0	\$53,087	\$53,087	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$181,730	\$181,730	\$285,674
31B	Construction (Refractory Repair)	\$224,268	\$72,898	\$297,166	\$297,166
31C	Construction (Hazardous Waste Work)	\$17,410	\$5,317	\$22,727	\$756,337
31CG	Haz. Waste (government)	\$0	\$24,442	\$24,442	\$816,714
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)		\$56,564,659	\$55,509,192	\$112,073,851	\$69,657,233
Total (Maritime Industry)		\$1,776,755	\$1,349,418	\$3,126,173	\$1,838,707
Total (Construction Industry)		\$25,430,121	\$4,771,177	\$30,201,298	\$3,791,573
Total (Government)		\$0	\$1,898,241	\$1,898,241	\$2,753,377
Total Industry		\$83,771,535	\$63,528,028	\$147,299,563	\$78,040,889

Table III.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		< 20 employees	20 employees >= 20 employees	< 20 employees	10 ug/m <sup>3</sup> > 20 employees		
1	Electroplating	\$182,686	\$992,130	\$381,619	\$2,071,966	\$2,453,585	
2A	Welding (general industry)	\$30,110	\$194,571	\$1,183,952	\$7,649,989	\$8,833,941	
2B	Welding (maritime industry)	\$0	\$67,863	\$208,735	\$11,200,961	\$11,409,696	
2C	Welding (construction industry)	\$614,616	\$782,802	\$1,395,841	\$1,777,925	\$3,173,766	
2D	Welding (government)	\$0	\$23,503	\$0	\$26,879	\$26,879	
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
3A	Painting (general industry - aerospace)	\$11,540	\$3,427,814	\$9,439	\$5,068,257	\$5,077,696	
3A1	Painting (general industry - auto repair)	\$525,116	\$1,125,116	\$291,730	\$1,248,489	\$1,540,219	
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0	
3B	Painting (maritime industry)	\$335,548	\$1,088,418	\$466,324	\$1,512,449	\$1,978,773	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$44,349	\$364	\$44,349	\$44,713	
7	Chromium Catalyst Producers	\$0	\$0	\$0	\$2,680	\$2,680	
8	Paint and Coatings Producers	\$0	\$20,322	\$0	\$11,618	\$11,618	
9	Printing Ink Producers	\$0	\$32,797	\$0	\$0	\$0	
10	Plastic Colorant Producers and Users	\$15,635	\$86,437	\$0	\$0	\$0	
11	Plating Mixture Producers	\$0	\$0	\$20,207	\$118,834	\$139,041	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	
14	Steel Mills (stainless)	\$6,394	\$286,013	\$6,394	\$3,001	\$3,001	
14A	Steel Mills (carbon)	\$18,707	\$381,418	\$18,707	\$31,735	\$38,129	
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$858,140	\$876,847	
15	Iron and Steel Foundries	\$96,633	\$202,875	\$96,633	\$304,312	\$400,945	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$1,873	\$32,283	\$2,114	\$36,548	\$38,662	
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	

Table III.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	1 ug/m <sup>3</sup>			Total
		< 20 employees	> 20 employees	Total	< 20 employees		> 20 employees	Total		
1	Electroplating	\$596,349	\$3,237,826	\$3,834,175	\$2,197,857	\$12,758,098	\$14,955,955			
2A	Welding (general industry)	\$2,614,984	\$16,807,980	\$19,422,964	\$3,960,139	\$25,368,912	\$29,329,051			
2B	Welding (maritime industry)	\$253,096	\$13,632,231	\$13,885,327	\$293,101	\$15,876,928	\$16,170,029			
2C	Welding (construction industry)	\$4,346,074	\$5,535,890	\$9,881,964	\$9,737,761	\$12,403,564	\$22,141,325			
2D	Welding (government)	\$0	\$152,939	\$152,939	\$0	\$157,812	\$157,812			
2A1	Welding (general industry - carbon steel)	\$646,121	\$4,069,728	\$4,715,849	\$3,786,212	\$24,400,583	\$28,186,795			
2B1	Welding (maritime industry - carbon steel)	\$1,777	\$93,803	\$95,580	\$21,623	\$1,120,263	\$1,141,886			
2C1	Welding (construction industry - carbon steel)	\$923,596	\$1,128,570	\$2,052,166	\$5,441,823	\$6,649,233	\$12,091,056			
3A	Painting (general industry - aerospace)	\$9,439	\$6,273,132	\$6,282,571	\$12,581	\$9,792,513	\$9,805,094			
3A1	Painting (general industry - auto repair)	\$136,239	\$631,427	\$767,666	\$3,547	\$277,391	\$280,938			
3A2	Painting (general industry - coil coating)	\$7,220	\$102,758	\$109,978	\$10,767	\$154,087	\$164,854			
3B	Painting (maritime industry)	\$691,177	\$2,240,186	\$2,931,363	\$1,670,913	\$5,321,961	\$6,992,874			
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0			
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0			
4	Chromate (chromite ore) production	\$0	\$8,130	\$8,130	\$0	\$13,937	\$13,937			
5	Chromate Pigment Producers	\$364	\$46,636	\$47,000	\$0	\$39,774	\$39,774			
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$2,680	\$2,680	\$0	\$2,680	\$2,680			
7	Chromium Catalyst Producers	\$0	\$34,844	\$34,844	\$0	\$587,133	\$587,133			
8	Paint and Coatings Producers	\$0	\$32,797	\$32,797	\$0	\$32,797	\$32,797			
9	Printing Ink Producers	\$9,243	\$9,722	\$18,965	\$89,496	\$108,799	\$198,295			
10	Plastic Colorant Producers and Users	\$15,739	\$252,089	\$267,828	\$18,831	\$308,963	\$327,794			
11	Plating Mixture Producers	\$1,341	\$5,046	\$6,387	\$0	\$0	\$0			
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0			
13	Chromium Material Producers	\$0	\$4,797	\$4,797	\$0	\$10,197	\$10,197			
14	Steel Mills (stainless)	\$12,688	\$1,334,862	\$1,347,550	\$12,688	\$794,570	\$807,258			
14A	Steel Mills (carbon)	\$37,413	\$95,304	\$132,717	\$37,413	\$4,290,698	\$4,328,111			
14B	reshaping (Alloy and Stainless)	\$18,330	\$68,491	\$86,821	\$18,330	\$34,245	\$52,575			
15	Iron and Steel Foundries	\$241,482	\$2,130,484	\$2,371,966	\$241,482	\$2,029,046	\$2,270,528			
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0			
17	Chromium Dye Producers	\$3,156	\$53,651	\$57,007	\$3,573	\$59,583	\$63,156			
18	Chromium Sulfate Producers	\$1,919	\$0	\$1,919	\$0	\$0	\$0			



Table III.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		< 20 employees	> 20 employees	0.5 ug/m <sup>3</sup>	0.25 ug/m <sup>3</sup>		
1	Electroplating	\$4,969,078	\$28,865,027	\$33,834,105	\$8,033,731	\$46,865,776	\$54,919,507
2A	Welding (general industry)	\$6,738,473	\$43,273,575	\$50,012,048	\$7,391,588	\$47,483,297	\$54,874,885
2B	Welding (maritime industry)	\$506,192	\$27,371,863	\$27,878,055	\$661,654	\$35,847,478	\$36,509,132
2C	Welding (construction industry)	\$15,343,902	\$19,544,392	\$34,888,294	\$22,494,886	\$28,653,074	\$51,147,960
2D	Welding (government)	\$0	\$236,835	\$236,835	\$0	\$246,982	\$246,982
2A1	Welding (general industry - carbon steel)	\$8,984,599	\$58,216,068	\$67,200,667	\$19,566,884	\$127,250,812	\$146,817,696
2B1	Welding (maritime industry - carbon steel)	\$26,114	\$1,352,035	\$1,378,149	\$48,782	\$2,527,505	\$2,576,287
2C1	Welding (construction industry - carbon steel)	\$12,983,420	\$15,864,032	\$28,847,452	\$29,326,274	\$35,832,758	\$65,159,032
3A	Painting (general industry - aerospace)	\$3,547	\$13,753,373	\$13,756,920	\$228,174	\$19,593,862	\$19,822,036
3A1	Painting (general industry - auto repair)	\$1,299,737	\$3,979,659	\$5,279,396	\$1,195,209	\$2,375,420	\$3,570,629
3A2	Painting (general industry - coil coating)	\$10,767	\$51,329	\$62,096	\$10,767	\$102,758	\$113,525
3B	Painting (maritime industry)	\$2,039,996	\$6,448,329	\$8,488,325	\$2,653,912	\$8,454,336	\$11,108,248
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$34,841	\$34,841	\$0	\$404,196	\$404,196
5	Chromate Pigment Producers	\$0	\$123,522	\$123,522	\$0	\$184,098	\$184,098
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$6,705	\$6,705	\$0	\$116,866	\$116,866
7	Chromium Catalyst Producers	\$0	\$595,836	\$595,836	\$0	\$914,656	\$914,656
8	Paint and Coatings Producers	\$0	\$32,797	\$32,797	\$0	\$327,962	\$327,962
9	Printing Ink Producers	\$111,024	\$135,447	\$246,471	\$114,522	\$139,666	\$254,188
10	Plastic Colorant Producers and Users	\$19,445	\$317,084	\$336,529	\$21,371	\$346,841	\$368,212
11	Plating Mixture Producers	\$2,682	\$20,173	\$22,855	\$1,341	\$3,367	\$4,708
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$8,400	\$8,400	\$0	\$52,099	\$52,099
14	Steel Mills (stainless)	\$77,004	\$9,341,601	\$9,418,605	\$77,004	\$9,030,923	\$9,107,927
14A	Steel Mills (carbon)	\$226,589	\$23,214,762	\$23,441,351	\$226,589	\$29,381,076	\$29,607,665
14B	reshaping (Alloy and Stainless)	\$18,330	\$119,759	\$138,089	\$18,330	\$17,123	\$35,453
15	Iron and Steel Foundries	\$193,165	\$1,420,322	\$1,613,487	\$241,482	\$20,600,580	\$20,842,062
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$3,585	\$59,258	\$62,843	\$3,592	\$59,056	\$62,648
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$3,838	\$0	\$3,838

Table iii.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$15,822	\$568,098	\$15,822	\$568,098	\$583,920
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$566	\$0	\$566	\$566
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$4,895	\$12,600	\$17,495		\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$15,490	\$15,490		\$0
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$909,411	\$7,422,879	\$2,026,981	\$18,018,582	\$20,045,563
	Total (Maritime Industry)	\$335,548	\$1,156,281	\$675,059	\$12,713,410	\$13,388,469
	Total (Construction Industry)	\$614,616	\$782,802	\$1,395,841	\$1,777,925	\$3,173,766
	Total (Government)	\$0	\$23,503	\$0	\$26,879	\$26,879
	Total Industry	\$1,859,575	\$9,385,465	\$4,097,881	\$32,536,796	\$36,634,677

Table III.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$3,226	\$0	\$3,226	\$0
21A	Fiber, Flat, and Container Glass	\$17,637	\$748,930	\$31,544	\$1,883,008	\$1,914,552
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$566	\$0	\$566	\$566
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$5,529	\$5,529
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$22,010	\$224,681	\$246,691
27A	Incinerators (government)	\$0	\$0	\$0	\$11,005	\$11,005
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$30,980	\$0	\$23,240	\$23,240
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$4,369,664	\$35,986,286	\$10,446,470	\$83,201,030	\$93,647,500
Total (Maritime Industry)		\$946,050	\$15,966,220	\$1,985,637	\$22,319,152	\$24,304,789
Total (Construction Industry)		\$5,269,670	\$6,664,460	\$15,179,584	\$19,052,797	\$34,232,381
Total (Government)		\$0	\$152,939	\$0	\$168,817	\$168,817
Total Industry		\$10,585,384	\$58,769,905	\$27,611,691	\$124,741,796	\$152,353,487

Table III.15 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$171,904	\$1,819,501	\$1,991,405	\$373,918	\$4,434,466
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$3,226
21A	Fiber, Flat, and Container Glass	\$31,544	\$1,913,147	\$1,944,691	\$37,189	\$3,155,783
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$6,272	\$6,272	\$0	\$6,272
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$1,843	\$1,843	\$0	\$16,588
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$22,010	\$195,097	\$217,107	\$0	\$0
27A	Incinerators (government)	\$0	\$11,005	\$11,005	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$293,003	\$293,003	\$0	\$502,119
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$105,845	\$239,828
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$137,247
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$22,883,483	\$187,798,401	\$210,681,884	\$37,545,529	\$350,523,310
Total (Maritime Industry)		\$2,572,302	\$35,172,227	\$37,744,529	\$3,364,348	\$50,193,667
Total (Construction Industry)		\$28,327,322	\$35,408,424	\$63,735,746	\$51,927,005	\$116,546,820
Total (Government)		\$0	\$247,840	\$247,840	\$0	\$384,229
Total Industry		\$53,783,107	\$258,626,892	\$312,409,999	\$92,836,882	\$517,648,026

Table III.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		< 20 employees	20 ug/m <sup>3</sup> ≥ 20 employees	< 20 employees	10 ug/m <sup>3</sup> ≥ 20 employees		
1	Electroplating	\$0	\$0	\$0	\$0	\$0	
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
3A	Painting (general industry - aerospace)	\$191,389	\$11,727,984	\$11,919,372	\$191,389	\$11,711,583	
3A1	Painting (general industry - auto repair)	\$22,305,229	\$38,155,040	\$60,460,269	\$22,305,229	\$37,479,031	
3A2	Painting (general industry - coil coating)	\$168,872	\$2,675,718	\$2,844,590	\$168,872	\$2,797,183	
3B	Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$5,661,140	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	
7	Chromium Catalyst Producers	\$0	\$12,587	\$12,587	\$0	\$12,587	
8	Paint and Coatings Producers	\$0	\$110,290	\$110,290	\$0	\$110,290	
9	Printing Ink Producers	\$2,204,621	\$1,572,817	\$3,777,438	\$2,204,621	\$3,777,438	
10	Plastic Colorant Producers and Users	\$3,781	\$3,789	\$7,570	\$3,781	\$7,570	
11	Plating Mixture Producers	\$4,639	\$26,392	\$31,030	\$4,639	\$31,030	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$0	\$21,250	\$21,250	\$0	\$21,250	
18	Chromium Sulfate Producers	\$36,226	\$0	\$36,226	\$36,226	\$36,226	

Table iii.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	
1	Electroplating	\$0	\$0	\$0	\$0	\$0
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$191,389	\$11,520,194	\$11,711,583	\$191,389	\$11,711,583
3A1	Painting (general industry - auto repair)	\$22,305,229	\$37,479,031	\$59,784,259	\$22,305,229	\$59,784,259
3A2	Painting (general industry - coil coating)	\$168,872	\$2,628,311	\$2,797,183	\$168,872	\$2,797,183
3B	Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$5,661,140
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$12,587	\$12,587	\$0	\$12,587
7	Chromium Catalyst Producers	\$0	\$110,290	\$110,290	\$0	\$110,290
8	Paint and Coatings Producers	\$2,204,621	\$1,572,817	\$3,777,438	\$2,204,621	\$3,777,438
9	Printing Ink Producers	\$3,781	\$3,789	\$7,570	\$2,836	\$6,435
10	Plastic Colorant Producers and Users	\$4,639	\$26,392	\$31,030	\$4,639	\$31,030
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$21,250	\$21,250	\$0	\$21,250
18	Chromium Sulfate Producers	\$36,226	\$0	\$36,226	\$18,113	\$18,113

Table III.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		< 20 employees	0.5 ug/m <sup>3</sup> ≥ 20 employees	Total	< 20 employees	0.25 ug/m <sup>3</sup> ≥ 20 employees	Total
1	Electroplating	\$0	\$0	\$0	\$0	\$0	\$0
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$191,389	\$11,520,194	\$11,711,583	\$191,389	\$11,520,194	\$11,711,583
3A1	Painting (general industry - auto repair)	\$22,305,229	\$37,479,031	\$59,784,259	\$22,305,229	\$37,479,031	\$59,784,259
3A2	Painting (general industry - coil coating)	\$168,872	\$2,628,311	\$2,797,183	\$168,872	\$2,628,311	\$2,797,183
3B	Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$2,027,636	\$5,154,231
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
6	Chromium Catalyst Producers	\$0	\$12,587	\$12,587	\$0	\$12,587	\$12,587
7	Paint and Coatings Producers	\$0	\$110,290	\$110,290	\$0	\$102,550	\$102,550
8	Printing Ink Producers	\$2,204,621	\$1,572,817	\$3,777,438	\$2,204,621	\$1,572,817	\$3,777,438
9	Plastic Colorant Producers and Users	\$2,836	\$3,599	\$6,435	\$2,836	\$3,599	\$6,435
10	Plating Mixture Producers	\$4,639	\$26,392	\$31,030	\$4,639	\$22,022	\$26,661
11	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
12	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
13	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14A	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14B	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0
15	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
16	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Sulfate Producers	\$0	\$21,250	\$21,250	\$0	\$21,250	\$21,250
18		\$18,113	\$0	\$18,113	\$18,113	\$0	\$18,113

Table III.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$127,387	\$1,108,991	\$127,387	\$1,108,991	\$1,236,379
21	Colored Glass Producers	\$0	\$2,555	\$0	\$2,555	\$2,555
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$114,711	\$258,997	\$114,711	\$258,997	\$373,708
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$143,158	\$0	\$143,158	\$143,158
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$29,900	\$0	\$29,900	\$29,900
26A	Woodworking (general industry)	\$70,224	\$74,950	\$70,224	\$74,950	\$145,174
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$4,251,244	\$1,790,392	\$4,251,244	\$1,790,392	\$5,444,838
26D	Woodworking (government)	\$0	\$48,096	\$0	\$48,096	\$48,096
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$129,319	\$330,840	\$129,319	\$330,840	\$460,158
31C	Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$0	\$90,563
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$25,227,080	\$55,924,416	\$25,156,856	\$54,918,260	\$80,075,116
	Total (Maritime Industry)	\$3,126,595	\$2,534,545	\$3,126,595	\$2,534,545	\$5,661,140
	Total (Construction Industry)	\$4,471,125	\$2,121,231	\$4,471,125	\$1,524,434	\$5,995,559
	Total (Government)	\$0	\$48,096	\$0	\$48,096	\$48,096
	Total Industry	\$32,824,799	\$60,628,290	\$32,754,575	\$59,025,336	\$91,779,911



Table III.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$127,387	\$1,108,991	\$1,236,379	\$127,387	\$1,108,991	\$1,236,379
21	Colored Glass Producers	\$0	\$2,555	\$2,555	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$114,711	\$258,997	\$373,708	\$114,711	\$258,997	\$373,708
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$143,158	\$143,158	\$0	\$143,158	\$143,158
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$29,900	\$29,900	\$0	\$29,900	\$29,900
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$4,251,244	\$1,193,594	\$5,444,838	\$4,251,244	\$596,797	\$4,848,041
26D	Woodworking (government)	\$0	\$48,096	\$48,096	\$0	\$48,096	\$48,096
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$129,319	\$330,840	\$460,158	\$129,319	\$330,840	\$460,158
31C	Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$90,563	\$0	\$90,563
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$25,156,856	\$54,918,260	\$80,075,116	\$25,137,798	\$54,915,516	\$80,053,313
Total (Maritime Industry)		\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$2,534,545	\$5,661,140
Total (Construction Industry)		\$4,471,125	\$1,524,434	\$5,995,559	\$4,471,125	\$927,637	\$5,398,761
Total (Government)		\$0	\$48,096	\$48,096	\$0	\$48,096	\$48,096
Total Industry		\$32,754,575	\$59,025,336	\$91,779,911	\$32,735,517	\$58,425,794	\$91,161,311

Table III.16 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>			0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	Total	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$127,387	\$1,108,991	\$1,236,379	\$127,387	\$1,108,991	\$1,236,379
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$114,711	\$258,997	\$373,708	\$114,711	\$258,997	\$373,708
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$143,158	\$143,158	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$24,463	\$24,463	\$0	\$24,463	\$24,463
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$4,251,244	\$596,797	\$4,848,041	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$48,096	\$48,096	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$129,319	\$330,840	\$460,158	\$129,319	\$330,840	\$460,158
31C	Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$90,563	\$0	\$90,563
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$25,137,798	\$54,910,079	\$80,047,877	\$25,137,798	\$54,754,813	\$79,892,611
Total (Maritime Industry)		\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$2,027,636	\$5,154,231
Total (Construction Industry)		\$4,471,125	\$927,637	\$5,398,761	\$219,881	\$330,840	\$550,721
Total (Government)		\$0	\$48,096	\$48,096	\$0	\$0	\$0
Total Industry		\$32,735,517	\$58,420,358	\$91,155,875	\$28,484,273	\$57,113,289	\$85,597,562

Table III.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	20 ug/m <sup>3</sup> > 20 employees	10 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$358
3B	Painting (maritime industry)	\$381,959	\$838,667	\$1,220,626	\$1,220,626
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$40
8	Paint and Coatings Producers	\$73	\$140	\$213	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$139
11	Plating Mixture Producers	\$2	\$17	\$20	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$2
18	Chromium Sulfate Producers	\$1	\$0	\$1	\$1

Table III.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	5 ug/m <sup>3</sup> > 20 employees	1 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$358
3B	Painting (maritime industry)	\$381,959	\$838,667	\$1,220,626	\$1,220,626
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$40
8	Paint and Coatings Producers	\$73	\$140	\$213	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$139
11	Plating Mixture Producers	\$2	\$17	\$20	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$2
18	Chromium Sulfate Producers	\$1	\$0	\$1	\$0

Table III.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> ≥ 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$358
3B	Painting (maritime industry)	\$381,959	\$838,667	\$1,220,626	\$1,052,893
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$37
8	Paint and Coatings Producers	\$73	\$140	\$213	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$118
11	Plating Mixture Producers	\$2	\$17	\$20	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$2
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0

Table iii.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$1,903	\$42,703	\$44,605	\$1,903	\$42,703	\$44,605
21	Colored Glass Producers	\$0	\$4	\$4	\$0	\$4	\$4
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$555	\$3,302	\$3,857	\$555	\$3,302	\$3,857
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$45	\$45	\$0	\$45	\$45
24A	Chromium Catalyst Users (Service)	\$760	\$7,976	\$8,735	\$760	\$7,976	\$8,735
25	Refractory Brick Producers	\$0	\$42	\$42	\$0	\$42	\$42
26A	Woodworking (general industry)	\$317	\$904	\$1,221	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$130,808	\$148,770	\$279,578	\$130,808	\$99,180	\$229,988
26D	Woodworking (government)	\$0	\$3,997	\$3,997	\$0	\$3,997	\$3,997
27	Solid Waste Incineration	\$10,083	\$56,017	\$66,100	\$10,083	\$56,017	\$66,100
27A	Incinerators (government)	\$0	\$5,042	\$5,042	\$0	\$5,042	\$5,042
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$3,643	\$25,178	\$28,821	\$3,643	\$25,178	\$28,821
31C	Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$54,552	\$21,742	\$32,810	\$54,552
31CG	Haz. Waste (government)	\$0	\$32,523	\$32,523	\$0	\$32,523	\$32,523
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$509,864	\$2,231,886	\$2,741,750	\$509,547	\$2,230,982	\$2,740,529
	Total (Maritime Industry)	\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626
	Total (Construction Industry)	\$651,951	\$641,936	\$1,293,887	\$651,951	\$592,346	\$1,244,297
	Total (Government)	\$0	\$298,506	\$298,506	\$0	\$298,506	\$298,506
	Total Industry	\$1,543,774	\$4,010,994	\$5,554,768	\$1,543,457	\$3,960,500	\$5,503,957

Table III.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					Total
		< 20 employees	≥ 20 employees	5 ug/m <sup>3</sup>	≥ 20 employees	1 ug/m <sup>3</sup>	
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$1,903	\$42,703	\$44,605	\$1,903	\$42,703	\$44,605
21	Colored Glass Producers	\$0	\$4	\$4	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$555	\$3,302	\$3,857	\$555	\$3,302	\$3,857
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$45	\$45	\$0	\$45	\$45
24A	Chromium Catalyst Users (Service)	\$760	\$7,976	\$8,735	\$760	\$7,976	\$8,735
25	Refractory Brick Producers	\$0	\$42	\$42	\$0	\$42	\$42
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$130,808	\$99,180	\$229,988	\$130,808	\$99,180	\$180,398
26D	Woodworking (government)	\$0	\$3,997	\$3,997	\$0	\$3,997	\$3,997
27	Solid Waste Incineration	\$10,083	\$56,017	\$66,100	\$10,083	\$56,017	\$66,100
27A	Incinerators (government)	\$0	\$5,042	\$5,042	\$0	\$5,042	\$5,042
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$3,643	\$25,178	\$28,821	\$3,643	\$25,178	\$28,821
31C	Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$54,552	\$21,742	\$32,810	\$54,552
31CG	Haz. Waste (government)	\$0	\$32,523	\$32,523	\$0	\$32,523	\$32,523
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$509,547	\$2,230,982	\$2,740,529	\$509,546	\$2,230,978	\$2,740,524
Total (Maritime Industry)		\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626
Total (Construction Industry)		\$651,951	\$592,346	\$1,244,297	\$651,951	\$542,756	\$1,194,707
Total (Government)		\$0	\$298,506	\$298,506	\$0	\$298,506	\$298,506
Total Industry		\$1,543,457	\$3,960,500	\$5,503,957	\$1,543,457	\$3,910,906	\$5,454,363

Table iii.17 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$1,903	\$42,703	\$1,903	\$42,703	\$44,605
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$555	\$3,302	\$555	\$3,302	\$3,857
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$45	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$760	\$7,976	\$760	\$7,976	\$8,735
25	Refractory Brick Producers	\$0	\$34	\$0	\$34	\$34
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$130,808	\$49,590	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$3,997	\$0	\$0	\$0
27	Solid Waste Incineration	\$10,083	\$36,411	\$6,722	\$25,208	\$31,930
27A	Incinerators (government)	\$0	\$5,042	\$0	\$3,361	\$3,361
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$3,643	\$25,178	\$3,643	\$25,178	\$28,821
31C	Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$21,742	\$32,810	\$54,552
31CG	Haz. Waste (government)	\$0	\$32,523	\$0	\$32,523	\$32,523
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$509,546	\$2,211,364	\$506,185	\$2,200,091	\$2,706,277
Total (Maritime Industry)		\$381,959	\$838,667	\$381,959	\$670,933	\$1,052,893
Total (Construction Industry)		\$651,951	\$542,756	\$521,143	\$493,166	\$1,014,309
Total (Government)		\$0	\$298,506	\$0	\$292,829	\$292,829
Total Industry		\$1,543,457	\$3,891,293	\$1,409,287	\$3,657,019	\$5,066,306



Table III.18 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$3,475,500	\$964,300	\$4,439,800	\$3,475,500	\$964,300	\$4,439,800
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$63,300	\$212,100	\$275,400	\$63,300	\$212,100	\$275,400
3A1	Painting (general industry - auto repair)	\$1,476,000	\$1,024,700	\$2,500,700	\$1,476,000	\$1,024,700	\$2,500,700
3A2	Painting (general industry - coll coating)	\$18,600	\$97,800	\$116,400	\$18,600	\$97,800	\$116,400
3B	Painting (maritime industry)	\$310,500	\$97,300	\$407,800	\$310,500	\$97,300	\$407,800
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,400	\$4,400	\$0	\$4,400	\$4,400
5	Chromate Pigment Producers	\$700	\$2,300	\$3,000	\$700	\$2,300	\$3,000
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$1,200	\$0	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$12,700	\$12,700	\$0	\$12,700	\$12,700
8	Paint and Coatings Producers	\$84,000	\$58,300	\$142,300	\$84,000	\$58,300	\$142,300
9	Printing Ink Producers	\$4,200	\$3,100	\$7,300	\$4,200	\$3,100	\$7,300
10	Plastic Colorant Producers and Users	\$22,500	\$11,100	\$33,600	\$22,500	\$11,100	\$33,600
11	Plating Mixture Producers	\$2,500	\$6,900	\$9,400	\$2,500	\$6,900	\$9,400
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$700	\$5,100	\$5,800	\$700	\$5,100	\$5,800
18	Chromium Sulfate Producers	\$3,200	\$0	\$3,200	\$3,200	\$0	\$3,200

Table iii. 18 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	> 20 employees	1 ug/m <sup>3</sup>	
1	Electroplating	\$3,475,500	\$964,300	\$4,439,800	\$4,439,800
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$63,300	\$212,100	\$275,400	\$275,400
3A1	Painting (general industry - auto repair)	\$1,476,000	\$1,024,700	\$2,500,700	\$2,500,700
3A2	Painting (general industry - coil coating)	\$18,600	\$97,800	\$116,400	\$116,400
3B	Painting (maritime industry)	\$310,500	\$97,300	\$407,800	\$407,800
3C	Painting (construction industry)	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,400	\$4,400	\$4,400
5	Chromate Pigment Producers	\$700	\$2,300	\$3,000	\$3,000
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$12,700	\$12,700	\$12,700
8	Paint and Coatings Producers	\$84,000	\$58,300	\$142,300	\$142,300
9	Printing Ink Producers	\$4,200	\$3,100	\$7,300	\$6,200
10	Plastic Colorant Producers and Users	\$22,500	\$11,100	\$33,600	\$33,600
11	Plating Mixture Producers	\$2,500	\$6,900	\$9,400	\$9,400
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$700	\$5,100	\$5,800	\$5,800
18	Chromium Sulfate Producers	\$3,200	\$0	\$3,200	\$2,800

Table III.18 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	0.5 ug/m <sup>3</sup> ≥ 20 employees	< 20 employees	0.25 ug/m <sup>3</sup> ≥ 20 employees	
1	Electroplating	\$3,475,500	\$964,300	\$4,439,800	\$4,439,800	\$4,439,800
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$63,300	\$212,100	\$275,400	\$275,400	\$275,400
3A1	Painting (general industry - auto repair)	\$1,476,000	\$1,024,700	\$2,500,700	\$2,500,700	\$2,500,700
3A2	Painting (general industry - coil coating)	\$18,600	\$97,800	\$116,400	\$116,400	\$116,400
3B	Painting (maritime industry)	\$310,500	\$97,300	\$407,800	\$407,800	\$407,400
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,400	\$4,400	\$4,400	\$4,400
5	Chromate Pigment Producers	\$700	\$2,300	\$3,000	\$3,000	\$3,000
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$1,200	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$12,700	\$12,700	\$12,700	\$12,300
8	Paint and Coatings Producers	\$84,000	\$58,300	\$142,300	\$142,300	\$142,300
9	Printing Ink Producers	\$3,300	\$2,900	\$6,200	\$6,200	\$6,200
10	Plastic Colorant Producers and Users	\$22,500	\$11,100	\$33,600	\$33,600	\$29,200
11	Plating Mixture Producers	\$2,500	\$6,900	\$9,400	\$9,400	\$9,400
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$700	\$5,100	\$5,800	\$5,800	\$5,800
18	Chromium Sulfate Producers	\$2,800	\$0	\$2,800	\$2,800	\$2,800

Table iii.18 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$179,600	\$1,204,200	\$1,383,800	\$179,600	\$1,383,800
21	Colored Glass Producers	\$0	\$1,200	\$1,200	\$0	\$1,200
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$78,400	\$93,300	\$171,700	\$78,400	\$171,700
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$39,200	\$39,200	\$0	\$39,200
24A	Chromium Catalyst Users (Service)	\$8,600	\$25,300	\$33,900	\$8,600	\$33,900
25	Refractory Brick Producers	\$0	\$5,300	\$5,300	\$0	\$5,300
26A	Woodworking (general industry)	\$45,700	\$46,600	\$92,300	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$2,516,000	\$399,300	\$2,915,300	\$2,516,000	\$2,906,900
26D	Woodworking (government)	\$0	\$27,600	\$27,600	\$0	\$27,600
27	Solid Waste Incineration	\$39,300	\$40,900	\$80,200	\$39,300	\$80,200
27A	Incinerators (government)	\$0	\$19,700	\$19,700	\$0	\$19,700
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$70,100	\$29,700	\$99,800	\$70,100	\$99,800
31C	Construction (Hazardous Waste Work)	\$79,200	\$28,300	\$107,500	\$79,200	\$107,500
31CG	Haz. Waste (government)	\$0	\$60,900	\$60,900	\$0	\$60,900
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$5,502,800	\$3,860,000	\$9,362,800	\$5,457,100	\$9,270,500
	Total (Maritime Industry)	\$310,500	\$97,300	\$407,800	\$310,500	\$407,800
	Total (Construction Industry)	\$2,665,300	\$457,300	\$3,122,600	\$2,665,300	\$3,114,200
	Total (Government)	\$0	\$108,200	\$108,200	\$0	\$108,200
	Total Industry	\$8,478,600	\$4,522,800	\$13,001,400	\$8,432,900	\$12,900,700

p/m <sup>3</sup>		
Employees	Total	
\$0	\$0	
74,200	\$1,383,800	
\$0	\$0	
\$0	\$0	
1,300	\$171,700	
\$0	\$0	
1,200	\$39,200	
1,300	\$33,900	
1,300	\$5,300	
\$0	\$0	
\$0	\$0	
2,900	\$2,858,900	
1,600	\$27,600	
1,900	\$80,200	
1,700	\$19,700	
\$0	\$0	
\$0	\$0	
\$0	\$0	
1,700	\$99,800	
1,300	\$107,500	
1,900	\$60,900	
\$0	\$0	
\$0	\$0	
\$0	\$0	
\$0	\$0	
2,000	\$9,267,800	
1,300	\$407,800	
1,900	\$3,066,200	
1,200	\$108,200	
8,400	\$12,850,000	
	\$0	

Table III. 18 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	> 20 employees	> 20 employees	
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$179,600	\$1,204,200	\$179,600	\$1,383,800
21	Colored Glass Producers	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0
22	Printing	\$78,400	\$93,300	\$78,400	\$171,700
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$39,200	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$8,600	\$25,300	\$8,600	\$33,900
25	Refractory Brick Producers	\$0	\$3,700	\$0	\$3,700
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$2,516,000	\$342,900	\$0	\$2,858,900
26D	Woodworking (government)	\$0	\$27,600	\$0	\$27,600
27	Solid Waste Incineration	\$39,300	\$33,200	\$33,100	\$105,600
27A	Incinerators (government)	\$0	\$19,700	\$0	\$19,700
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$70,100	\$29,700	\$70,100	\$99,800
31C	Construction (Hazardous Waste Work)	\$79,200	\$28,300	\$79,200	\$107,500
31CG	Haz. Waste (government)	\$0	\$60,900	\$0	\$60,900
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)		\$5,455,800	\$3,802,700	\$5,446,400	\$9,194,500
Total (Maritime Industry)		\$310,500	\$97,300	\$310,500	\$401,400
Total (Construction Industry)		\$2,665,300	\$400,900	\$149,300	\$207,300
Total (Government)		\$0	\$108,200	\$0	\$77,500
Total Industry		\$8,431,600	\$4,409,100	\$5,906,200	\$9,880,700

Table III.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
1 Electroplating	\$6,094,300	\$6,284,900	\$12,379,200	\$6,094,300	\$6,284,900	\$12,379,200
2A Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1 Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1 Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1 Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A Painting (general industry - aerospace)	\$196,300	\$155,900	\$352,200	\$196,300	\$155,900	\$352,200
3A1 Painting (general industry - auto repair)	\$3,028,400	\$1,039,300	\$4,067,700	\$3,028,400	\$1,039,300	\$4,067,700
3A2 Painting (general industry - coil coating)	\$57,700	\$317,600	\$375,300	\$57,700	\$317,600	\$375,300
3B Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
3C Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4 Chromate (chromite ore) production	\$0	\$6,400	\$6,400	\$0	\$6,400	\$6,400
5 Chromate Pigment Producers	\$3,150	\$0	\$3,150	\$3,150	\$0	\$3,150
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7 Chromium Catalyst Producers	\$0	\$16,000	\$16,000	\$0	\$16,000	\$16,000
8 Paint and Coatings Producers	\$140,820	\$90,340	\$231,160	\$140,820	\$90,340	\$231,160
9 Printing Ink Producers	\$12,640	\$3,790	\$16,430	\$12,640	\$3,790	\$16,430
10 Plastic Colorant Producers and Users	\$11,730	\$9,590	\$21,320	\$11,730	\$9,590	\$21,320
11 Plating Mixture Producers	\$11,040	\$16,560	\$27,600	\$11,040	\$16,560	\$27,600
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$4,190	\$4,190	\$0	\$4,190	\$4,190
14 Steel Mills (stainless)	\$54,500	\$170,000	\$224,500	\$54,500	\$170,000	\$224,500
14A Steel Mills (carbon)	\$160,400	\$510,100	\$670,500	\$160,400	\$510,100	\$670,500
14B reshaping (Alloy and Stainless)	\$157,200	\$166,800	\$324,000	\$157,200	\$166,800	\$324,000
15 Iron and Steel Foundries	\$302,500	\$418,300	\$720,800	\$302,500	\$418,300	\$720,800
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$1,320	\$3,970	\$5,290	\$1,320	\$3,970	\$5,290
18 Chromium Sulfate Producers	\$10,100	\$0	\$10,100	\$10,100	\$0	\$10,100

Table III.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
1	Electroplating	\$6,094,300	\$6,284,900	\$12,379,200	\$6,094,300	\$6,284,900	\$12,379,200
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$196,300	\$155,900	\$352,200	\$196,300	\$155,900	\$352,200
3A1	Painting (general industry - auto repair)	\$3,028,400	\$1,039,300	\$4,067,700	\$3,028,400	\$1,039,300	\$4,067,700
3A2	Painting (general industry - coil coating)	\$57,700	\$317,600	\$375,300	\$57,700	\$317,600	\$375,300
3B	Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$6,400	\$6,400	\$0	\$6,400	\$6,400
5	Chromate Pigment Producers	\$3,150	\$0	\$3,150	\$3,150	\$0	\$3,150
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$16,000	\$16,000	\$0	\$16,000	\$16,000
8	Paint and Coatings Producers	\$140,820	\$90,340	\$231,160	\$140,820	\$90,340	\$231,160
9	Printing Ink Producers	\$12,640	\$3,790	\$16,430	\$12,640	\$3,790	\$16,430
10	Plastic Colorant Producers and Users	\$11,730	\$9,590	\$21,320	\$11,730	\$9,590	\$21,320
11	Plating Mixture Producers	\$11,040	\$16,560	\$27,600	\$11,040	\$16,560	\$27,600
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,190	\$4,190	\$0	\$4,190	\$4,190
14	Steel Mills (stainless)	\$54,500	\$170,000	\$224,500	\$54,500	\$170,000	\$224,500
14A	Steel Mills (carbon)	\$160,400	\$510,100	\$670,500	\$160,400	\$510,100	\$670,500
14B	reshaping (Alloy and Stainless)	\$157,200	\$166,800	\$324,000	\$157,200	\$166,800	\$324,000
15	Iron and Steel Foundries	\$302,500	\$418,300	\$720,800	\$302,500	\$418,300	\$720,800
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,320	\$3,970	\$5,290	\$1,320	\$3,970	\$5,290
18	Chromium Sulfate Producers	\$10,100	\$0	\$10,100	\$10,100	\$0	\$10,100



Table III.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$6,094,300	\$6,284,900	\$12,379,200	\$6,094,300	\$6,284,900	\$12,379,200
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$196,300	\$155,900	\$352,200	\$196,300	\$155,900	\$352,200
3A1	Painting (general industry - auto repair)	\$3,028,400	\$1,039,300	\$4,067,700	\$3,028,400	\$1,039,300	\$4,067,700
3A2	Painting (general industry - coil coating)	\$57,700	\$317,600	\$375,300	\$57,700	\$317,600	\$375,300
3B	Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$6,400	\$6,400	\$0	\$6,400	\$6,400
5	Chromate Pigment Producers	\$3,150	\$0	\$3,150	\$3,150	\$0	\$3,150
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$16,000	\$16,000	\$0	\$16,000	\$16,000
8	Paint and Coatings Producers	\$140,820	\$90,340	\$231,160	\$140,820	\$90,340	\$231,160
9	Printing Ink Producers	\$12,640	\$3,780	\$16,430	\$12,640	\$3,780	\$16,430
10	Plastic Colorant Producers and Users	\$11,730	\$9,590	\$21,320	\$11,730	\$9,590	\$21,320
11	Plating Mixture Producers	\$11,040	\$16,560	\$27,600	\$11,040	\$16,560	\$27,600
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,190	\$4,190	\$0	\$4,190	\$4,190
14	Steel Mills (stainless)	\$54,500	\$170,000	\$224,500	\$54,500	\$170,000	\$224,500
14A	Steel Mills (carbon)	\$160,400	\$510,100	\$670,500	\$160,400	\$510,100	\$670,500
14B	reshaping (Alloy and Stainless)	\$157,200	\$166,800	\$324,000	\$157,200	\$166,800	\$324,000
15	Iron and Steel Foundries	\$302,500	\$418,300	\$720,800	\$302,500	\$418,300	\$720,800
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,320	\$3,970	\$5,290	\$1,320	\$3,970	\$5,290
18	Chromium Sulfate Producers	\$10,100	\$0	\$10,100	\$10,100	\$0	\$10,100

Table III.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
19	Chemical Distributors	\$2,750,700	\$568,400	\$3,319,100	\$2,750,700	\$568,400	\$3,319,100
20	Textile Dyeing	\$510,900	\$201,900	\$712,800	\$510,900	\$201,900	\$712,800
21	Colored Glass Producers	\$14,200	\$4,300	\$18,500	\$14,200	\$4,300	\$18,500
21A	Fiber, Flat, and Container Glass	\$27,600	\$228,900	\$256,500	\$27,600	\$228,900	\$256,500
22	Printing	\$41,100	\$11,500	\$52,600	\$41,100	\$11,500	\$52,600
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$466,300	\$466,300	\$0	\$466,300	\$466,300
24A	Chromium Catalyst Users (Service)	\$11,440	\$60,070	\$71,510	\$11,440	\$60,070	\$71,510
25	Refractory Brick Producers	\$0	\$12,420	\$12,420	\$0	\$12,420	\$12,420
26A	Woodworking (general industry)	\$283,900	\$531,000	\$814,900	\$283,900	\$531,000	\$814,900
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,580	\$16,580	\$0	\$16,580	\$16,580
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,881,940	\$11,315,110	\$25,197,050	\$13,881,940	\$11,315,110	\$25,197,050
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,881,940	\$11,315,110	\$25,197,050	\$13,881,940	\$11,315,110	\$25,197,050

Table III.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$2,750,700	\$568,400	\$3,319,100	\$2,750,700	\$568,400	\$3,319,100
20	Textile Dyeing	\$510,900	\$201,900	\$712,800	\$510,900	\$201,900	\$712,800
21	Colored Glass Producers	\$14,200	\$4,300	\$18,500	\$14,200	\$4,300	\$18,500
21A	Fiber, Flat, and Container Glass	\$27,600	\$228,900	\$256,500	\$27,600	\$228,900	\$256,500
22	Printing	\$41,100	\$11,500	\$52,600	\$41,100	\$11,500	\$52,600
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$466,300	\$466,300	\$0	\$466,300	\$466,300
24A	Chromium Catalyst Users (Service)	\$11,440	\$60,070	\$71,510	\$11,440	\$60,070	\$71,510
25	Refractory Brick Producers	\$0	\$12,420	\$12,420	\$0	\$12,420	\$12,420
26A	Woodworking (general industry)	\$283,900	\$531,000	\$814,900	\$283,900	\$531,000	\$814,900
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,580	\$16,580	\$0	\$16,580	\$16,580
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,881,940	\$11,315,110	\$25,197,050	\$13,881,940	\$11,315,110	\$25,197,050
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,881,940	\$11,315,110	\$25,197,050	\$13,881,940	\$11,315,110	\$25,197,050

Table iii.19 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$2,750,700	\$568,400	\$2,750,700	\$568,400	\$3,319,100
20	Textile Dyeing	\$510,900	\$201,900	\$510,900	\$201,900	\$712,800
21	Colored Glass Producers	\$14,200	\$4,300	\$14,200	\$4,300	\$18,500
21A	Fiber, Flat, and Container Glass	\$27,600	\$228,900	\$27,600	\$228,900	\$256,500
22	Printing	\$41,100	\$11,500	\$41,100	\$11,500	\$52,600
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$466,300	\$0	\$466,300	\$466,300
24A	Chromium Catalyst Users (Service)	\$11,440	\$60,070	\$11,440	\$60,070	\$71,510
25	Refractory Brick Producers	\$0	\$12,420	\$0	\$12,420	\$12,420
26A	Woodworking (general industry)	\$283,900	\$531,000	\$283,900	\$531,000	\$814,900
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,580	\$0	\$16,580	\$16,580
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,881,940	\$11,315,110	\$13,881,940	\$11,315,110	\$25,197,050
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,881,940	\$11,315,110	\$13,881,940	\$11,315,110	\$25,197,050

Table III.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$85,533	\$346,904	\$432,437	\$166,057	\$716,147	\$882,204
2A	Welding (general industry)	\$74,565	\$259,819	\$334,385	\$228,020	\$780,377	\$1,008,397
2B	Welding (maritime industry)	\$2,755	\$370,728	\$373,483	\$2,746	\$444,874	\$447,620
2C	Welding (construction industry)	\$250,722	\$386,033	\$636,755	\$666,674	\$798,188	\$1,464,863
2D	Welding (government)	\$0	\$12,637	\$12,637	\$0	\$14,585	\$14,585
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$23,898	\$83,952	\$107,850
2B1	Welding (maritime industry - carbon steel)	\$5,956	\$0	\$5,956	\$5,956	\$1,975	\$7,931
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$69,931	\$211,434	\$281,365
3A	Painting (general industry - aerospace)	\$4,678	\$341,734	\$346,412	\$3,283	\$377,702	\$380,985
3A1	Painting (general industry - auto repair)	\$427,657	\$430,144	\$857,801	\$253,949	\$575,457	\$829,405
3A2	Painting (general industry - coil coating)	\$2	\$45	\$47	\$2	\$45	\$47
3B	Painting (maritime industry)	\$2,517	\$27,424	\$29,940	\$5,376	\$33,839	\$39,215
3C	Painting (construction industry)	\$72,196	\$58,905	\$131,100	\$69,395	\$150,993	\$220,388
3D	Painting (government)	\$0	\$76,428	\$76,428	\$0	\$54,239	\$54,239
4	Chromate (chromite ore) production	\$0	\$2	\$2	\$0	\$2	\$2
5	Chromate Pigment Producers	\$60	\$2,958	\$3,017	\$213	\$3,116	\$3,329
6	Chromate Copper Arsenate (CCA) Producers	\$0	\$1	\$1	\$0	\$1,124	\$1,124
7	Chromium Catalyst Producers	\$0	\$6,701	\$6,701	\$0	\$4,926	\$4,926
8	Paint and Coatings Producers	\$6,374	\$20,705	\$27,079	\$6,374	\$9,126	\$15,499
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$1	\$4	\$5	\$1	\$4	\$5
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$868	\$868
14	Steel Mills (stainless)	\$5,718	\$150,365	\$156,083	\$5,741	\$38,561	\$44,302
14A	Steel Mills (carbon)	\$17,689	\$190,365	\$208,054	\$17,689	\$453,548	\$471,237
14B	reshaping (Alloy and Stainless)	\$1	\$7	\$8	\$1	\$7	\$8
15	Iron and Steel Foundries	\$106,126	\$100,394	\$206,520	\$106,126	\$154,759	\$260,885
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$359	\$0	\$359	\$359	\$0	\$359

Table iii.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total	1 ug/m <sup>3</sup>			Total
		< 20 employees	≥ 20 employees	Total		< 20 employees	≥ 20 employees	Total	
1	Electroplating	\$264,670	\$1,168,332	\$1,433,002	\$210,623	\$920,502	\$1,131,126	\$1,131,126	
2A	Welding (general industry)	\$433,177	\$1,477,944	\$1,911,121	\$618,591	\$2,107,810	\$2,726,401	\$2,726,401	
2B	Welding (maritime industry)	\$2,750	\$547,076	\$549,827	\$5,504	\$964,003	\$969,507	\$969,507	
2C	Welding (construction industry)	\$1,672,644	\$1,613,219	\$3,285,863	\$2,215,376	\$2,443,527	\$4,658,903	\$4,658,903	
2D	Welding (government)	\$0	\$31,783	\$31,783	\$0	\$40,016	\$40,016	\$40,016	
2A1	Welding (general industry - carbon steel)	\$145,136	\$501,664	\$646,799	\$668,801	\$2,300,369	\$2,969,170	\$2,969,170	
2B1	Welding (maritime industry - carbon steel)	\$5,956	\$8,547	\$14,504	\$11,912	\$81,143	\$93,054	\$93,054	
2C1	Welding (construction industry - carbon steel)	\$630,131	\$899,793	\$1,729,924	\$1,985,822	\$2,364,312	\$4,350,134	\$4,350,134	
3A	Painting (general industry - aerospace)	\$3,686	\$593,047	\$596,733	\$8,503	\$744,313	\$752,816	\$752,816	
3A1	Painting (general industry - auto repair)	\$143,468	\$245,821	\$389,289	\$49,467	\$178,477	\$227,943	\$227,943	
3A2	Painting (general industry - coil coating)	\$5,873	\$48,252	\$54,125	\$7,040	\$72,378	\$79,418	\$79,418	
3B	Painting (maritime industry)	\$14,968	\$93,441	\$108,410	\$19,137	\$131,622	\$150,759	\$150,759	
3C	Painting (construction industry)	\$185,688	\$406,904	\$592,592	\$495,971	\$790,770	\$1,286,741	\$1,286,741	
3D	Painting (government)	\$0	\$125,284	\$125,284	\$0	\$282,118	\$282,118	\$282,118	
4	Chromate (chromite ore) production	\$0	\$4,345	\$4,345	\$0	\$7,895	\$7,895	\$7,895	
5	Chromate Pigment Producers	\$244	\$4,197	\$4,441	\$103	\$2,509	\$2,612	\$2,612	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,157	\$1,157	\$0	\$1,316	\$1,316	\$1,316	
7	Chromium Catalyst Producers	\$0	\$13,139	\$13,139	\$0	\$21,398	\$21,398	\$21,398	
8	Paint and Coatings Producers	\$8,251	\$23,393	\$31,644	\$8,726	\$24,074	\$32,800	\$32,800	
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
11	Plating Mixture Producers	\$131	\$5,281	\$5,412	\$243	\$582	\$825	\$825	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$1,559	\$1,559	\$0	\$3,395	\$3,395	\$3,395	
14	Steel Mills (stainless)	\$12,203	\$700,198	\$712,400	\$12,721	\$498,872	\$511,593	\$511,593	
14A	Steel Mills (carbon)	\$35,378	\$118,283	\$153,661	\$35,804	\$2,238,818	\$2,274,622	\$2,274,622	
14B	reshaping (Alloy and Stainless)	\$4	\$7,596	\$7,600	\$1,086	\$10,809	\$11,895	\$11,895	
15	Iron and Steel Foundries	\$269,668	\$924,445	\$1,194,114	\$269,668	\$1,024,141	\$1,293,810	\$1,293,810	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
18	Chromium Sulfate Producers	\$1,362	\$0	\$1,362	\$467	\$0	\$467	\$467	

Table III.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
1	Electroplating	\$474,430	\$2,130,177	\$2,604,607	\$474,430	\$2,130,177	\$2,604,607
2A	Welding (general industry)	\$944,477	\$3,209,144	\$4,153,621	\$1,021,100	\$3,468,089	\$4,489,188
2B	Welding (maritime industry)	\$8,255	\$1,255,628	\$1,263,883	\$8,252	\$1,266,496	\$1,274,748
2C	Welding (construction industry)	\$3,150,400	\$3,352,662	\$6,503,062	\$3,157,746	\$3,369,413	\$6,527,159
2D	Welding (government)	\$0	\$49,969	\$49,969	\$0	\$50,759	\$50,759
2A1	Welding (general industry - carbon steel)	\$1,388,295	\$4,759,892	\$6,148,186	\$2,636,609	\$9,006,296	\$11,642,905
2B1	Welding (maritime industry - carbon steel)	\$17,868	\$54,731	\$72,599	\$17,867	\$87,956	\$105,824
2C1	Welding (construction industry - carbon steel)	\$4,864,672	\$4,736,590	\$9,601,261	\$4,579,399	\$4,732,821	\$9,312,220
3A	Painting (general industry - aerospace)	\$2,333	\$545,360	\$547,693	\$22,666	\$716,929	\$739,595
3A1	Painting (general industry - auto repair)	\$1,105,497	\$2,553,218	\$3,658,716	\$997,941	\$1,677,738	\$2,675,679
3A2	Painting (general industry - coil coating)	\$7,040	\$31,223	\$38,263	\$7,040	\$51,801	\$58,841
3B	Painting (maritime industry)	\$22,367	\$169,802	\$192,170	\$21,339	\$174,962	\$196,301
3C	Painting (construction industry)	\$1,121,556	\$887,727	\$2,009,284	\$1,187,256	\$1,328,233	\$2,515,489
3D	Painting (government)	\$0	\$522,627	\$522,627	\$0	\$587,576	\$587,576
4	Chromate (chromite ore) production	\$0	\$18,793	\$18,793	\$0	\$18,794	\$18,794
5	Chromate Pigment Producers	\$103	\$5,659	\$5,762	\$103	\$5,657	\$5,760
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$2,572	\$2,572	\$0	\$4,624	\$4,624
7	Chromium Catalyst Producers	\$0	\$24,422	\$24,422	\$0	\$44,606	\$44,606
8	Paint and Coatings Producers	\$9,202	\$24,755	\$33,956	\$9,202	\$141,369	\$150,571
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$197	\$21,481	\$21,677	\$309	\$5,817	\$6,126
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$3,284	\$3,284	\$0	\$2,727	\$2,727
14	Steel Mills (stainless)	\$24,668	\$1,207,799	\$1,232,467	\$24,668	\$924,004	\$948,673
14A	Steel Mills (carbon)	\$70,753	\$2,107,233	\$2,177,986	\$70,753	\$3,554,540	\$3,625,293
14B	reshaping (Alloy and Stainless)	\$2,294	\$22,883	\$25,178	\$2,294	\$22,865	\$25,159
15	Iron and Steel Foundries	\$220,958	\$914,509	\$1,135,467	\$269,668	\$3,230,452	\$3,500,120
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$467	\$0	\$467	\$3,260	\$0	\$3,260

Table III.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)						Total
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	Total	
	<20 employees	≥ 20 employees	<20 employees	≥ 20 employees			
19	Chemical Distributors	\$3	\$0	\$4	\$3	\$0	\$4
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$1	\$2	\$3	\$1	\$2	\$3
21A	Fiber, Flat, and Container Glass	\$1,847	\$53,921	\$55,768	\$1,847	\$53,863	\$55,710
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$5,404	\$5,404	\$0	\$5,404	\$5,404
24A	Chromium Catalyst Users (Service)	\$6,773	\$46,318	\$53,091	\$3,707	\$26,522	\$30,229
25	Refractory Brick Producers	\$0	\$5	\$5	\$0	\$5	\$5
26A	Woodworking (general industry)	\$5,579	\$16,691	\$22,270	\$425	\$5,373	\$5,798
26B	Woodworking (maritime industry)	\$0	\$13	\$13	\$0	\$13	\$13
26C	Woodworking (construction industry)	\$21,622	\$273,829	\$295,451	\$21,622	\$85,561	\$107,183
26D	Woodworking (government)	\$0	\$18,620	\$18,620	\$0	\$3,448	\$3,448
27	Solid Waste Incineration	\$4	\$37	\$41	\$4	\$37	\$41
27A	Incinerators (government)	\$0	\$2	\$2	\$0	\$2	\$2
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$9,955	\$9,955	\$0	\$1,082	\$1,082
31B	Construction (Refractory Repair)	\$28,080	\$10,855	\$38,935	\$28,080	\$10,217	\$38,297
31C	Construction (Hazardous Waste Work)	\$11	\$14	\$25	\$11	\$14	\$25
31CG	Haz. Waste (government)	\$0	\$14	\$14	\$0	\$14	\$14
31D	Construction (Industrial Rehabilitation)	\$5	\$30	\$34	\$5	\$30	\$34
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$2	\$2
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$742,969	\$1,982,484	\$2,725,453	\$817,699	\$3,292,009	\$4,109,707
Total (Maritime Industry)		\$11,228	\$398,165	\$409,393	\$14,078	\$480,701	\$494,779
Total (Construction Industry)		\$372,635	\$729,666	\$1,102,300	\$855,718	\$1,256,437	\$2,112,155
Total (Government)		\$0	\$107,701	\$107,701	\$0	\$72,289	\$72,289
Total Industry		\$1,126,832	\$3,218,016	\$4,344,847	\$1,687,495	\$5,101,436	\$6,788,931



Table III.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	Total	Total	
19	Chemical Distributors	\$3	\$0	\$4	\$0	\$4
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$35	\$1,254	\$1,289	\$179	\$214
21A	Fiber, Flat, and Container Glass	\$3,694	\$167,562	\$171,256	\$136,706	\$140,399
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$5,404	\$5,404	\$5,404	\$5,404
24A	Chromium Catalyst Users (Service)	\$832	\$26,698	\$27,531	\$49,904	\$51,242
25	Refractory Brick Producers	\$0	\$5	\$5	\$3,688	\$3,688
26A	Woodworking (general industry)	\$425	\$5,373	\$5,798	\$5,373	\$5,798
26B	Woodworking (maritime industry)	\$0	\$13	\$13	\$13	\$13
26C	Woodworking (construction industry)	\$924,813	\$316,610	\$1,241,423	\$128,342	\$1,053,155
26D	Woodworking (government)	\$0	\$18,620	\$18,620	\$3,448	\$3,448
27	Solid Waste Incineration	\$4	\$37	\$41	\$160,296	\$190,928
27A	Incinerators (government)	\$0	\$2	\$2	\$15,316	\$15,316
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$18,828	\$18,828	\$14,933	\$14,933
31B	Construction (Refractory Repair)	\$28,080	\$24,144	\$52,224	\$28,322	\$56,402
31C	Construction (Hazardous Waste Work)	\$11	\$14	\$25	\$14	\$25
31CG	Haz. Waste (government)	\$0	\$14	\$14	\$14	\$14
31D	Construction (Industrial Rehabilitation)	\$5	\$30	\$34	\$30	\$34
31DG	Industrial Rehab. (government)	\$0	\$2	\$2	\$2	\$2
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$1,328,245	\$6,063,815	\$7,392,060	\$1,927,970	\$12,462,112
	Total (Maritime Industry)	\$23,675	\$649,078	\$672,753	\$36,553	\$1,213,334
	Total (Construction Industry)	\$3,641,372	\$3,260,713	\$6,902,085	\$5,650,078	\$11,405,396
	Total (Government)	\$0	\$175,705	\$175,705	\$0	\$340,914
	Total Industry	\$4,993,291	\$10,149,312	\$15,142,603	\$7,614,602	\$25,421,755

Table III.20 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.25 ug/m <sup>3</sup>		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>	
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$3	\$0	\$4	\$3	\$0	\$4
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$35	\$179	\$214	\$35	\$1,254	\$1,289
21A	Fiber, Flat, and Container Glass	\$3,694	\$155,150	\$158,844	\$9,236	\$862,881	\$872,117
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$3,421	\$3,421	\$0	\$5,144	\$5,144
24A	Chromium Catalyst Users (Service)	\$2,147	\$76,357	\$78,504	\$2,499	\$114,707	\$117,206
25	Refractory Brick Producers	\$0	\$1,578	\$1,578	\$0	\$11,238	\$11,238
26A	Woodworking (general industry)	\$425	\$5,373	\$5,798	\$425	\$5,373	\$5,798
26B	Woodworking (maritime industry)	\$0	\$13	\$13	\$6,856	\$14,299	\$21,155
26C	Woodworking (construction industry)	\$924,813	\$547,658	\$1,472,471	\$171,238	\$171,123	\$342,360
26D	Woodworking (government)	\$0	\$18,620	\$18,620	\$0	\$3,448	\$3,448
27	Solid Waste Incineration	\$30,632	\$153,680	\$184,312	\$3,929	\$24,809	\$28,738
27A	Incinerators (government)	\$0	\$15,316	\$15,316	\$0	\$1,965	\$1,965
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$40,887	\$40,887	\$0	\$176,904	\$176,904
31B	Construction (Refractory Repair)	\$28,080	\$28,322	\$56,402	\$28,080	\$109,870	\$137,950
31C	Construction (Hazardous Waste Work)	\$27,234	\$9,850	\$37,085	\$27,234	\$9,850	\$37,085
31CG	Haz. Waste (government)	\$0	\$38,399	\$38,399	\$0	\$38,399	\$38,399
31D	Construction (Industrial Rehabilitation)	\$5	\$30	\$34	\$5	\$30	\$34
31DG	Industrial Rehab. (government)	\$0	\$2	\$2	\$0	\$2	\$2
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$4,287,650	\$18,019,030	\$22,306,680	\$5,556,170	\$26,208,794	\$31,764,965
Total (Maritime Industry)		\$48,490	\$1,480,174	\$1,528,664	\$54,314	\$1,543,714	\$1,598,028
Total (Construction Industry)		\$10,116,760	\$9,562,839	\$19,679,599	\$9,150,958	\$9,721,339	\$18,872,297
Total (Government)		\$0	\$644,933	\$644,933	\$0	\$682,147	\$682,147
Total Industry		\$14,452,900	\$29,706,976	\$44,159,876	\$14,761,443	\$38,155,995	\$52,917,437

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1 Electroplating	\$209,284	\$707,899	\$209,284	\$707,899	\$917,183	\$917,183
2A Welding (general industry)	\$814,788	\$1,018,757	\$815,088	\$1,018,957	\$1,834,045	\$1,834,045
2B Welding (maritime industry)	\$13,821	\$251,646	\$13,821	\$251,646	\$265,467	\$265,467
2C Welding (construction industry)	\$1,062,111	\$664,364	\$1,062,111	\$664,364	\$1,726,475	\$1,726,475
2D Welding (government)	\$0	\$82,026	\$0	\$82,026	\$82,026	\$82,026
2A1 Welding (general industry - carbon steel)	\$1,097,019	\$1,688,594	\$1,097,019	\$1,688,594	\$2,785,613	\$2,785,613
2B1 Welding (maritime industry - carbon steel)	\$18,753	\$44,655	\$18,753	\$44,655	\$63,408	\$63,408
2C1 Welding (construction industry - carbon steel)	\$1,838,903	\$1,221,318	\$1,838,903	\$1,221,318	\$3,060,221	\$3,060,221
3A Painting (general industry - aerospace)	\$9,932	\$363,681	\$9,989	\$357,625	\$367,614	\$367,614
3A1 Painting (general industry - auto repair)	\$532,107	\$1,125,399	\$532,107	\$1,105,299	\$1,637,407	\$1,637,407
3A2 Painting (general industry - coil coating)	\$4,846	\$84,205	\$4,846	\$84,205	\$89,051	\$89,051
3B Painting (maritime industry)	\$106,873	\$107,799	\$106,873	\$107,799	\$214,672	\$214,672
3C Painting (construction industry)	\$1,301,149	\$766,565	\$1,301,249	\$766,665	\$2,067,914	\$2,067,914
3D Painting (government)	\$0	\$663,967	\$0	\$824,467	\$824,467	\$824,467
4 Chromate (chromite ore) production	\$0	\$2,734	\$0	\$2,734	\$2,734	\$2,734
5 Chromate Pigment Producers	\$80	\$899	\$80	\$899	\$979	\$979
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$460	\$0	\$460	\$460	\$460
7 Chromium Catalyst Producers	\$0	\$5,842	\$0	\$5,842	\$5,842	\$5,842
8 Paint and Coatings Producers	\$16,750	\$22,785	\$16,750	\$22,785	\$39,535	\$39,535
9 Printing Ink Producers	\$727	\$893	\$727	\$893	\$1,620	\$1,620
10 Plastic Colorant Producers and Users	\$1,785	\$10,283	\$1,935	\$10,473	\$12,408	\$12,408
11 Plating Mixture Producers	\$288	\$1,541	\$288	\$1,541	\$1,829	\$1,829
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$815	\$0	\$815	\$815	\$815
14 Steel Mills (stainless)	\$2,068	\$162,785	\$2,068	\$162,785	\$164,853	\$164,853
14A Steel Mills (carbon)	\$5,370	\$438,368	\$5,370	\$438,368	\$443,738	\$443,738
14B reshaping (Alloy and Stainless)	\$2,423	\$13,235	\$2,423	\$13,235	\$15,658	\$15,658
15 Iron and Steel Foundries	\$10,480	\$410,977	\$10,480	\$410,977	\$421,457	\$421,457
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$140	\$1,836	\$140	\$1,846	\$1,987	\$1,987
18 Chromium Sulfate Producers	\$291	\$0	\$291	\$0	\$291	\$291

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	
			Total	Total	Total	
1	Electroplating	\$209,284	\$707,899	\$817,183	\$736,699	\$1,000,083
2A	Welding (general industry)	\$818,088	\$1,020,957	\$1,839,045	\$821,788	\$1,845,145
2B	Welding (maritime industry)	\$13,821	\$251,646	\$265,467	\$13,821	\$265,467
2C	Welding (construction industry)	\$1,062,211	\$664,364	\$1,726,575	\$1,062,211	\$1,726,575
2D	Welding (government)	\$0	\$82,026	\$82,026	\$0	\$82,026
2A1	Welding (general industry - carbon steel)	\$1,100,119	\$1,691,594	\$2,791,713	\$1,106,319	\$2,804,013
2B1	Welding (maritime industry - carbon steel)	\$18,853	\$44,655	\$63,508	\$18,853	\$63,608
2C1	Welding (construction industry - carbon steel)	\$1,839,003	\$1,221,318	\$3,060,321	\$1,839,303	\$3,060,721
3A	Painting (general industry - aerospace)	\$10,015	\$357,662	\$367,677	\$10,045	\$367,881
3A1	Painting (general industry - auto repair)	\$532,107	\$1,105,299	\$1,637,407	\$532,107	\$1,637,407
3A2	Painting (general industry - coil coating)	\$4,846	\$84,205	\$89,051	\$4,846	\$89,051
3B	Painting (maritime industry)	\$106,873	\$107,799	\$214,672	\$107,173	\$215,172
3C	Painting (construction industry)	\$1,301,449	\$766,665	\$2,068,114	\$1,302,549	\$2,069,414
3D	Painting (government)	\$0	\$824,567	\$824,567	\$0	\$824,967
4	Chromate (chromite ore) production	\$0	\$2,734	\$2,734	\$0	\$2,734
5	Chromate Pigment Producers	\$80	\$899	\$979	\$80	\$989
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$460	\$460	\$0	\$460
7	Chromium Catalyst Producers	\$0	\$5,872	\$5,872	\$0	\$5,842
8	Paint and Coatings Producers	\$16,750	\$22,785	\$39,535	\$16,750	\$39,535
9	Printing Ink Producers	\$727	\$893	\$1,620	\$597	\$1,448
10	Plastic Colorant Producers and Users	\$2,025	\$10,583	\$12,608	\$2,645	\$13,978
11	Plating Mixture Producers	\$288	\$1,541	\$1,829	\$288	\$1,829
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$815	\$815	\$0	\$815
14	Steel Mills (stainless)	\$2,068	\$162,785	\$164,853	\$2,068	\$164,853
14A	Steel Mills (carbon)	\$5,370	\$438,368	\$443,738	\$5,370	\$443,738
14B	reshaping (Alloy and Stainless)	\$2,423	\$13,235	\$15,658	\$2,423	\$15,658
15	Iron and Steel Foundries	\$10,480	\$410,977	\$421,457	\$10,480	\$421,457
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$152	\$1,856	\$2,009	\$159	\$2,056
18	Chromium Sulfate Producers	\$291	\$0	\$291	\$291	\$291

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	≥ 20 employees	Total	< 20 employees	≥ 20 employees	Total
1	Electroplating	\$335,584	\$775,099	\$1,110,683	\$335,584	\$775,099	\$1,110,683
2A	Welding (general industry)	\$869,688	\$1,055,657	\$1,925,345	\$892,988	\$1,071,457	\$1,964,445
2B	Welding (maritime industry)	\$13,921	\$251,746	\$265,667	\$14,021	\$251,746	\$265,767
2C	Welding (construction industry)	\$1,062,311	\$664,364	\$1,726,675	\$1,062,311	\$664,364	\$1,726,675
2D	Welding (government)	\$0	\$82,126	\$82,126	\$0	\$82,126	\$82,126
2D	Welding (general industry - carbon steel)						
2A1	Welding (maritime industry - carbon steel)	\$1,157,219	\$1,747,594	\$2,904,813	\$1,185,119	\$1,775,194	\$2,960,313
2B1	Welding (construction industry - carbon steel)	\$19,353	\$45,555	\$64,908	\$19,453	\$45,755	\$65,208
2C1	Welding (construction industry - carbon steel)	\$1,840,103	\$1,221,518	\$3,061,621	\$1,842,503	\$1,221,818	\$3,064,321
3A	Painting (general industry - aerospace)	\$10,544	\$358,140	\$368,684	\$10,611	\$358,140	\$368,751
3A1	Painting (general industry - auto repair)	\$532,107	\$1,105,299	\$1,637,407	\$532,107	\$1,105,299	\$1,637,407
3A2	Painting (general industry - coil coating)	\$4,846	\$84,205	\$89,051	\$4,846	\$84,205	\$89,051
3B	Painting (maritime industry)	\$107,273	\$107,999	\$215,272	\$107,473	\$108,099	\$215,572
3C	Painting (construction industry)	\$1,303,749	\$767,065	\$2,070,814	\$1,304,149	\$767,165	\$2,071,314
3D	Painting (government)	\$0	\$825,267	\$825,267	\$0	\$825,367	\$825,367
4	Chromate (chromite ore) production	\$0	\$2,734	\$2,734	\$0	\$2,778	\$2,778
5	Chromate Pigment Producers	\$80	\$909	\$989	\$80	\$949	\$1,029
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$460	\$460	\$0	\$470	\$470
7	Chromium Catalyst Producers	\$0	\$5,992	\$5,992	\$0	\$5,992	\$5,992
8	Paint and Coatings Producers	\$16,750	\$22,785	\$39,535	\$16,750	\$22,785	\$39,535
9	Printing Ink Producers	\$597	\$851	\$1,448	\$637	\$871	\$1,508
10	Plastic Colbrant Producers and Users	\$2,645	\$11,333	\$13,978	\$2,675	\$11,823	\$14,498
11	Plating Mixture Producers	\$288	\$1,541	\$1,829	\$288	\$1,541	\$1,829
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$815	\$815	\$0	\$815	\$815
14	Steel Mills (stainless)	\$2,168	\$163,085	\$165,253	\$2,168	\$163,085	\$165,253
14A	Steel Mills (carbon)	\$5,670	\$439,368	\$445,038	\$5,670	\$439,368	\$445,038
14B	reshaping (Alloy and Stainless)	\$2,423	\$13,235	\$15,658	\$2,423	\$13,235	\$15,658
15	Iron and Steel Foundries	\$10,480	\$410,977	\$421,457	\$10,480	\$412,877	\$423,357
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$159	\$1,896	\$2,056	\$178	\$1,896	\$2,075
18	Chromium Sulfate Producers	\$291	\$0	\$291	\$291	\$0	\$291

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	> 20 employees	10 ug/m <sup>3</sup>	
19	Chemical Distributors	\$30,778	\$4,079	\$34,858	\$34,858
20	Textile Dyeing	\$25,188	\$251,615	\$276,803	\$276,803
21	Colored Glass Producers	\$583	\$516	\$1,099	\$1,099
21A	Fiber, Flat, and Container Glass	\$380	\$62,405	\$62,785	\$61,643
22	Printing	\$17,975	\$52,332	\$70,307	\$70,307
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$6,331	\$6,331	\$6,331
24A	Chromium Catalyst Users (Service)	\$931	\$9,532	\$10,463	\$10,463
25	Refractory Brick Producers	\$0	\$937	\$937	\$937
26A	Woodworking (general industry)	\$2,359	\$3,953	\$6,313	\$6,313
26B	Woodworking (maritime industry)	\$812	\$1,481	\$2,292	\$2,292
26C	Woodworking (construction industry)	\$197,730	\$122,406	\$320,136	\$320,136
26D	Woodworking (government)	\$0	\$3,736	\$3,736	\$3,736
27	Solid Waste Incineration	\$3,449	\$19,474	\$22,923	\$22,923
27A	Incinerators (government)	\$0	\$1,150	\$1,150	\$1,150
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$11,256	\$11,256	\$11,256
31B	Construction (Refractory Repair)	\$7,139	\$20,415	\$27,554	\$27,554
31C	Construction (Hazardous Waste Work)	\$15,916	\$18,831	\$34,747	\$34,747
31CG	Haz. Waste (government)	\$0	\$22,405	\$22,405	\$22,405
31D	Construction (Industrial Rehabilitation)	\$10,373	\$40,566	\$50,939	\$50,939
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
	Total (General Industry)	\$2,790,024	\$6,484,419	\$9,274,444	\$9,248,053
	Total (Maritime Industry)	\$140,258	\$405,581	\$545,840	\$545,840
	Total (Construction Industry)	\$4,433,321	\$2,854,465	\$7,287,787	\$7,287,987
	Total (Government)	\$0	\$773,284	\$773,284	\$938,525
	Total Industry	\$7,363,604	\$10,517,750	\$17,881,354	\$18,020,404

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
	0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19 Chemical Distributors	\$30,778	\$4,079	\$34,858	\$4,079	\$34,858	\$34,858
20 Textile Dyeing	\$25,188	\$251,615	\$276,803	\$25,588	\$251,815	\$277,403
21 Colored Glass Producers	\$583	\$516	\$1,099	\$583	\$516	\$1,099
21A Fiber, Flat, and Container Glass	\$380	\$58,037	\$58,417	\$380	\$56,895	\$57,275
22 Printing	\$17,975	\$52,332	\$70,307	\$17,975	\$52,332	\$70,307
23 Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$7,211	\$7,211	\$0	\$7,211	\$7,211
24A Chromium Catalyst Users (Service)	\$951	\$9,642	\$10,593	\$951	\$9,642	\$10,593
25 Refractory Brick Producers	\$0	\$937	\$937	\$0	\$937	\$937
26A Woodworking (general industry)	\$2,359	\$3,953	\$6,313	\$2,359	\$3,953	\$6,313
26B Woodworking (maritime industry)	\$812	\$1,481	\$2,292	\$812	\$1,481	\$2,292
26C Woodworking (construction industry)	\$197,730	\$122,406	\$320,136	\$197,730	\$122,406	\$320,136
26D Woodworking (government)	\$0	\$3,736	\$3,736	\$0	\$3,736	\$3,736
27 Solid Waste Incineration	\$3,449	\$19,474	\$22,923	\$3,449	\$19,474	\$22,923
27A Incinerators (government)	\$0	\$1,150	\$1,150	\$0	\$1,150	\$1,150
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$11,346	\$11,346	\$0	\$11,346	\$11,346
31B Construction (Refractory Repair)	\$7,139	\$20,415	\$27,554	\$7,139	\$20,415	\$27,554
31C Construction (Hazardous Waste Work)	\$15,916	\$18,831	\$34,747	\$16,006	\$18,861	\$34,867
31CG Haz. Waste (government)	\$0	\$22,405	\$22,405	\$0	\$22,535	\$22,535
31D Construction (Industrial Rehabilitation)	\$10,373	\$40,566	\$50,939	\$10,373	\$40,566	\$50,939
31DG Industrial Rehab. (government)	\$0	\$4,740	\$4,740	\$0	\$4,740	\$4,740
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)	\$3,033,206	\$6,621,118	\$9,654,324	\$3,084,962	\$6,666,081	\$9,751,042
Total (Maritime Industry)	\$141,358	\$406,781	\$548,140	\$141,758	\$407,081	\$548,840
Total (Construction Industry)	\$4,437,321	\$2,855,165	\$7,292,487	\$4,440,211	\$2,856,595	\$7,295,807
Total (Government)	\$0	\$939,425	\$939,425	\$0	\$939,655	\$939,655
Total Industry	\$7,611,885	\$10,822,490	\$18,434,375	\$7,666,931	\$10,868,412	\$18,535,343

Table III.21 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$30,778	\$4,079	\$34,858	\$30,778	\$4,079	\$34,858
20	Textile Dyeing	\$25,188	\$251,615	\$276,803	\$25,188	\$251,615	\$276,803
21	Colored Glass Producers	\$583	\$516	\$1,099	\$583	\$516	\$1,099
21A	Fiber, Flat, and Container Glass	\$380	\$60,221	\$60,601	\$380	\$58,037	\$58,417
22	Printing	\$17,975	\$52,332	\$70,307	\$17,975	\$52,332	\$70,307
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$6,331	\$6,331	\$0	\$6,331	\$6,331
24A	Chromium Catalyst Users (Service)	\$951	\$9,642	\$10,593	\$951	\$9,642	\$10,593
25	Refractory Brick Producers	\$0	\$937	\$937	\$0	\$937	\$937
26A	Woodworking (general industry)	\$2,359	\$3,953	\$6,313	\$2,359	\$3,953	\$6,313
26B	Woodworking (maritime industry)	\$812	\$1,481	\$2,292	\$812	\$1,481	\$2,292
26C	Woodworking (construction industry)	\$197,730	\$122,406	\$320,136	\$197,730	\$122,406	\$320,136
26D	Woodworking (government)	\$0	\$3,736	\$3,736	\$0	\$3,736	\$3,736
27	Solid Waste Incineration	\$3,449	\$19,474	\$22,923	\$3,449	\$19,474	\$22,923
27A	Incinerators (government)	\$0	\$1,150	\$1,150	\$0	\$1,150	\$1,150
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$11,256	\$11,256	\$0	\$11,256	\$11,256
31B	Construction (Refractory Repair)	\$7,139	\$20,415	\$27,554	\$7,139	\$20,415	\$27,554
31C	Construction (Hazardous Waste Work)	\$15,916	\$18,831	\$34,747	\$15,916	\$18,831	\$34,747
31CG	Haz. Waste (government)	\$0	\$22,405	\$22,405	\$0	\$22,405	\$22,405
31D	Construction (Industrial Rehabilitation)	\$10,373	\$40,566	\$50,939	\$10,373	\$40,566	\$50,939
31DG	Industrial Rehab. (government)	\$0	\$4,740	\$4,740	\$0	\$4,740	\$4,740
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$2,796,779	\$6,461,776	\$9,258,556	\$2,861,307	\$6,497,794	\$9,359,101
Total (Maritime Industry)		\$140,358	\$405,581	\$545,940	\$140,658	\$405,881	\$546,540
Total (Construction Industry)		\$4,433,821	\$2,854,565	\$7,288,387	\$4,435,221	\$2,854,865	\$7,290,087
Total (Government)		\$0	\$938,625	\$938,625	\$0	\$939,025	\$939,025
Total Industry		\$7,370,959	\$10,660,548	\$18,031,507	\$7,437,186	\$10,697,566	\$18,134,752



Table III.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>			10 ug/m <sup>3</sup>		
		<20 employees	>20 employees	Total	<20 employees	>20 employees	Total
1	Electroplating	\$48,000	\$220,100	\$268,100	\$48,000	\$220,100	\$268,100
2A	Welding (general industry)	\$21,500	\$84,400	\$105,900	\$21,500	\$84,400	\$105,900
2B	Welding (maritime industry)	\$1,000	\$43,900	\$44,900	\$1,000	\$43,900	\$44,900
2C	Welding (construction industry)	\$74,600	\$96,600	\$171,200	\$74,600	\$96,600	\$171,200
2D	Welding (government)	\$0	\$11,800	\$11,800	\$0	\$11,800	\$11,800
2A1	Welding (general industry - carbon steel)	\$46,300	\$162,600	\$208,900	\$46,300	\$162,600	\$208,900
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$141,700	\$175,900	\$317,600	\$141,700	\$175,900	\$317,600
3A	Painting (general industry - aerospace)	\$300	\$33,300	\$33,600	\$300	\$33,300	\$33,600
3A1	Painting (general industry - auto repair)	\$39,100	\$108,300	\$147,400	\$39,100	\$108,300	\$147,400
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,500	\$7,900	\$13,400	\$5,500	\$7,900	\$13,400
3C	Painting (construction industry)	\$83,000	\$72,900	\$155,900	\$83,000	\$72,900	\$155,900
3D	Painting (government)	\$0	\$43,100	\$43,100	\$0	\$43,100	\$43,100
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,820	\$1,820	\$0	\$1,820	\$1,820
8	Paint and Coatings Producers	\$4,570	\$6,550	\$11,120	\$4,570	\$6,550	\$11,120
9	Printing Ink Producers	\$870	\$260	\$1,130	\$870	\$260	\$1,130
10	Plastic Colorant Producers and Users	\$220	\$2,640	\$2,860	\$220	\$2,640	\$2,860
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,600	\$46,200	\$600	\$45,600	\$46,200
14A	Steel Mills (carbon)	\$1,400	\$119,200	\$120,600	\$1,400	\$119,200	\$120,600
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,700	\$108,100	\$186,800	\$78,700	\$108,100	\$186,800
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table iii.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		<20 employees	≥ 20 employees	Total	<20 employees	≥ 20 employees	Total
1	Electroplating	\$48,000	\$220,100	\$268,100	\$48,000	\$220,100	\$268,100
2A	Welding (general industry)	\$21,500	\$84,400	\$105,900	\$21,500	\$84,400	\$105,900
2B	Welding (maritime industry)	\$1,000	\$43,900	\$44,900	\$1,000	\$43,900	\$44,900
2C	Welding (construction industry)	\$74,600	\$96,600	\$171,200	\$74,600	\$96,600	\$171,200
2D	Welding (government)	\$0	\$11,800	\$11,800	\$0	\$11,800	\$11,800
2A1	Welding (general industry - carbon steel)	\$46,300	\$162,600	\$208,900	\$46,300	\$162,600	\$208,900
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$141,700	\$175,900	\$317,600	\$141,700	\$175,900	\$317,600
3A	Painting (general industry - aerospace)	\$300	\$33,300	\$33,600	\$300	\$33,300	\$33,600
3A1	Painting (general industry - auto repair)	\$39,100	\$108,300	\$147,400	\$39,100	\$108,300	\$147,400
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,500	\$7,900	\$13,400	\$5,500	\$7,900	\$13,400
3C	Painting (construction industry)	\$83,000	\$72,900	\$155,900	\$83,000	\$72,900	\$155,900
3D	Painting (government)	\$0	\$43,100	\$43,100	\$0	\$43,100	\$43,100
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,820	\$1,820	\$0	\$1,820	\$1,820
8	Paint and Coatings Producers	\$4,570	\$6,550	\$11,120	\$4,570	\$6,550	\$11,120
9	Printing Ink Producers	\$870	\$260	\$1,130	\$820	\$250	\$1,070
10	Plastic Colorant Producers and Users	\$220	\$2,640	\$2,860	\$220	\$2,640	\$2,860
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,600	\$46,200	\$600	\$45,600	\$46,200
14A	Steel Mills (carbon)	\$1,400	\$119,200	\$120,600	\$1,400	\$119,200	\$120,600
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,700	\$108,100	\$186,800	\$78,700	\$108,100	\$186,800
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table III.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$48,000	\$220,100	\$268,100	\$48,000	\$220,100	\$268,100
2A	Welding (general industry)	\$21,500	\$84,400	\$105,900	\$21,500	\$84,400	\$105,900
2B	Welding (maritime industry)	\$1,000	\$43,900	\$44,900	\$1,000	\$43,900	\$44,900
2C	Welding (construction industry)	\$74,600	\$96,600	\$171,200	\$74,600	\$96,600	\$171,200
2D	Welding (government)	\$0	\$11,800	\$11,800	\$0	\$11,800	\$11,800
2A1	Welding (general industry - carbon steel)	\$46,300	\$162,600	\$208,900	\$46,300	\$162,600	\$208,900
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$141,700	\$175,900	\$317,600	\$141,700	\$175,900	\$317,600
3A	Painting (general industry - aerospace)	\$300	\$33,300	\$33,600	\$300	\$33,300	\$33,600
3A1	Painting (general industry - auto repair)	\$39,100	\$108,300	\$147,400	\$39,100	\$108,300	\$147,400
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,500	\$7,900	\$13,400	\$5,500	\$7,900	\$13,400
3C	Painting (construction industry)	\$83,000	\$72,900	\$155,900	\$83,000	\$72,900	\$155,900
3D	Painting (government)	\$0	\$43,100	\$43,100	\$0	\$43,100	\$43,100
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,820	\$1,820	\$0	\$1,820	\$1,820
8	Paint and Coatings Producers	\$4,570	\$6,550	\$11,120	\$4,570	\$6,550	\$11,120
9	Printing Ink Producers	\$820	\$250	\$1,070	\$820	\$250	\$1,070
10	Plastic Colorant Producers and Users	\$220	\$2,640	\$2,860	\$220	\$2,640	\$2,860
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,600	\$46,200	\$600	\$45,600	\$46,200
14A	Steel Mills (carbon)	\$1,400	\$119,200	\$120,600	\$1,400	\$119,200	\$120,600
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,700	\$108,100	\$186,800	\$78,700	\$108,100	\$186,800
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table III.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>			10 ug/m <sup>3</sup>		
	< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19 Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20 Textile Dyeing	\$4,600	\$71,700	\$76,300	\$4,600	\$71,700	\$76,300
21 Colored Glass Producers	\$100	\$100	\$200	\$100	\$100	\$200
21A Fiber, Flat, and Container Glass	\$100	\$14,400	\$14,500	\$100	\$14,200	\$14,300
22 Printing	\$3,800	\$14,900	\$18,700	\$3,800	\$14,900	\$18,700
23 Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$990	\$990	\$0	\$990	\$990
24A Chromium Catalyst Users (Service)	\$290	\$3,060	\$3,350	\$290	\$3,060	\$3,350
25 Refractory Brick Producers	\$0	\$300	\$300	\$0	\$300	\$300
26A Woodworking (general industry)	\$200	\$300	\$500	\$200	\$300	\$500
26B Woodworking (maritime industry)	\$100	\$300	\$400	\$100	\$300	\$400
26C Woodworking (construction industry)	\$21,700	\$23,000	\$44,700	\$21,700	\$23,000	\$44,700
26D Woodworking (government)	\$0	\$400	\$400	\$0	\$400	\$400
27 Solid Waste Incineration	\$540	\$4,280	\$4,820	\$540	\$4,280	\$4,820
27A Incinerators (government)	\$0	\$140	\$140	\$0	\$140	\$140
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$3,530	\$3,530	\$0	\$3,530	\$3,530
31B Construction (Refractory Repair)	\$680	\$3,580	\$4,260	\$680	\$3,580	\$4,260
31C Construction (Hazardous Waste Work)	\$2,320	\$3,300	\$5,620	\$2,320	\$3,300	\$5,620
31CG Haz. Waste (government)	\$0	\$3,270	\$3,270	\$0	\$3,270	\$3,270
31D Construction (Industrial Rehabilitation)	\$1,060	\$7,160	\$8,220	\$1,060	\$7,160	\$8,220
31DG Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$490	\$490
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)	\$252,120	\$1,020,790	\$1,272,910	\$252,120	\$1,020,590	\$1,272,710
Total (Maritime Industry)	\$6,700	\$54,400	\$61,100	\$6,700	\$54,400	\$61,100
Total (Construction Industry)	\$325,060	\$382,440	\$707,500	\$325,060	\$382,440	\$707,500
Total (Government)	\$0	\$58,710	\$58,710	\$0	\$59,200	\$59,200
Total Industry	\$583,880	\$1,516,340	\$2,100,220	\$583,880	\$1,516,630	\$2,100,510

Table III.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	Total
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$4,600	\$71,700	\$76,300	\$4,600	\$71,700	\$76,300
21	Colored Glass Producers	\$100	\$100	\$200	\$100	\$100	\$200
21A	Fiber, Flat, and Container Glass	\$100	\$13,900	\$14,000	\$100	\$13,400	\$13,500
22	Printing	\$3,800	\$14,900	\$18,700	\$3,800	\$14,900	\$18,700
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$990	\$990	\$0	\$990	\$990
24A	Chromium Catalyst Users (Service)	\$290	\$3,060	\$3,350	\$290	\$3,060	\$3,350
25	Refractory Brick Producers	\$0	\$300	\$300	\$0	\$300	\$300
26A	Woodworking (general industry)	\$200	\$300	\$500	\$200	\$300	\$500
26B	Woodworking (maritime industry)	\$100	\$300	\$400	\$100	\$300	\$400
26C	Woodworking (construction industry)	\$21,700	\$23,000	\$44,700	\$21,700	\$23,000	\$44,700
26D	Woodworking (government)	\$0	\$400	\$400	\$0	\$400	\$400
27	Solid Waste Incineration	\$540	\$4,280	\$4,820	\$540	\$4,280	\$4,820
27A	Incinerators (government)	\$0	\$140	\$140	\$0	\$140	\$140
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$3,530	\$3,530	\$0	\$3,530	\$3,530
31B	Construction (Refractory Repair)	\$680	\$3,580	\$4,260	\$680	\$3,580	\$4,260
31C	Construction (Hazardous Waste Work)	\$2,320	\$3,300	\$5,620	\$2,320	\$3,300	\$5,620
31CG	Haz. Waste (government)	\$0	\$3,270	\$3,270	\$0	\$3,270	\$3,270
31D	Construction (Industrial Rehabilitation)	\$1,060	\$7,160	\$8,220	\$1,060	\$7,160	\$8,220
31DG	Industrial Rehab. (government)	\$0	\$490	\$490	\$0	\$490	\$490
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$252,120	\$1,020,290	\$1,272,410	\$252,070	\$1,019,780	\$1,271,850
Total (Maritime Industry)		\$6,700	\$54,400	\$61,100	\$6,700	\$54,400	\$61,100
Total (Construction Industry)		\$325,060	\$382,440	\$707,500	\$325,060	\$382,440	\$707,500
Total (Government)		\$0	\$59,200	\$59,200	\$0	\$59,200	\$59,200
Total Industry		\$583,880	\$1,516,330	\$2,100,210	\$583,830	\$1,515,820	\$2,099,650

Table III.22 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 7 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	Total
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$4,600	\$71,700	\$76,300	\$4,600	\$71,700	\$76,300
21	Colored Glass Producers	\$100	\$100	\$200	\$100	\$100	\$200
21A	Fiber, Flat, and Container Glass	\$100	\$13,400	\$13,500	\$100	\$13,100	\$13,200
22	Printing	\$3,800	\$14,900	\$18,700	\$3,800	\$14,900	\$18,700
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$990	\$990	\$0	\$990	\$990
24A	Chromium Catalyst Users (Service)	\$290	\$3,060	\$3,350	\$290	\$3,060	\$3,350
25	Refractory Brick Producers	\$0	\$300	\$300	\$0	\$300	\$300
26A	Woodworking (general industry)	\$200	\$300	\$500	\$200	\$300	\$500
26B	Woodworking (maritime industry)	\$100	\$300	\$400	\$100	\$300	\$400
26C	Woodworking (construction industry)	\$21,700	\$23,000	\$44,700	\$21,700	\$23,000	\$44,700
26D	Woodworking (government)	\$0	\$400	\$400	\$0	\$400	\$400
27	Solid Waste Incineration	\$540	\$4,280	\$4,820	\$540	\$4,280	\$4,820
27A	Incinerators (government)	\$0	\$140	\$140	\$0	\$140	\$140
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$3,530	\$3,530	\$0	\$3,530	\$3,530
31B	Construction (Refractory Repair)	\$680	\$3,580	\$4,260	\$680	\$3,580	\$4,260
31C	Construction (Hazardous Waste Work)	\$2,320	\$3,300	\$5,620	\$2,320	\$3,300	\$5,620
31CG	Haz. Waste (government)	\$0	\$3,270	\$3,270	\$0	\$3,270	\$3,270
31D	Construction (Industrial Rehabilitation)	\$1,060	\$7,160	\$8,220	\$1,060	\$7,160	\$8,220
31DG	Industrial Rehab. (government)	\$0	\$490	\$490	\$0	\$490	\$490
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$252,070	\$1,019,780	\$1,271,850	\$252,070	\$1,019,480	\$1,271,550
Total (Maritime Industry)		\$6,700	\$54,400	\$61,100	\$6,700	\$54,400	\$61,100
Total (Construction Industry)		\$325,060	\$382,440	\$707,500	\$325,060	\$382,440	\$707,500
Total (Government)		\$0	\$59,200	\$59,200	\$0	\$59,200	\$59,200
Total Industry		\$583,830	\$1,515,820	\$2,099,650	\$583,830	\$1,515,520	\$2,099,350

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )									
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0		
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	0	200	424	139	1,261	496	69	0		
		Use of floating balls										
		Improve tank covers										
		Upgrade existing LEV to ACGIH standards										
		Cost of MACT Testing										
		Tank covers, floating balls, fume suppressants, etc.	0	529	881	0	88	44	132	176		
		Tank covers, floating balls, fume suppressants, etc.	0	833	740	185	370	570	355	278		
		Captive Shop Chrome Plater	0	278	1,018	370	370	370	93	185		
		Job Shop Plater	0	3,365	6,083	416	1,409	924	671	732		
		Captive Shop Plater	0	1,165	3,975	457	1,005	594	183	114		
		Anodizer	0	795	795	88	88	177	0	88		
		Operator	0	954	1,751	373	842	636	342	282		
		Helper/Other	0	990	3,975	0	688	765	347	173		
		Chrome Conversion	0	12,301	7,828	0	1,118	0	0	0		
		2A Welding (general industry)	SMAW	Local Exhaust Ventilation	4,680	0	0	0	3,670	2,447	6,525	3,059
				Directional General Ventilation of a Confined Space								
				Increase general exhaust ventilation								
Replace SMAW with GMAW												
Improved maintenance of existing ventilation system												
Use stationary LEV - Articulating Welding Exhaust Duct												
Use stationary LEV (Downdraft Table)												
High-Velocity-Low-Volume System												
Controls combined with SMAW												
Use stationary LEV - Articulating Welding Exhaust Duct	6,878			449	0	3,589	2,392	150	1,047	449		
Improved Maintenance of existing LEV	3,579			0	0	952	0	0	0	0		
No controls required	1,812			0	0	0	0	0	0	0		
Install LEV by torch	204			0	0	0	45	23	0	195		
Replace existing plasma cutting gas with argon-hydrogen gas												
Install LEV by torch	390			0	0	0	0	63	0	0		
No controls required	2,718			0	0	0	0	0	0	0		
GMAW TIG SAW Plasma Cutting Plasma Welding Resistance Welding				Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space										
		Increase general exhaust ventilation										
		Replace SMAW with GMAW										
		Improved maintenance of existing ventilation system										
		Use stationary LEV - Articulating Welding Exhaust Duct										
		Use stationary LEV (Downdraft Table)										
		High-Velocity-Low-Volume System										
		Controls combined with SMAW										
		Use stationary LEV - Articulating Welding Exhaust Duct	6,878	449	0	3,589	2,392	150	1,047	449		
		Improved Maintenance of existing LEV	3,579	0	0	952	0	0	0	0		
		No controls required	1,812	0	0	0	0	0	0	0		
		Install LEV by torch	204	0	0	0	45	23	0	195		
		Replace existing plasma cutting gas with argon-hydrogen gas										
		Install LEV by torch	390	0	0	0	0	63	0	0		
		No controls required	2,718	0	0	0	0	0	0	0		

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	\$487,032	\$487,032	\$382,668	\$0	\$0	\$0	
		Use of floating balls	\$44,957	\$44,957	\$35,323	\$0	\$0	\$0	
		Improve tank covers	\$442,075	\$442,075	\$347,345	\$0	\$0	\$0	
		Upgrade existing LEV to ACGIH standards	\$162,098,895	\$64,362,717	\$67,211,304	\$30,989,456	\$14,302,826	\$7,151,413	
		Cost of MACT Testing	\$7,017,192	\$2,786,238	\$2,476,656	\$1,341,522	\$619,164	\$309,662	
	Decorative Chrome Job Shop Chrome Plater Captive Shop Chrome Plater Job Shop Plater Captive Shop Plater Anodizer Operator Helper/Other Chrome Conversion	Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in hard chrome job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in hard chrome job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in hard chrome job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in hard chrome job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in hard chrome job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in operator job category.						
		Tank covers, floating balls, fume suppressants, etc.	Engineering costs accounted for in operator job category.						
		Dust controls while chromic acid flakes are added to tanks	Engineering costs accounted for in operator job category.	\$110,519	\$110,519	\$110,519	\$110,519	\$0	\$0
		Installation of New LEV		\$320,574,316	\$38,163,609	\$38,163,609	\$0	\$0	\$0
		2A Welding (general industry)	SMAW	Local Exhaust Ventilation	\$66,232,800	\$60,125,400	\$45,360,600	\$23,974,300	\$12,062,100
Directional General Ventilation of a Confined Space									
Increase general exhaust ventilation									
Replace SMAW with GMAW									
Improved maintenance of existing ventilation system									
GMAW TIG SAW Plasma Cutting Plasma Welding Resistance Welding	Use stationary LEV - Articulating Welding Exhaust Duct								
	Use stationary LEV (Downdraft Table)								
	High-Velocity-Low-Volume System								
	Controls combined with SMAW								
	Use stationary LEV - Articulating Welding Exhaust Duct								
	Improved Maintenance of existing LEV								
	No controls required								
	Install LEV by torch								
	Replace existing plasma cutting gas with argon-hydrogen gas								
	Install LEV by torch								
No controls required									
GMAW cost are included under SMAW									
			\$1,713,600	\$1,713,600	\$0	\$0	\$0		
			\$476,000	\$476,000	\$0	\$0	\$0		
			\$0	\$0	\$0	\$0	\$0		
			\$256,500	\$256,500	\$256,500	\$212,800	\$191,900		
			\$26,800	\$26,800	\$26,800	\$22,200	\$20,000		
			\$119,700	\$119,700	\$119,700	\$119,700	\$0		
			\$0	\$0	\$0	\$0	\$0		



Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to > 20.0	
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	555	212	138	250	305	129	157	148
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
	GMAW	Use moveable LEV - Articulating Welding Exhaust Duct	1,113	432	243	405	487	55	0	0
		Replace SMAW with pulsed arc GMAW welding unit	423	158	25	19	6	0	0	0
		Use Portable LEV - Nedermann Filterbox	5,605	1,251	1,869	1,717	1,088	153	153	784
	TIG	Fume Extractor Gun (FEG)								
		Controls combined with SMAW								
		Use moveable LEV - Articulating Welding Exhaust Duct								
	FCAW	Use moveable LEV - Articulating Welding Exhaust Duct								
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
	Plasma Cutting	Replace 100%CO2 with 95%Argon/5%CO3	58	58	0	29	160	72	0	43
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	0	113	55	0	0	0	0	0
		Install LEV by torch	106	161	76	26	26	13	13	0
Use Portable LEV - Nedermann Filterbox										
Use moveable LEV - Articulating Welding Exhaust Duct		51	15	37	7	0	22	29	7	
Replace power source to convert unit to a plasma arc-cutting unit										
No controls required		42	0	0	0	0	0	0	0	
Electron Torch Cutting		0	42	0	0	0	0	0	0	
Thermal Spray Tungsten Carbide		1882	0	0	0	0	0	0	0	
SAW										
Grinding		84	125	0	0	0	0	0	0	
2C Welding (construction industry)		SMAW	Local Exhaust Ventilation	13,284	5,078	3,310	5,985	7,299	3,083	3,763
	Directional General Ventilation of a Confined Space									
	Nedermann Filterbox									
	Plasma Cutting	Welder training on proper position of LEV ducts								
		2 hour training course								
		Replace SMAW with GMAW								
	GMAW	Fume Extractor Gun (FEG)	83	83	0	42	229	104	0	62
		Install LEV by torch								
		Replace existing plasma cutting gas with argon-hydrogen cutting gas								
	Brazing	GMAW controls are included under SMAW	3,690	1,433	807	1,342	1,614	181	0	0
		Nedermann Filterbox	0	0	0	0	0	0	4,534	0
		No controls required	0	0	0	0	0	154	0	752
	Metalizing	Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Nedermann Filterbox								
2D Welding (government industry)	SMAW	Local Exhaust Ventilation	207	79	52	93	114	48	59	55
		Directional General Ventilation of a Confined Space								
		Nedermann Filterbox								
	Plasma Cutting	Welder training on proper position of LEV ducts								
		Replace SMAW with GMAW								
		Install LEV by torch	1	1	0	1	3	2	0	1
	GMAW	Fume extractor gun	57	22	13	21	25	3	0	0
		Replace short-circuit and other welding equipment with a pulsed arc								
		Nedermann Filterbox								
	Brazing	Welder training on proper position of LEV ducts	0	0	0	0	0	0	0	72
		Local Exhaust Ventilation	0	0	0	0	0	2	0	12

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )					
			0.25	0.5	1	5	10	20
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$8,156,148	\$5,954,253	\$2,837,663	\$1,031,880	\$582,170	\$357,676
		Directional General Ventilation of a Confined Space						
		Use stationary LEV (Downdraft Table)						
		Use moveable LEV - Articulating Welding Exhaust Duct						
		Replace SMAW with pulsed arc GMAW welding unit						
	GMAW	Use Portable LEV - Nedermann Filterbox						
		Fume Extractor Gun (FEG)						
		Controls combined with SMAW						
		Use moveable LEV - Articulating Welding Exhaust Duct	\$90,372	\$46,072	\$12,404	\$0	\$0	\$0
		Use moveable LEV - Articulating Welding Exhaust Duct	\$5,318,432	\$3,976,001	\$3,283,529	\$2,244,821	\$2,244,821	\$1,880,142
	FCAW	Local Exhaust Ventilation						
		Directional General Ventilation of a Confined Space						
		Replace 100%CO <sub>2</sub> with 95%Argon/5%CO <sub>3</sub>						
		Replace existing plasma cutting gas with argon-hydrogen cutting gas						
		Install LEV by torch	\$74,951	\$74,951	\$67,962	\$29,402	\$12,291	\$12,291
Plasma Cutting	Plasma Cutting							
	Plasma Welding							
	Oxy-fuel Cutting	\$70,345	\$0	\$0	\$0	\$0	\$0	
	Air Carbon Arc Cutting/Gouging	\$334,248	\$167,124	\$112,149	\$57,174	\$28,587	\$0	
	Electron Torch Cutting	\$93,916	\$60,248	\$54,932	\$54,932	\$33,668	\$7,088	
	Thermal Spray Tungsten Carbide	\$80,784	\$50,490	\$43,756	\$43,756	\$26,928	\$5,049	
	Grinding	\$0	\$0	\$0	\$0	\$0	\$0	
	SAW	\$0	\$0	\$0	\$0	\$0	\$0	
	Grinding	\$0	\$0	\$0	\$0	\$0	\$0	
	Grinding	\$0	\$0	\$0	\$0	\$0	\$0	
2C Welding (construction industry)	SMAW	Local Exhaust Ventilation	\$65,448,951	\$53,971,420	\$33,864,281	\$13,138,790	\$9,867,133	\$6,061,208
		Directional General Ventilation of a Confined Space						
		Nedermann Filterbox						
		Welder training on proper position of LEV ducts						
		2 hour training course						
	Plasma Cutting	Replace SMAW with GMAW						
		Fume Extractor Gun (FEG)	\$411,939	\$411,939	\$372,438	\$156,123	\$58,311	\$58,311
		Install LEV by torch	\$52,779	\$52,779	\$47,718	\$20,003	\$7,471	\$7,471
		Replace existing plasma cutting gas with argon-hydrogen cutting gas						
		GMAW controls are included under SMAW						
	GMAW Brazing Metalizing	Nedermann Filterbox	\$6,823,670	\$6,823,670	\$6,823,670	\$6,823,670	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Local Exhaust Ventilation						
		Directional General Ventilation of a Confined Space						
		Nedermann Filterbox						
2D Welding (government industry)	SMAW	Local Exhaust Ventilation	\$1,156,791	\$1,049,733	\$313,614	\$66,063	\$9,083	\$0
		Directional General Ventilation of a Confined Space						
		Nedermann Filterbox						
		Welder training on proper position of LEV ducts						
		Replace SMAW with GMAW						
	Plasma Cutting GMAW	Install LEV by torch	\$16,929	\$16,929	\$16,929	\$0	\$0	\$0
		Fume extractor gun						
		Replace short-circuit and other welding equipment with a pulsed arc						
		Nedermann Filterbox						
		Welder training on proper position of LEV ducts						
Brazing Metalizing	Local Exhaust Ventilation	\$0	\$0	\$0	\$0	\$0	\$0	
	Welder training on proper position of LEV ducts	\$267	\$267	\$267	\$267	\$267	\$267	
	Local Exhaust Ventilation							
	Welder training on proper position of LEV ducts							
	Local Exhaust Ventilation							

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to > 20.0	
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	8,680	8,680	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Increase general exhaust ventilation								
		Replace SMAW with GMAW								
		Improved maintenance of existing ventilation system								
		Use stationary LEV - Articulating Welding Exhaust Duct								
		Use stationary LEV (Downdraft Table)								
		High-Velocity-Low-Volume System								
		Controls combined with SMAW	0	0	6,366	6,366	0	0	0	0
		No controls required	3,472	0	0	0	0	0	0	0
		No controls required	1,543	0	0	0	0	0	0	0
		Install LEV by torch	0	0	193	193	0	0	0	0
		Replace existing plasma cutting gas with argon-hydrogen gas								
No controls required	386	0	0	0	0	0	0	0		
No controls required	2,315	0	0	0	0	0	0	0		
Resistance Welding										
FCAW										
Confined Space										
			0	1,233	1,233	8,544	7,333	3,678	0	
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	10	10	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Use stationary LEV (Downdraft Table)								
		Use moveable LEV - Articulating Welding Exhaust Duct								
		Replace SMAW with pulsed arc GMAW welding unit								
		Use Portable LEV - Nederman Filterbox								
		Fume Extractor Gun (FEG)								
		Controls combined with SMAW	0	0	14	14	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	7	0	0	0	0	0	0	0
		Use moveable LEV - Articulating Welding Exhaust Duct	0	0	52	78	0	0	0	0
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		Replace 100%CO2 with 95%Argon/5%CO3								
Replace existing plasma cutting gas with argon-hydrogen cutting gas	0	0	2	2	0	0	0	0		
Install LEV by torch	2	0	0	0	0	0	0	0		
Use Portable LEV - Nederman Filterbox	0	0	2	2	0	0	0	0		
Use moveable LEV - Articulating Welding Exhaust Duct	0	0	1	1	0	0	0	0		
Replace power source to convert unit to a plasma arc-cutting unit										
No controls required	0	0	0	0	0	0	0	0		
No controls required	0	0	0	0	0	0	0	0		
No controls required	18	0	0	0	0	0	0	0		
No controls required	2	0	0	0	0	0	0	0		
Controls combined with other processes	0	23	23	160	137	69	0	0		
Plasma Cutting	Plasma Cutting	Electron Torch Cutting								
		Thermal Spray Tungsten Carbide								
		SAW								
		Grinding								
		Confined Space								

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls					
			0.25	0.5	1	5	10	20
			PEL (ug/m <sup>3</sup> )					
2A1 Welding (General Industry; carbon steel)	SMAW	Local Exhaust Ventilation	\$94,355,600	\$59,068,100	\$14,534,200	\$4,854,200	\$0	\$0
		Directional General Ventilation of a Confined Space						
		Increase general exhaust ventilation						
		Replace SMAW with GMAW						
		Improved maintenance of existing ventilation system						
		Use stationary LEV - Articulating Welding Exhaust Duct						
		Use stationary LEV (Downdraft Table)						
		High-Velocity-Low-Volume System						
		Controls combined with SMAW						
		No controls required						
		No controls required						
		Install LEV by torch						
		Replace existing plasma cutting gas with argon-hydrogen gas						
		No controls required						
		No controls required						
Controls combined with SMAW								
Controls combined with other processes								
GMAW cost are included under SMAW								
	TIG		\$230,200	\$230,200	\$0	\$0	\$0	
	SAW		\$0	\$0	\$0	\$0	\$0	
	Plasma Cutting		\$549,100	\$182,400	\$0	\$0	\$0	
	Plasma Welding		\$58,000	\$19,400	\$0	\$0	\$0	
	Resistance Welding		\$0	\$0	\$0	\$0	\$0	
	FCAW		\$0	\$0	\$0	\$0	\$0	
	Confined Space		\$0	\$0	\$0	\$0	\$0	
Controls combined with other processes								
GMAW cost are included under SMAW								
Controls combined with other processes								
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$752,723	\$663,606	\$382,942	\$102,352	\$0	\$0
		Directional General Ventilation of a Confined Space						
		Use stationary LEV (Downdraft Table)						
		Use moveable LEV - Articulating Welding Exhaust Duct						
		Replace SMAW with pulsed arc GMAW welding unit						
		Use Portable LEV - Nederman Filterbox						
		Fume Extractor Gun (FEG)						
		Controls combined with SMAW						
		Use moveable LEV - Articulating Welding Exhaust Duct						
		Use moveable LEV - Articulating Welding Exhaust Duct						
		Local Exhaust Ventilation						
		Directional General Ventilation of a Confined Space						
		Replace 100%CO2 with 95%Argon/5%CO3						
		Replace existing plasma cutting gas with argon-hydrogen cutting gas						
		Install LEV by torch						
Use Portable LEV - Nederman Filterbox								
Use moveable LEV - Articulating Welding Exhaust Duct								
Replace power source to convert unit to a plasma arc-cutting unit								
No controls required								
No controls required								
No controls required								
No controls required								
Controls combined with other processes								
Controls combined with other processes								
	TIG		\$0	\$0	\$0	\$0	\$0	
	FCAW		\$130,845	\$76,507	\$0	\$0	\$0	
GMAW cost are included under SMAW								
Controls combined with other processes								
All SMAW and GMAW costs have been combined in this analysis								
	Plasma Cutting		\$964	\$482	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$8,796	\$4,398	\$0	\$0	\$0	
			\$1,772	\$0	\$0	\$0	\$0	
			\$1,683	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	
Controls combined with other processes								

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to >20.0	
			LOD	0.25	0.5	1.0	5.0	10.0	20.0	
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	0	0	21,360	21,360	0	0	0	0
		Directional General Ventilation of a Confined Space								
		Nedermann Filterbox								
		Welder training on proper position of LEV ducts								
		2 hour training course								
		Replace SMAW with GMAW								
		Fume Extractor Gun (FEG)								
		Local Exhaust Ventilation								
		Directional General Ventilation of a Confined Space								
		GMAW controls are included under SMAW								
Metallizing	GMAW	Nedermann Filterbox	0	0	0	0	0	0	0	
		No controls required	0	0	0	0	0	0	0	
		Plasma Cutting	0	0	0	0	0	0	0	
		Confined Space	0	1,619	1,619	11,228	9,636	4,832	0	
3A Painting (general industry)	Spray Painter	Improved maintenance of existing ventilation system	274	657	247	298	874	321	490	760
		Sander with integrated LEV and HEPA-filtered exhaust								
		Replace existing HVLPA/airless guns with electrostatic spray painting equipment								
		Use Hudson-type sprayer or brushes for application								
		Directional general ventilation of a confined space								
		Periodic inspection and maintenance of hanger flow-through ventilation								
		Increase spray booth air velocity to 100 fpm								
		Use appropriately sized (larger) spray paint booth								
		Sander with integrated LEV and HEPA-filtered exhaust	955	492	608	492	116	116	0	116
		Assembler								
3A2 Painting (coil coating)	Operator (coil coating)	Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	772	129	0	176	94	0	0	0
		No controls required	390	0	0	0	0	0	0	0
3A1 Painting (auto body repair)	Spray Painter Sander	Use appropriately sized (larger) spray paint booth (8)	0	217	2,173	0	217	435	869	435
		Sander with integrated LEV and HEPA-filtered exhaust (9)	0	8,191	12,410	0	0	2,730	1,489	0
3B Painting (maritime industry)	Spray Painter	Use spray gun with higher transfer efficiency (such as HVLPA spray gun)	24	16	0	8	47	16	8	16
		Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)								
3C Painting (construction industry)	Abrasive Blaster Grinder/Sander	Improved maintenance of existing ventilation system								
		Sander with integrated LEV and HEPA-filtered exhaust	121	91	151	106	559	106	106	272
		No controls required	393	242	151	181	393	151	0	0
		No controls required								
3C Painting (government)	Spray painter Laborer Traffic Painters	No controls required	4,891	4,402	1,141	1,956	1,630	1,141	326	815
		No controls required	1,793	3,587	0	7,337	3,587	0	0	0
		No controls required	0	100	600	0	0	100	0	0
3D Painting (government)	Spray painter Laborer	No controls required	1,222	1,100	285	489	407	285	81	204
		No controls required	448	896	0	1,833	896	0	0	0

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )					
			0.25	0.5	1	5	10	20
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$120,447,694	\$72,502,708	\$19,014,387	\$6,349,914	\$0	\$0
		Directional General Ventilation of a Confined Space						
		Niedermaier Filterbox						
		Welder training on proper position of LEV ducts						
		2 hour training course						
		Replace SMAW with GMAW	\$0	\$0	\$0	\$0	\$0	\$0
		Fume Extractor Gun (FEG)	\$0	\$0	\$0	\$0	\$0	\$0
		Local Exhaust Ventilation						
		Directional General Ventilation of a Confined Space						
		GMAW controls are included under SMAW						
3A Painting (general industry)	Spray Painter	Improved maintenance of existing ventilation system	\$93,200	\$85,600	\$65,600	\$40,400	\$27,600	\$12,400
		Sander with integrated LEV and HEPA-filtered exhaust	\$194,090	\$165,890	\$128,288	\$40,736	\$21,868	\$9,334
		Replace existing HVLP/airless guns with electrostatic spray painting equipment	\$2,127,387	\$1,931,587	\$1,686,445	\$806,450	\$561,308	\$358,912
		Use Hudson-type sprayer or brushes for application	\$34,451	\$34,451	\$34,451	\$17,519	\$13,898	\$3,621
		Directional general ventilation of a confined space	\$900	\$900	\$900	\$900	\$900	\$0
		Periodic inspection and maintenance of hangar flow-through ventilation	\$22,400	\$22,400	\$22,400	\$22,400	\$22,400	\$0
		Increase spray booth air velocity to 100 ft/min	\$17,500	\$17,500	\$17,500	\$17,500	\$0	\$0
		Use appropriately sized (larger) spray paint booth	\$36,800	\$36,800	\$36,800	\$0	\$0	\$0
		Sander with integrated LEV and HEPA-filtered exhaust	\$289,615	\$168,006	\$69,606	\$46,404	\$23,202	\$23,202
		Controls combined with other processes						
3A2 Painting (coil coating)	Operator (coil coating) Maintenance (coil coating)	Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	\$277,500	\$277,500	\$88,800	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Use appropriately sized (larger) spray paint booth (8)	\$20,013,473	\$9,987,750	\$9,987,750	\$8,878,000	\$6,658,500	\$2,219,500
		Sander with integrated LEV and HEPA-filtered exhaust (9)	\$17,865,560	\$827,560	\$827,560	\$827,560	\$292,080	\$0
		Use spray gun with higher transfer efficiency (such as HVLP spray gun)	\$4,563	\$4,563	\$2,966	\$1,369	\$821	\$548
		Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	\$258,610	\$227,346	\$205,492	\$95,916	\$74,062	\$52,208
		Improved maintenance of existing ventilation system	\$6,173	\$6,173	\$5,651	\$2,608	\$1,565	\$0
		Sander with integrated LEV and HEPA-filtered exhaust	\$137,317	\$114,043	\$83,786	\$23,274	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
3C Painting (construction industry)	Spray painter Laborer Traffic Painters	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
3D Painting (government)	Spray painter Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	>20.0
			4	Chromate (chromite ore) production	Process Operators	1	39	11	13	1
		Upgrade LEV by grinders and kiln access doors Upgrade LEV and use closed sample collection containers Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers Ventilation loader to two railcars Use portable LEV Fume Hood	0	7	0	5	9	0	0	0
	Packaging Workers		0	32	2	6	2	0	0	0
	Maintenance workers		0	11	11	0	0	0	0	0
	Other Exposed Workers		0	0	0	0	0	0	0	0
5	Chromate Pigment Producers	Sink Tank Operator Drying/Blending/Packaging Operator	0	0	0	0	4	0	1	1
		No controls required Install a dust collection spill hopper for 50 pound bag tube packing machine Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit Install an air replacement system to provide building make up air Retrofit open-cab forklift to closed-cab with HEPA filtered air No controls required No controls required Install ventilated sample collection boxes No controls required Install dust tight covers on existing conveyors No controls required	0	0	0	0	1	0	0	1
	Maintenance Worker		0	0	0	0	0	3	0	3
	Laborer		0	0	0	0	5	2	0	2
	Laboratory Technician		0	0	0	0	2	2	2	2
	Wastewater Treatment Operator		0	0	0	0	2	1	1	3
	Manager/Supervisor		0	0	0	0	0	0	0	3
	Proprietary Process Operator		0	0	0	0	0	0	0	3
	Dispersion Operator		0	0	0	0	0	0	0	3
6	Chromated Copper Arsenate (CCA) Producers	Production Operator Production Supervisor CCA Truck Loader Warehouse Operator	0	0	0	5	5	0	0	0
		No controls required No controls required No controls required No controls required	0	6	0	0	0	0	0	0
			0	3	0	0	0	0	0	0
			0	3	0	0	0	0	0	0

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )					
			0.25	0.5	1	5	10	20
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	\$172,960	\$172,960	\$0	\$0	\$0	\$0
		Upgrade LEV and use closed sample collection containers	\$6,640	\$6,640	\$0	\$0	\$0	\$0
		Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	\$86,480	\$86,480	\$0	\$0	\$0	\$0
	Packaging Workers	Ventilation loader to two railcars	\$217,971	\$217,971	\$217,971	\$0	\$0	\$0
		Maintenance workers	\$286	\$286	\$0	\$0	\$0	\$0
		Use portable LEV	\$2,700	\$0	\$0	\$0	\$0	\$0
		Fume Hood	\$0	\$0	\$0	\$0	\$0	\$0
	5 Chromate Pigment Producers	Strike Tank Operator	No controls required	\$0	\$0	\$0	\$0	\$0
			Install a dust collection spill hopper for 50 pound bag tube packing machine	\$900	\$900	\$900	\$900	\$900
		Drying/Blending/Packaging Operator	Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit	\$2,933	\$2,933	\$2,933	\$0	\$0
Install an air replacement system to provide building make up air			\$31,600	\$31,600	\$31,600	\$31,600	\$31,600	\$31,600
Retrofit open-cab forklift to closed-cab with HEPA filtered air			\$700	\$700	\$700	\$0	\$0	\$0
Maintenance Worker		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Install ventilated sample collection boxes	\$2,400	\$2,400	\$2,400	\$0	\$0	\$0
Laborer		No controls required	\$0	\$0	\$0	\$0	\$0	\$0
		Wastewater Treatment Operator	\$0	\$0	\$0	\$0	\$0	\$0
		Proprietary Process Operator	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400
Laboratory Technician	Install dust tight covers on existing conveyors	\$0	\$0	\$0	\$0	\$0	\$0	
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
6 Chromated Copper Arsenate (CCA) Producers	Production Operator	No controls required	\$0	\$0	\$0	\$0	\$0	
		No controls required	\$0	\$0	\$0	\$0	\$0	
	Production Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	
		No controls required	\$0	\$0	\$0	\$0	\$0	
	CCA Truck Loader	No controls required	\$0	\$0	\$0	\$0	\$0	
Warehouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0		



Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Chromium Catalyst Producers	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )																					
				Below LOD	0.25 to 0.25	0.5 to 0.5	1.0 to 1.0	1.9 to 1.9	2.0 to 2.0	5.0 to 5.0	10.0 to 10.0	20.0 to 20.0	> 20.0												
7	Chromium Catalyst Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	0	0	0	1	19	2	2	10														
		Dry Process Operator	Improve existing side draft LEV at 55-gallon loading station	0	0	0	2	5	0	20	8														
			Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine																						
		Screening Operator	Upgrade flat deck screening equipment to ACGIH standard	0	2	4	8	0	2	0	0														
		Quality Control Inspector	No controls required	0	15	0	0	0	0	0	0														
		Dry Mix Operator	No controls required	0	52	0	0	0	0	0	0														
		Process Control Operator	No controls required	0	12	0	0	0	0	0	0														
		Control Room Operator	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	0	0	3	0	0	0	0	0														
		Forming Operator	No controls required	0	0	0	0	9	0	0	0														
		Team Leader	No controls required	0	0	6	0	0	0	0	0														
		Lead Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	0	0	0	0	1	1	2	0														
				Increase air supply and general exhaust ventilation																					
				Replace manually-unloaded filter press with automatic pressure filter equipment																					
			Floor Person	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	0	0	4	5	18	2	1	1													
		8	Paint and Coatings Producers	Warehouse Operator	No controls required	0	16	8	0	0	0	0													
				Maintenance Person	No controls required	0	30	0	15	15	0	0	0												
				Solid Waste Handler	No controls required	0	0	0	0	4	4	4	4												
				Batchmaker	Improved LEV at Cr(VI) mixing tanks	400	75	38	38	150	0	21	479												
Packager	Partially enclosed drum opening/ dumping station																								
9	Printing Ink Producers	Shipping/receiving Technician	No controls required	0	600	0	0	0	0	0															
		Laboratory Chemist/Technician	No controls required	0	384	0	0	0	0	0	0														
		Batch Weigher	No controls required	4	0	0	17	47	0	0	0														
		Mill Operator	No controls required	4	4	0	0	8	0	0	0														
		Utility Worker	No controls required	6	0	0	0	6	0	0	0														
10	Plastic Colorant Producers and Users	Maintenance Worker	No controls required	0	0	3	0	0	0	0															
		Production Supervisor	No controls required	13	0	0	0	0	0	0	0														
		Dry Color Handler	No controls required	0	0	0	0	232	35	58	23														
		Wet Mill Operator	No controls required	0	15	15	0	0	0	0	0														
		Dry Color Blender/packager	No controls required	0	0	0	0	18	1	6	15														
	Production Supervisor	No controls required	37	0	0	0	0	0	0	37															

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Chromium Catalyst Producers	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
				0.25	0.5	1	5	10	20	
7	Chromium Catalyst Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Dry Process Operator	Improve existing side draft LEV at 55-gallon loading station; Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	\$6,800 \$1,331,735	\$6,800 \$1,331,735	\$6,800 \$1,331,735	\$6,800 \$1,331,735	\$6,800 \$1,331,735	\$6,800 \$1,331,735	\$1,943 \$493,235
		Screening Operator	Upgrade flat deck screening equipment to ACGIH standard	\$13,000	\$0	\$0	\$0	\$0	\$0	\$0
		Quality Control Inspector	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Dry Mix Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Process Control Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Control Room Operator	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	\$15,000	\$0	\$0	\$0	\$0	\$0	\$0
		Forming Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Team Leader	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Lead Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	\$133,809	\$133,809	\$133,809	\$133,809	\$133,809	\$133,809	\$49,559
			Increase air supply and general exhaust ventilation	\$11,125	\$11,125	\$11,125	\$11,125	\$11,125	\$11,125	\$0
			Replace manually-unloaded filter press with automatic pressure filter equipment	\$46,941	\$46,941	\$46,941	\$0	\$0	\$0	\$0
			Floor Person	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment.	\$70,258	\$70,258	\$70,258	\$0	\$0	\$0
			Warehouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
			Maintenance Person	No controls required	\$0	\$0	\$0	\$0	\$0	\$0
	Solid Waste Handler	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
8	Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	\$1,441,163	\$1,068,010	\$809,673	\$243,145	\$243,145	\$227,283	
		Package	Partially enclosed drum opening/dumping station	\$4,917,183	\$3,717,763	\$2,875,777	\$666,318	\$666,318	\$622,129	
		Shipping/receiving Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Laboratory Chemist/Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
			No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
9	Printing Ink Producers	Batch Weigher	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Mill Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Utility Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Production Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
10	Plastic Colorant Producers and Users	Dry Color Handler	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Wet Mill Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Dry Color Blender/packager	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
		Production Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	
			No controls required	\$0	\$0	\$0	\$0	\$0	\$0	

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )									
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0		
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11 Plating Mixture Producers	Blender/Mixer Operator-Dry	Partially enclosed drum opening/ dumping station	0	0	0	0	22	0	0	0	0	0
		Totally enclosed automated bag slitter and dumping station										
		Totally enclosed ventilated drum-dumping station										
		Barrel and bag filling stations with effective ventilation systems										
Blender/Mixer Operator-Liquid	Laboratory Chemist	Barrel stations with effective ventilation systems	0	0	80	0	0	0	0	0	0	0
		Partially enclosed manual drum filling station										
		Totally enclosed automated drum dumping station	0	16	0	0	0	0	0	0	0	0
		No controls required										
12 Wood Preserving	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Leach Operator	Strahman valves and ventilated sample box	0	0	8	0	0	0	0	0	0	
13 Chromium Material Producers	Agar Operator	Covers and tank head space ventilation on eger tanks	0	0	0	0	4	0	0	0	0	
	Lower-cell-room Operator	Cell covers to completely cover the cell and improved LEV	0	0	0	4	0	0	0	0		
	Cell Assembler	Enclosed, ventilated cell-component cleaning room or enclosure	0	0	0	0	4	0	0	0		
	Cell Operator	Cell covers to completely cover the cell and improved LEV	0	0	0	4	0	0	0	0		
	Plate Hooker	Upgrade existing side-draft hood at the chromic acid tank with push-puff LEV system for open surface tanks	0	0	0	0	0	5	0	0		
	Plater Stripper	Install Booth around chromic acid tank with remote hoist controls	0	0	0	9	0	0	0	0		
	Mill Operator	No controls required	2	2	0	0	0	0	0	0		
	Blender Operator	No controls required	0	1	0	0	0	0	0	0		
	Briquetting Operator	No controls required	0	1	0	0	0	0	0	0		
	Furnace Loader	No controls required	3	0	0	0	0	0	0	0		
	Furnace Operator	No controls required	3	0	0	0	0	0	0	0		
	VG Picker	No controls required	0	3	0	0	0	0	0	0		
	Brick Layer	No controls required	3	0	0	0	0	0	0	0		
Shipper	No controls required	3	0	0	0	0	0	0	0			
Bagger	No controls required	2	1	1	0	0	0	0	0			

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls							PEL (ug/m <sup>3</sup> )
			0.25	0.5	1	5	10	20		
11 Plating Mixture Producers	Blender/Mixer Operator-Dry	Partially enclosed drum opening/ dumping station	\$187,200	\$187,200	\$187,200	\$0	\$0	\$0	\$0	
		Totally enclosed automated bag slitter and dumping station	\$135,000	\$0	\$0	\$0	\$0	\$0		
		Totally enclosed ventilated drum-dumping station	\$126,400	\$0	\$0	\$0	\$0	\$0		
		Barrel and bag filling stations with effective ventilation systems	\$3,000	\$0	\$0	\$0	\$0	\$0		
		Barrel stations with effective ventilation systems	\$9,000	\$0	\$0	\$0	\$0	\$0		
	Blender/Mixer Operator-Liquid	Partially enclosed manual drum filling station	\$92,800	\$0	\$0	\$0	\$0	\$0		
		Totally enclosed automated drum dumping station	\$122,000	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
	Laboratory Chemist	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
	12	Wood Preserving	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13 Chromium Material Producers	Leach Operator	Strahman valves and ventilated sample box	\$200	\$0	\$0	\$0	\$0	\$0		
		Covers and tank head space ventilation on ager tanks	\$13,300	\$13,300	\$13,300	\$0	\$0	\$0		
	Ager Operator	Cell covers to completely cover the cell and improved LEV	\$0	\$0	\$0	\$0	\$0	\$0		
		Enclosed, ventilated cell-component cleaning room or enclosure	\$600	\$600	\$600	\$0	\$0	\$0		
	Lower-cell-room Operator	Cell covers to completely cover the cell and improved LEV	\$0	\$0	\$0	\$0	\$0	\$0		
		Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	\$5,700	\$5,700	\$5,700	\$5,700	\$0	\$0		
	Cell Assembler	Engineering costs accounted for in other job categories.	\$0	\$0	\$0	\$0	\$0	\$0		
		Cell covers to completely cover the cell and improved LEV	\$0	\$0	\$0	\$0	\$0	\$0		
	Cell Operator	Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	\$0	\$0	\$0	\$0	\$0	\$0		
		Cell covers to completely cover the cell and improved LEV	\$0	\$0	\$0	\$0	\$0	\$0		
	Plate Hooker	Install Booth around chromic acid tank with remote noist controls	\$1,500	\$1,500	\$1,500	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
	Plater Stripper	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
	Mill Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
		No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
	Blender Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0		
No controls required		\$0	\$0	\$0	\$0	\$0	\$0			
Briquetting Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
Furnace Loader	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
Furnace Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
VG Picker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
Brick Layer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
Shipper	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
Bagger	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			
	No controls required	\$0	\$0	\$0	\$0	\$0	\$0			

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )										
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	> 20.0			
14 Steel Mills (stainless)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	0	0	206	206	0	0	0	0	0		
		No controls required	0	832	214	214	0	0	0	0	0		
	Crane Operator Continuous Casting Operator Rolling-Mill Operator Welders Steel Conditioning Operator	Direct-Shell Evacuation Control Collection (DEC) Collection System Change to Bottom-Pour Method from Lip and Pour Method Ladle LEV with traveling cantilevered exhaust hood Periodic inspection and maintenance of furnace LEV Substitute lip pour ladle with bottom-pour ladle with LEV Retrofit Crane Cab with HEPA-filtered air Annual Maintenance Install HEPA Filtration in the Operator Control Room Replace SMAW with GMAW Fume Extractor Gun (FEG) Perform Maintenance on Grinding Station Booth Ventilation and LEV	391	0	203	297	672	0	0	0	0		
			0	254	0	121	639	0	0	0	0		
			0	233	233	0	0	0	0	0	0		
			868	108	542	145	145	0	0	0	0		
			0	49	0	158	317	49	463	183	0		
			0	0	1023	0	511	0	0	0	0		
			Upgrade existing ventilation hood exhaust air flow rates										
			14A Steel Mills (carbon)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system	0	651	651	0	0	0	0	0
					No controls required	2,635	678	678	0	0	0	0	0
				Crane Operator Continuous Casting Operator Rolling-Mill Operator Welders Steel Conditioning Operator	Direct-Shell Evacuation Control Collection (DEC) Collection System Change to Bottom-Pour Method from Lip and Pour Method Ladle LEV with traveling cantilevered exhaust hood Periodic inspection and maintenance of furnace LEV Substitute lip pour ladle with bottom-pour ladle with LEV Retrofit Crane Cab with HEPA-filtered air Annual Maintenance Install HEPA Filtration in the Operator Control Room Replace SMAW with GMAW Fume Extractor Gun (FEG) Perform Maintenance on Grinding Station Booth Ventilation and LEV	1,236	643	940	2,126	0	0	0	0
	803	0				385	2,022	0	0	0	0		
	738	738				0	0	0	0	0	0		
3,092	1,718	458				458	0	0	0	0			
0	154	502				1,004	154	1,467	579	0			
0	3,255	0				1,603	0	0	0	0			
Upgrade existing ventilation hood exhaust air flow rates													
14B Reshaping	Raw Material Handler Laborer Crane Operator Rolling-Mill/Forging Operator Steel Conditioning Operator	No controls required				0	0	35	35	0	0	0	0
		Periodic inspection and maintenance of furnace LEV				129	16	80	21	21	0	0	0
		Retrofit Crane Cab with HEPA-filtered air				0	43	0	21	108	0	0	0
		Install HEPA Filtration in the Operator Control Room		147	18	92	25	25	0	0	0		
		Annual Maintenance		0	0	175	0	86	0	0	0		
		Perform Maintenance on Grinding Station Booth Ventilation and LEV	0	0	175	0	86	0	0	0			
Upgrade existing ventilation hood exhaust air flow rates													

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls							
			0.25	0.5	1	5	10	20		
			PEL (ug/m <sup>3</sup> )							
14 Steel Mills (Stainless)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Direct-Shell Evacuation Control Collection (DEC) Collection System	\$5,696,956	\$5,696,956	\$5,696,956	\$0	\$0	\$0	\$0	\$0
		Change to Bottom-Pour Method from Lip and Pour Method Ladle LEV with traveling cantilevered exhaust hood	\$111,957	\$111,957	\$0	\$0	\$0	\$0	\$0	\$0
	Crane Operator	Periodic inspection and maintenance of furnace LEV	\$435,446	\$435,446	\$0	\$0	\$0	\$0	\$0	\$0
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$4,483	\$4,483	\$0	\$0	\$0	\$0	\$0	\$0
		Retrofit Crane Cab with HEPA-filtered air	\$307,837	\$307,837	\$0	\$0	\$0	\$0	\$0	\$0
	Continuous Casting Operator Rolling-Mill Operator	Annual Maintenance	\$355,720	\$355,720	\$299,086	\$0	\$0	\$0	\$0	\$0
		Annual Maintenance	\$65,378	\$65,378	\$0	\$0	\$0	\$0	\$0	\$0
		Install HEPA Filtration in the Operator Control Room	\$44,552	\$44,552	\$0	\$0	\$0	\$0	\$0	\$0
	Welders	Replace SMAW with GMAW	\$47,511	\$47,511	\$9,448	\$0	\$0	\$0	\$0	\$0
		Fume Extractor Gun (FEG)	\$55,030	\$55,030	\$55,030	\$37,356	\$34,460	\$10,203	\$0	\$0
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$224,515	\$224,515	\$224,515	\$0	\$0	\$0	\$0	\$0
		Upgrade existing ventilation hood exhaust air flow rates	\$39,244	\$39,244	\$39,244	\$0	\$0	\$0	\$0	\$0
			\$185,475	\$0	\$0	\$0	\$0	\$0	\$0	
14A Steel Mills (Carbon)	Raw Material Handler Furnace Operator Furnace Helper/Laborer	HEPA-filtered vacuum system No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Direct-Shell Evacuation Control Collection (DEC) Collection System	\$17,008,962	\$17,008,962	\$0	\$0	\$0	\$0	\$0	\$0
		Change to Bottom-Pour Method from Lip and Pour Method Ladle LEV with traveling cantilevered exhaust hood	\$756,311	\$756,311	\$0	\$0	\$0	\$0	\$0	\$0
	Crane Operator	Periodic inspection and maintenance of furnace LEV	\$2,941,590	\$2,941,590	\$0	\$0	\$0	\$0	\$0	\$0
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$30,281	\$30,281	\$0	\$0	\$0	\$0	\$0	\$0
		Retrofit Crane Cab with HEPA-filtered air	\$1,349,097	\$1,349,097	\$0	\$0	\$0	\$0	\$0	\$0
	Continuous Casting Operator Rolling-Mill Operator	Annual Maintenance	\$1,066,380	\$895,612	\$0	\$0	\$0	\$0	\$0	\$0
		Annual Maintenance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Install HEPA Filtration in the Operator Control Room	\$35,635	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Welders	Replace SMAW with GMAW	\$28,135	\$28,135	\$0	\$0	\$0	\$0	\$0	\$0
		Fume Extractor Gun (FEG)	\$116,067	\$116,067	\$116,067	\$107,942	\$30,547	\$0	\$0	\$0
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$461,860	\$461,860	\$461,860	\$0	\$0	\$0	\$0	\$0
		Upgrade existing ventilation hood exhaust air flow rates	\$91,491	\$91,491	\$0	\$0	\$0	\$0	\$0	\$0
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	
14B Reshaping	Raw Material Handler Laborer Crane Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Periodic inspection and maintenance of furnace LEV	\$26,152	\$5,374	\$2,687	\$0	\$0	\$0	\$0	\$0
		Retrofit Crane Cab with HEPA-filtered air	\$390,035	\$390,035	\$326,541	\$0	\$0	\$0	\$0	\$0
	Rolling-Mill/Forging Operator	Install HEPA Filtration in the Operator Control Room	\$56,191	\$56,191	\$13,842	\$0	\$0	\$0	\$0	\$0
		Annual Maintenance	\$46,960	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$56,010	\$56,010	\$56,010	\$0	\$0	\$0	\$0	\$0
			\$116,820	\$0	\$0	\$0	\$0	\$0	\$0	
			\$0	\$0	\$0	\$0	\$0	\$0	\$0	

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )																	
			Below LOD	LOD 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to 20.0	>20.0										
15 Iron and Steel Foundries	Molders	No controls required	2,669	4,016	1,335	2,669	1,335	0	0	0	0	0	0	0	0	0	0	0	0	
	Furnace Operator	Install LEV in the form of hoods over the furnace	0	1,083	359	143	143	0	0	0	0	0	0	0	0	0	0	0	0	
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	0	0	383	256	891	0	0	0	0	0	0	0	0	0	0	0	0	
	Pourers	No controls required	0	1,584	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	0	0	0	0	0	396	0	0	0	0	0	0	0	0	0	0	0	
	Torch Cutter/Gouger Welder	Install enclosed booths for manual blasting	0	0	99	198	0	198	0	198	99	198	0	0	0	0	0	0	0	
	Grinder Operator	Install a moveable hood and an HVLV fume exhaust system Grinding wheel hood	0	0	223	445	0	445	0	445	223	446	0	0	0	0	0	0	0	
		Downdraft Ventilation Booth with Air Shower	648	3,868	648	0	1,296	0	0	0	0	0	0	0	0	0	0	0	0	
		HVLV Grinders																		
		Laborer	No controls required	867	1,304	434	867	434	0	0	0	0	0	0	0	0	0	0	0	0
16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
17 Chromium Dye Producers	Color Maker	No controls required	0	0	0	0	0	11	0	0	1	4	0	0	0	0	0	0	0	
	Drying/Blending/Packaging Operator	No controls required	0	0	0	0	0	9	0	3	18	0	0	0	0	0	0	0	0	
	Maintenance Worker	No controls required	0	0	0	0	2	0	2	0	6	0	0	0	0	0	0	0	0	
	Laborer	No controls required	0	0	0	0	10	0	0	0	10	0	0	0	0	0	0	0	0	
	Laboratory Technician	No controls required	0	0	0	0	5	2	0	2	0	0	0	0	0	0	0	0	0	
	Wastewater Treatment Operator	No controls required	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	
	Manager/Supervisor	No controls required	0	0	0	0	3	1	1	1	1	1	1	1	1	1	1	1	1	
18 Chromium Sulfate Producers	Reactor Operators	No controls required	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	
	Railcar Operators	No controls required	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
19 Chemical Distributors	Shipping	No controls required	3,572	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
20 Textile Dyeing	Blender	No controls required	3,963	0	3,963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Dyer	No controls required	13,384	2,741	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Maintenance Worker	No controls required	645	645	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
21 Colored Glass Producers	Lab Assistant	Install a moveable canopy hood connected to a dust collector	3	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	
	Batch Mixer	No controls required	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Furnace Worker	No controls required	245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
21A Fiber, Flat, and Container Glass	Batch Operator	HEPA Filtration in Control Room	70	250	37	0	37	37	37	37	37	0	0	0	0	0	0	0	0	
	Furnace Operator	HEPA Filtration in Control Room	373	989	81	0	113	32	32	32	0	0	0	0	0	0	0	0	0	
	EP/Baghouse Operator	No controls required	36	36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Forehearth Operator	HEPA Filtration in Control Room	110	428	0	0	110	0	0	0	0	0	0	0	0	0	0	0	0	
	Hot End/Maintenance	No controls required	0	1665	0	0	456	0	0	0	160	0	0	0	0	0	0	0	0	
22 Printing	Printer	No controls required	5,700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Mixer	No controls required	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Shipper	No controls required	700	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls						
			0.25	0.5	1	5	10	20	
			PEL (ug/m <sup>3</sup> )						
15 Iron and Steel Foundries	Molders	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Furnace Operator	Install LEV in the form of hoods over the furnace	\$2,850,751	\$1,198,688	\$594,344	\$0	\$0	\$0	\$0
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	\$918,000	\$688,200	\$534,600	\$0	\$0	\$0	\$0
	Pourers	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	\$168,300	\$168,300	\$168,300	\$0	\$0	\$0	\$0
	Torch Cutter/Gouger	Install enclosed booths for manual blasting	\$29,700	\$29,700	\$29,700	\$0	\$0	\$0	\$0
	Welder	Install a moveable hood and an HVLV fume exhaust system	\$935,400	\$935,400	\$688,400	\$668,400	\$401,400	\$267,600	
	Grinder Operator	Install a moveable hood and an HVLV fume exhaust system	\$311,850	\$311,850	\$222,750	\$222,750	\$133,650	\$89,100	
		Grinding wheel hood	\$5,400	\$3,600	\$3,600	\$0	\$0	\$0	\$0
		Downdraft Ventilation Booth with Air Shower	\$174,600	\$133,200	\$133,200	\$0	\$0	\$0	\$0
	HVLV Grinders	\$10,800	\$7,200	\$7,200	\$0	\$0	\$0	\$0	
	Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Color Maker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	Drying/Blending/Packaging Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Laborer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Laboratory Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Wastewater Treatment Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Manager/Supervisor	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Reactor Operators	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
18 Chromium Sulfate Producers	Railcar Operators	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shipping	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
19 Chemical Distributors	Blender	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Dyer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
20 Textile Dyeing	Lab Assistant	Install a moveable canopy hood connected to a dust collector	\$1,772	\$1,772	\$1,772	\$0	\$0	\$0	\$0
	Batch Mixer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Furnace Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21 Colored Glass Producers	Batch Operator	HEPA Filtration in Control Room	\$19,584	\$14,688	\$14,688	\$9,792	\$4,896	\$0	\$0
	Furnace Operator	HEPA Filtration in Control Room	\$48,960	\$33,660	\$33,660	\$12,240	\$6,120	\$0	\$0
	EP/Baghouse Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
21A Fiber, Flat, and Container Glass	Foreman Operator	HEPA Filtration in Control Room	\$20,808	\$20,808	\$20,808	\$0	\$0	\$0	\$0
	Hot End/Maintenance	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Printer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22 Printing	Mixer	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shipper	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0



Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )																	
			Below LOD		0.25 to 0.50		0.50 to 1.0		1.0 to 5.0		5.0 to 10.0		10.0 to > 20.0							
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
23	Leather Tanning	Not Applicable																		
24	Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants Process Operators, all Catalyst Plants except Phillips Polyethylene Plants Field Technician	Not Applicable	Equip the catalyst vessel with exhaust ventilation to maintain the catalyst vessel under negative pressure when catalyst is loaded No controls required	38	28	11	15	10	10	10	0	0	0	0	0	0	0		
25	Refractory Brick Producers	Cleaner	No controls required	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0		
		Crusher Operator	No controls required	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Pressman	No controls required	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Batchman	3 sided LEV enclosures	3	9	3	3	0	0	0	0	0	0	0	0	0	0	0	0	
		Mold Filler	No controls required	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Brick Loader	Install overhead doors that open to the outside in kiln work area	0	9	0	9	0	0	0	0	0	0	0	0	0	0	0	0	
		Grinder Operator	No controls required	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Saw Operator	No controls required	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Engineering Intern	No controls required	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
26	Woodworking	Construction	Install central HEPA-filtered vacuum	4,651	0	4,651	0	3,100	0	1,550	0	0	0	0	0	0	0	0		
		Maritime	Improve LEV at workstation	239	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		General Industry	No controls required	334	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
			Install central HEPA-filtered vacuum																	
		Government	Improve LEV at workstation	40	0	40	0	27	0	14	0	0	0	0	0	0	0	0	0	
27	Solid Waste Incineration	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	296	0	149	296	0	0	0	0	0	0	0	0	0	0	0		
		Shredder/Heavy Equipment Operator	No controls required	451	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Maintenance Mechanic/Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	225	0	113	113	0	0	0	0	0	0	0	0	0	0	0	0	
		Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	217	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	
		Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	112	0	112	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	64	0	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			No controls required																	
			Improve LEV at workstation																	

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Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls							
			0.25	0.5	1	5	10	20		
			PEL (ug/m <sup>3</sup> )							
23	Leather Tanning	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24	Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	\$101,345	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Process Operators, all Catalyst Plants except Phillips Polyethylene Plants	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Field Technician	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Cleaner	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	Crusher Operator	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Pressman	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Batchman	\$18,642	\$9,321	\$0	\$0	\$0	\$0	\$0	\$0
		Mold Filler	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Brick Loader	\$2,844	\$2,844	\$0	\$0	\$0	\$0	\$0	\$0
		Grinder Operator	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Saw Operator	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Engineering Intern	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
					\$0	\$0	\$0	\$0	\$0	\$0
					\$0	\$0	\$0	\$0	\$0	\$0
26	Woodworking	Construction	\$3,972,658	\$1,986,115	\$1,986,115	\$662,038	\$662,038	\$0	\$0	
		Maritime	\$1,241,482	\$496,529	\$496,529	\$0	\$0	\$0	\$0	
		General Industry	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Government	\$11,983	\$11,983	\$11,983	\$0	\$0	\$0	\$0	
			\$64,264	\$32,529	\$32,529	\$11,107	\$11,107	\$0	\$0	
			\$19,934	\$8,033	\$8,033	\$0	\$0	\$0	\$0	
27	Solid Waste Incineration	Laborer	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Shredder/Heavy Equipment Operator	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Maintenance Mechanic/Maintenance Helper	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Boiler Operator/Assistant Operator	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Maintenance Electrician	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
		Truck Operator (ash hauling)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
					\$0	\$0	\$0	\$0	\$0	
					\$0	\$0	\$0	\$0	\$0	
					\$0	\$0	\$0	\$0	\$0	
					\$0	\$0	\$0	\$0	\$0	

Table III.23 Engineering Costs Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, Control Technology, and PEL) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Number of Exposed Workers (ug/m <sup>3</sup> )							
			Below LOD	LOD to 0.25	0.25 to 0.5	0.5 to 1.0	1.0 to 5.0	5.0 to 10.0	10.0 to > 20.0	
			N/A	N/A	N/A	N/A	N/A	N/A	N/A	
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming No controls required	14	0	6	14	0	0	0	0
	Shredder/Heavy Equipment Operator		21	0	0	0	0	0	0	0
	Maintenance Mechanic/Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	11	0	5	5	0	0	0	0
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	10	0	0	4	0	0	0	0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	5	0	5	0	0	0	0	0
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	3	0	3	0	0	0	0	0
28 Oil and Gas Well Drilling	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30 Superalloy Producers	Melt Specialist	No controls required	72	0	0	0	0	0	0	0
	Reclaim Weigh Operator	No controls required	0	0	72	0	0	0	0	0
	EAF Operator	No controls required	0	48	0	0	0	0	0	0
	VIM/AIM Furnace Operator	No controls required	84	56	28	0	0	0	0	0
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	0	36	0	17	90	0	0	0
	Refining Unit Operator	No controls required	236	0	0	0	0	0	0	0
	Floor Person	No controls required	400	400	0	0	0	0	0	0
	Welder	Portable LEV	30	0	0	0	0	0	10	0
	Inert Screener	Replace SMAW with GMAW No controls required	8	0	0	0	0	0	0	0
	Laboratory Technician	No controls required	86	58	0	0	0	0	0	0
	Machine Operator	No controls required	262	26	0	0	0	0	0	0
	Maintenance Worker	No controls required	144	0	0	0	0	0	0	0
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	156	104	0	156	520	52	52	0
	Hazardous Waste Site Worker	No controls required	910	230	73	0	0	0	0	0
	Industrial Rehabilitation	No controls required	1,684	0	0	0	0	0	0	0
31 Construction (government)	Hazardous Waste Site Worker	No controls required	509	129	41	0	0	0	0	0
	Industrial Rehabilitation	No controls required	101	0	0	0	0	0	0	0
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total			121,522	85,249	115,769	104,638	62,957	27,759	25,154	15,382

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Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Cost of Engineering Controls PEL (ug/m <sup>3</sup> )						
			0.25	0.5	1	5	10	20	
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Shredder/Heavy Equipment Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0	\$0	\$0	\$0	\$0
28 Oil and Gas Well Drilling	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
30 Superalloy Producers	Melt Specialist	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Reclaim Weigh Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	EAF Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	VIM/AIM Furnace Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$45,900	\$45,900	\$38,556	\$0	\$0	\$0	\$0
	Refining Unit Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Floor Person	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Welder	Portable LEV	\$9,000	\$9,000	\$9,000	\$9,000	\$9,000	\$9,000	\$9,000
	Inert Screener	Replace SMAW with GMAW	\$1,800	\$1,800	\$1,800	\$0	\$0	\$0	\$0
	Laboratory Technician	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Machine Operator	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Maintenance Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	\$429,000	\$429,000	\$343,200	\$57,200	\$28,600	\$0	\$0
	Hazardous Waste Site Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Industrial Rehabilitation	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
31 Construction (government)	Hazardous Waste Site Worker	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Industrial Rehabilitation	No controls required	\$0	\$0	\$0	\$0	\$0	\$0	\$0
32A Ready-Mix Concrete	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total			\$958,257,206	\$431,929,006	\$257,952,259	\$106,795,241	\$51,502,449	\$25,247,673	\$0

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost		
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	\$2,199	\$132	\$400		
		Use of floating balls	\$208	\$12	\$36		
		Improve tank covers	\$2,000	\$120	\$400		
		Upgrade existing LEV to ACGIH standards	\$22,800	\$34,829	\$37,500		
		Upgrade existing LEV to ACGIH standards	\$7,696	\$2,953	\$3,900		
		Cost of MACT Testing	\$0	\$0	\$5,000		
		Cost of MACT Testing	\$0	\$0	\$7,500		
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Tank covers, floating balls, fume suppressants, etc.		See costs for Hard Chrome			
		Dust controls while chromic acid flakes are added to tanks		\$1,000	\$60	\$200	
		Installation of New LEV		\$38,000	\$58,048	\$62,500	
		Installation of New LEV		\$12,826	\$4,921	\$6,400	
		2A Welding (general industry)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
				Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900
				Increase general exhaust ventilation	\$41,800	\$9,675	\$14,600
Replace SMAW with GMAW	\$1,353			\$62	\$200		
Improved maintenance of existing ventilation system	\$0			\$378	\$400		
Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605			\$998	\$1,600		
Use stationary LEV (Downdraft Table)	\$11,400			\$2,530	\$3,800		
High-Velocity-Low-Volume System	\$4,963			\$900	\$1,500		
Controls combined with SMAW	N/A			N/A	N/A		
Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605			\$998	\$1,600		
Improved Maintenance of existing LEV	\$660			\$385	\$500		
No controls required	N/A			N/A	N/A		
Install LEV by torch	\$7,220			\$846	\$1,900		
Replace existing plasma cutting gas with argon-hydrogen gas	\$1,353			\$62	\$200		
Plasma Welding Resistance Welding	Install LEV by torch			\$7,220	\$846	\$1,900	
	No controls required	N/A	N/A	N/A			

Table iii.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions					Design Basis
			ACFM	Length of ductwork, feet	Room size	Other	Design Basis	
1 Electroplating	Hard Chrome	Use of chemical fume suppressants (per tank per year)	N/A	N/A	N/A	N/A	N/A	N/A
		Use of floating balls	N/A	N/A	N/A	N/A	N/A	N/A
		Improve tank covers	N/A	N/A	N/A	N/A	N/A	N/A
		Upgrade existing LEV to ACGIH standards	17,010	N/A	N/A	N/A	N/A	Large
		Upgrade existing LEV to ACGIH standards	3,360	N/A	N/A	N/A	N/A	small
		Cost of MACT Testing	N/A	N/A	N/A	N/A	N/A	large
		Cost of MACT Testing	N/A	N/A	N/A	N/A	N/A	small
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Tank covers, floating balls, fume suppressants, etc.						
		Dust controls while chromic acid flakes are added to tanks						
		Installation of New LEV						
2A Welding (general industry)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A	Froats and Mason Granger Tubeaxial Fan
		Increase general exhaust ventilation	12,000cfm/welder	200	N/A	N/A	N/A	Donaldson Torit Truckline
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW
		Improved maintenance of existing ventilation system	N/A	N/A	N/A	N/A	N/A	Stationary Nederman 5000
		Use stationary LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		Use stationary LEV (Downdraft Table)	N/A	N/A	N/A	N/A	N/A	Lincoln Electric Suction Heads High Vacuum
		High-Velocity-Low-Volume System	650	10	N/A	N/A	N/A	SHM, SHFA, UNM, SMHT
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A	Stationary Nederman 5000
		Use stationary LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	N/A	Stationary Nederman 5000
		Improved Maintenance of existing LEV	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		Install LEV by torch	650	10	N/A	N/A	N/A	Van der Wall (1986), Nedermann Filtercart Zone
		Replace existing plasma cutting gas with argon-hydrogen gas	N/A	N/A	N/A	N/A	N/A	Van der Wall (1986), Nedermann Filtercart Zone
		Install LEV by torch	650	10	N/A	N/A	N/A	Van der Wall (1986), Nedermann Filtercart
No controls required	N/A	N/A	N/A	N/A	N/A	N/A		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%.

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost	
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400	
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900	
		Use stationary LEV (Downdraft Table)	\$11,400	\$684	\$2,000	
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$988	\$1,800	
	GMAW TIG	Replace SMAW with pulsed arc GMAW welding unit	\$9,500	\$570	\$1,700	
		Use Portable LEV - Nedermann Filterbox	\$7,220	\$1,353	\$2,200	
	FCAW	Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,000	
		Controls combined with SMAW	N/A	N/A	N/A	
	2C Welding (construction industry)	SMAW	Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$988	\$1,800
			Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$988	\$1,800
			Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
			Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900
		Plasma Cutting	Replace 100%CO2 with 95%Argon/5%CO3	\$1,353	\$82	\$200
			Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$200
Plasma Welding Oxy-fuel Cutting Air Carbon Arc Cutting/Gouging		Install LEV by torch	\$7,220	\$433	\$1,300	
		Use Portable LEV - Nedermann Filterbox	\$7,220	\$1,353	\$2,200	
Electron Torch Cutting Thermal Spray Tungsten Carbide SAW Grinding		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$988	\$1,800	
		Replace power source to convert unit to a plasma arc-cutting unit	\$9,500	\$570	\$1,700	
2D Welding (government industry)	SMAW	No controls required	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	
	Plasma Cutting	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400	
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900	
	GMAW Brazing Metallizing	Nedermann Filterbox	\$7,220	\$659	\$1,500	
		Welder training on proper position of LEV ducts	\$0	\$0	\$0	
2D Welding (government industry)	SMAW	2 hour training course	\$1,353	\$82	\$200	
		Replace SMAW with GMAW	\$5,411	\$325	\$1,000	
	Plasma Cutting GMAW	Fume Extractor Gun (FEG)	\$7,220	\$1,035	\$1,900	
		Install LEV by torch	\$1,353	\$82	\$200	
	GMAW	Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	
		GMAW controls are included under SMAW	\$7,220	\$659	\$1,500	
	SMAW	Nedermann Filterbox	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	
	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400	
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900	
Plasma Cutting GMAW	Nedermann Filterbox	\$7,220	\$659	\$1,500		
	Welder training on proper position of LEV ducts	\$0	\$0	\$0		
Brazing Metallizing	2 hour training course	\$1,353	\$82	\$200		
	Replace SMAW with GMAW	\$7,220	\$1,035	\$1,900		
Brazing Metallizing	Install LEV by torch	\$5,411	\$325	\$1,000		
	Fume extractor gun	\$8,237	\$494	\$1,500		
Brazing Metallizing	Replace short-circuit and other welding equipment with a pulsed arc	\$3,990	\$694	\$1,628		
	Nedermann Filterbox	\$0	\$0	\$0		
Brazing Metallizing	Welder training on proper position of LEV ducts	\$0	\$0	\$0		
	2 hour training course	\$2,276	\$0	\$300		
Brazing Metallizing	Local Exhaust Ventilation	\$2,276	\$0	\$300		
	No controls required	\$0	\$0	\$0		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions					Design Basis	
			ACFM	Length of ductwork, feet	Room size	Other			
2B Welding (maritime industry)	SMAW	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	N/A	Frosts and Mason Grainger Tubaxial Fan	
		Use stationary LEV (Downdraft Table)	N/A	N/A	N/A	N/A	N/A	Downdraft Table/ACGIH VS-90-01	
	GMAW	Use moveable LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	N/A	Stationary Nederman 5000	
		Replace SMAW with pulsed arc GMAW welding unit	1200	13	N/A	N/A	N/A	GMAW inverter power source and matching wire feed	
		Use Portable LEV - Nederman Filterbox	N/A	N/A	N/A	N/A	N/A	Kura (1998) Nederman Filterbox	
	TIG	Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG	
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A	High-Vacuum Exhaust Hose	
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	N/A	Stationary Nederman 5000	
	Plasma Cutting	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	N/A	Stationary Nederman 5000	
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)	
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	N/A	Frosts and Mason Grainger Tubaxial Fan	
	2C Welding (construction industry)	Plasma Welding	Install LEV by torch	Nedermann Filtercart	N/A	N/A	N/A	N/A	(Hewitt and Hirst, 1993), Air Liquide
			Use Portable LEV - Nederman Filterbox	\$1,200	\$13	N/A	N/A	N/A	Van der Wall (1986)
			Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	N/A	10' x 24' Water Table Cutting Zone
Air Carbon Arc Cutting/Gouging		Replace power source to convert unit to a plasma arc-cutting unit	N/A	N/A	N/A	N/A	N/A	Kura (1998), Nederman Filterbox	
		No controls required	N/A	N/A	N/A	N/A	N/A	Stationary Nederman 5000	
		No controls required	N/A	N/A	N/A	N/A	N/A	(Harris, Castner, 2002)	
Electron Torch Cutting		No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
		Thermal Spray Tungsten Carbide	N/A	N/A	N/A	N/A	N/A	N/A	
		SAW	N/A	N/A	N/A	N/A	N/A	N/A	
Grinding		No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
		Local Exhaust Ventilation	1080	50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)	
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A	Frosts and Mason Grainger Tubaxial Fan	
SMAW		Nedermann Filterbox	1200	13	N/A	N/A	N/A	Kura (1998) Nederman Filterbox	
		Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication	
		2 hour training course	N/A	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW	
Plasma Cutting	Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	N/A		
	Fume Extractor Gun (FEG)	650	10	N/A	N/A	N/A	N/A		
	Install LEV by torch	N/A	N/A	N/A	N/A	N/A	Van der Wall (1986)		
GMAW	Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	N/A	N/A		
	GMAW controls are included under SMAW	N/A	N/A	N/A	N/A	N/A	N/A		
	Nedermann Filterbox	1200	13	N/A	N/A	N/A	Kura (1998) Nederman Filterbox		
Brazing	No controls required	N/A	N/A	N/A	N/A	N/A	N/A		
	Local Exhaust Ventilation	1080	50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)		
	Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A	Frosts and Mason Grainger Tubaxial Fan		
SMAW	Nedermann Filterbox	1200	13	N/A	N/A	N/A	Kura (1998) Nederman Filterbox		
	Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication		
	2 hour training course	N/A	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW		
Plasma Cutting	Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	N/A		
	Install LEV by torch	Nedermann Filtercart	N/A	N/A	N/A	N/A	Van der Wall (1986)		
	Fume extractor gun	N/A	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG, High-Vacuum, Exhaust Hose		
GMAW	Replace short-circuit and other welding equipment with a pulsed arc	N/A	N/A	N/A	N/A	N/A	Miller Pulse Arc GMAW		
	Nedermann Filterbox	1200	13	N/A	N/A	N/A	Kura (1998), Nederman Filterbox		
	Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication		
Brazing	2 hour training course	N/A	N/A	N/A	N/A	N/A	N/A		
	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)		
	Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A	Frosts and Mason Grainger Tubaxial Fan		



Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
		Directional General Ventilation of a Confined Space	\$2,262	\$2,561	\$2,900
		Increase general exhaust ventilation	\$41,800	\$9,675	\$14,600
	GMAW	Replace SMAW with GMAW	\$1,353	\$82	\$200
		Improved maintenance of existing ventilation system	\$0	\$378	\$400
		Use stationary LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,600
		Use stationary LEV (Downdraft Table)	\$11,400	\$2,530	\$3,900
		High-Velocity-Low-Volume System	\$4,963	\$900	\$1,500
	TIG	Controls combined with SMAW	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		Install LEV by torch	N/A	N/A	N/A
	SAW	Replace existing plasma cutting gas with argon-hydrogen gas	\$7,220	\$1,035	\$1,900
		Install LEV by torch	\$1,353	\$82	\$200
	Plasma Cutting	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
Controls combined with SMAW		N/A	N/A	N/A	
Controls combined with other processes		N/A	N/A	N/A	
Resistance Welding	No controls required	N/A	N/A	N/A	
	Controls combined with other processes	N/A	N/A	N/A	
FCAW	No controls required	N/A	N/A	N/A	
	Controls combined with other processes	N/A	N/A	N/A	
Confined Space	No controls required	N/A	N/A	N/A	
	Controls combined with other processes	N/A	N/A	N/A	
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
		Directional General Ventilation of a Confined Space	\$2,262	\$2,561	\$2,900
		Use stationary LEV (Downdraft Table)	\$11,400	\$2,530	\$3,900
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,600
		Replace SMAW with pulsed arc GMAW welding unit	\$9,500	\$570	\$1,700
	TIG	Use Portable LEV - Nederman Filterbox	\$7,220	\$1,353	\$2,200
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,000
	FCAW	Controls combined with SMAW	N/A	N/A	N/A
		Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,600
	Plasma Cutting	Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,600
		Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
	Plasma Welding	Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900
		Replace 100%CO2 with 95%Argon/5%CO3	\$1,353	\$82	\$200
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	\$1,353	\$82	\$200
	Oxy-fuel Cutting	Install LEV by torch	\$7,220	\$433	\$1,300
Use Portable LEV - Nederman Filterbox		\$7,220	\$1,353	\$2,200	
Air Carbon Arc Cutting/Gouging	Use moveable LEV - Articulating Welding Exhaust Duct	\$6,605	\$998	\$1,600	
	Replace power source to convert unit to a plasma arc-cutting unit	\$9,500	\$570	\$1,700	
Electron Torch Cutting	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	
Thermal Spray Tungsten Carbide	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	
SAW	No controls required	N/A	N/A	N/A	
	No controls required	N/A	N/A	N/A	
Grinding	No controls required	N/A	N/A	N/A	
	Controls combined with other processes	N/A	N/A	N/A	
Confined Space	No controls required	N/A	N/A	N/A	
	Controls combined with other processes	N/A	N/A	N/A	

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions				
			ACFM	Length of ductwork, feet	Room size	Other	
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	Frosts and Mason Grainger Tubeaxial Fan
		Increase general exhaust ventilation	12,000cfm/welder	200	N/A	N/A	Donaldson Torit Truckline
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW
		Improved maintenance of existing ventilation system	N/A	N/A	N/A	N/A	N/A
		Use stationary LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	Stationary Nederman 5000
		Use stationary LEV (Downdraft Table)	650	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		High-Velocity-Low-Volume System	650	10	N/A	N/A	Lincoln Electric Suction Heads High Vacuum SHM, SHFA, UNM, SMHT
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		Initial LEV by torch	650	10	N/A	N/A	Van der Wal (1986), Nedermann Filtercart
		Replace existing plasma cutting gas with argon-hydrogen gas	N/A	N/A	N/A	N/A	Van der Wal (1986), 10' x 24' Water Table Cutting Zone
		No controls required	N/A	N/A	N/A	N/A	N/A
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A
Controls combined with other processes	N/A	N/A	N/A	N/A	N/A		
2B1 Welding (maritime industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason Grainger Tubeaxial Fan
		Use stationary LEV (Downdraft Table)	N/A	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		Use moveable LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	Stationary Nederman 5000
		Replace SMAW with pulsed arc GMAW welding unit	1200	13	N/A	N/A	GMAW inverter power source and matching wire feed
		Use Portable LEV - Nederman Filterbox	N/A	N/A	N/A	N/A	Kura (1998) Nederman Filterbox
		Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG High-Vacuum Exhaust Hose
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000
		Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason Grainger Tubeaxial Fan
		Replace 100% CO2 with 95% Argon/5% CO2	N/A	N/A	N/A	N/A	Van der Wal (1986)
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	N/A
		Install LEV by torch	Nedermann Filtercart				
Use Portable LEV - Nederman Filterbox	\$1,200	\$13	N/A	N/A	Kura (1998), Nederman Filterbox		
Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000		
Replace power source to convert unit to a plasma arc-cutting unit	N/A	N/A	N/A	N/A	(Harris, Casiner, 2002)		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
Controls combined with other processes	N/A	N/A	N/A	N/A	N/A		
2A1 Welding (general industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason Grainger Tubeaxial Fan
		Use stationary LEV (Downdraft Table)	N/A	N/A	N/A	N/A	Downdraft Table ACGIH VS-90-01
		Use moveable LEV - Articulating Welding Exhaust Duct	650	10	N/A	N/A	Stationary Nederman 5000
		Replace SMAW with pulsed arc GMAW welding unit	1200	13	N/A	N/A	GMAW inverter power source and matching wire feed
		Use Portable LEV - Nederman Filterbox	N/A	N/A	N/A	N/A	Kura (1998) Nederman Filterbox
		Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG High-Vacuum Exhaust Hose
		Controls combined with SMAW	N/A	N/A	N/A	N/A	N/A
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000
		Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000
		Local Exhaust Ventilation	\$1,080	\$50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1986a)
		Directional General Ventilation of a Confined Space	\$14,792	None	N/A	N/A	Frosts and Mason Grainger Tubeaxial Fan
		Replace 100% CO2 with 95% Argon/5% CO2	N/A	N/A	N/A	N/A	Van der Wal (1986)
		Replace existing plasma cutting gas with argon-hydrogen cutting gas	N/A	N/A	N/A	N/A	N/A
		Install LEV by torch	Nedermann Filtercart				
Use Portable LEV - Nederman Filterbox	\$1,200	\$13	N/A	N/A	Kura (1998), Nederman Filterbox		
Use moveable LEV - Articulating Welding Exhaust Duct	\$650	\$10	N/A	N/A	Stationary Nederman 5000		
Replace power source to convert unit to a plasma arc-cutting unit	N/A	N/A	N/A	N/A	(Harris, Casiner, 2002)		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A	N/A	N/A		
Controls combined with other processes	N/A	N/A	N/A	N/A	N/A		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology) Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$1,000
		Niedermaier Filterbox	\$7,220	\$659	\$1,500
		Welder training on proper position of LEV ducts	\$0	\$0	\$0
		2 hour training course			
		Replace SMAW with GMAW	\$1,353	\$82	\$200
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,000
		Local Exhaust Ventilation	\$2,962	\$1,029	\$1,400
		Directional General Ventilation of a Confined Space	\$3,262	\$2,561	\$2,900
		GMAW controls are included under SMAW	N/A	N/A	N/A
3A Painting (general industry)	Spray Painter	Improved maintenance of existing ventilation system	\$0	\$378	\$400
		Sander with integrated LEV and HEPA-filtered exhaust	\$1,375	\$83	\$200
		Replace existing HVLP/airless guns with electrostatic spray painting equipment	\$12,600	\$756	\$2,200
		Use Hudson-type sprayer or brushes for application	\$96	\$6	\$17
		Directional general ventilation of a confined space	\$570	\$35	\$100
		Periodic inspection and maintenance of hangar flow-through ventilation	\$0	\$378	\$400
		Increase spray booth air velocity to 100 ft/min	\$12,600	\$756	\$2,200
		Use appropriately sized (larger) spray paint booth	\$9,496	\$8,094	\$9,200
		Sander with integrated LEV and HEPA-filtered exhaust	\$1,375	\$83	\$200
		Operator (coil coating)	\$19,371	\$8,827	\$11,100
3A2 Painting (coil coating)	Maintenance (coil coating)	Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	N/A	N/A	N/A
		No controls required			
3A1 Painting (auto body repair)	Spray Painter Sander	Use appropriately sized (larger) spray paint booth (8)	\$15,200	\$2,769	\$4,600
		Sander with integrated LEV and HEPA-filtered exhaust (9)	\$1,375	\$83	\$200
3B Painting (maritime industry)	Spray Painter	Use spray gun with higher transfer efficiency (such as HVLP spray gun)	\$950	\$58	\$200
		Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	\$2,445	\$146	\$400
		Improved maintenance of existing ventilation system	\$0	\$378	\$400
3C Painting (construction industry)	Abrasive Blaster Grinder/Sander	Sander with integrated LEV and HEPA-filtered exhaust	\$750	\$46	\$100
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
3D Painting (government industry)	Spray painter Laborer	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Assumptions							
Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Design Basis
2C1 Welding (construction industry) (carbon steel)	SMAW	Local Exhaust Ventilation	1080	50	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	Froats and Mason Granger Tubexalal Fan
		Niedermaier Filterbox	1200	13	N/A	N/A	Kura (1998) Niedermaier Filterbox
		Welder training on proper position of LEV ducts	N/A	N/A	N/A	N/A	Additional training cost incurred under Communication
		2 hour training course	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW
		Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A
		Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	American Crystal Sugar Company (NIOSH, 1985a)
		Local Exhaust Ventilation	1080	50	N/A	N/A	Froats and Mason Granger Tubexalal Fan
		Directional General Ventilation of a Confined Space	14792	None	N/A	N/A	N/A
		GMAW controls are included under SMAW	N/A	N/A	N/A	N/A	N/A
3A Painting (general industry)	Spray Painter	Niedermaier Filterbox	1200	13	N/A	N/A	Kura (1998) Niedermaier Filterbox
		No controls required	N/A	N/A	N/A	N/A	N/A
		Controls combined with other processes	N/A	N/A	N/A	N/A	N/A
		Improved maintenance of existing ventilation system.	N/A	N/A	N/A	N/A	N/A
		Sander with integrated LEV and HEPA-filtered exhaust	170 cfm	N/A	N/A	N/A	6-inch rotary sander with integrated LEV
		Replace existing HVLP/airless guns with electrostatic spray painting equipment	N/A	N/A	N/A	N/A	Binks HVLP-electrostatic gun
		Use Hudson-type sprayer or brushes for application	N/A	N/A	N/A	N/A	Hudson-type sprayer or professional paint brush and miscellaneous supplies
		Directional general ventilation of a confined space	2000 cfm	None	existing	N/A	NIOSH HHE (2001-0223) Venturi air horn (8)
		Periodic inspection and maintenance of hangar flow-through ventilation	N/A	N/A	N/A	N/A	NIOSH HHE (2201-0223)
		Increase spray booth air velocity to 100 ft/min	N/A	50	N/A	150 ft <sup>2</sup> cross section	Replace exhaust ductwork and fan
3A2 Painting (coil coating)	Assembler	Use appropriately sized (larger) spray paint booth	12,600 cfm	14' x 9'	N/A	100 ft <sup>2</sup> min cross area	Cross Flow Paint Booth, 26.5ft long x 14 ft wide x 9 ft high
		Sander with integrated LEV and HEPA-filtered exhaust	N/A	N/A	N/A	N/A	6-inch rotary sander with integrated LEV
		Install permanent total enclosure equipped with exhaust ventilation around the chemical treatment section	N/A	N/A	N/A	N/A	Existing permanent total enclosure at the coil coating section of the line
		No controls required	N/A	N/A	N/A	N/A	N/A
		Use appropriately sized (larger) spray paint booth (8)	12,600 cfm	30' hose	26.5' L x 14' W x 9' H	100 ft <sup>2</sup> min cross area	6-inch rotary sander with integrated LEV
		Sander with integrated LEV and HEPA-filtered exhaust (9)	170 cfm	N/A	N/A	N/A	No makeup air/HEPA exhaust
		Use spray gun with higher transfer efficiency (such as HVLP spray gun)	N/A	N/A	N/A	N/A	N/A
		Use HEPA vacuum for cleanup of abrasive blasting enclosure (instead of dry sweeping)	N/A	N/A	N/A	N/A	N/A
		Improved maintenance of existing ventilation system	N/A	N/A	N/A	N/A	N/A
		Sander with integrated LEV and HEPA-filtered exhaust	N/A	N/A	N/A	N/A	6-inch rotary sander
3B Painting (maritime industry)	Abrasive Blaster Grinder/Sander	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
3C Painting (construction industry)	Spray painter Laborer Traffic Painter	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A
3D Painting (government industry)	Spray painter Laborer	No controls required	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost	
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	\$3,689,000	\$0	\$432,400	
		Upgrade LEV and use closed sample collection containers	\$184,500	\$0	\$21,600	
		Upgrade equipment LEV, automate manual valves, use Stralman sample valves with closed collection containers	\$1,844,500	\$0	\$216,200	
	Packaging Workers Maintenance workers Other Exposed Workers	Ventilation loader to two railcars	\$2,170,000	\$0	\$254,300	
		Use portable LEV	\$3,990	\$560	\$1,000	
		Fume Hood	\$11,400	\$1,373	\$2,700	
		No controls required	N/A	N/A	N/A	
	5 Chromate Pigment Producers	Strike Tank Operator Drying/Blending/Packaging Operator	Install a dust collection spill hopper for 50 pound bag tube packing machine	\$3,800	\$454	\$900
			Install enclosure around packaging operation. Install bag hanger on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit	\$22,860	\$1,748	\$4,400
		Maintenance Worker Laborer	Install an air replacement system to provide building make up air	\$79,571	\$14,379	\$23,700
Retrofit open-cab forklift to close-cab with HEPA filtered air			\$3,800	\$228	\$700	
Laboratory Technician Wastewater Treatment Operator Manager/Supervisor		No controls required	N/A	N/A	N/A	
		Install ventilated sample collection boxes	\$846	\$276	\$400	
		No controls required	N/A	N/A	N/A	
Proprietary Process Operator Dispersion Operator		Install dust tight covers on existing conveyors	\$3,800	\$228	\$700	
		No controls required	N/A	N/A	N/A	
6 Chromated Copper Arsenate (CCA) Producers		Production Operator Production Supervisor CCA Truck Loader Warehouse Operator	No controls required	N/A	N/A	N/A
	No controls required		N/A	N/A	N/A	
	Wet Process Operator Dry Process Operator	Wash down filter press, associated booms, and entire filter press area after completion	\$0	\$0	\$0	
		Improve existing side draft LEV at 55-gallon loading station	\$9,500	\$570	\$1,700	
Screwing Operator Quality Control Inspector Dry Mix Operator Process Control Operator Control Room Operator Forming Operator Team Leader Lead Person	Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	\$946,200	\$56,772	\$167,700		
		Upgrade flat deck screening equipment to ACGIH standard	\$2,679	\$1,055	\$1,300	
	No controls required	N/A	N/A	N/A		
	No controls required	N/A	N/A	N/A		
	No controls required	N/A	N/A	N/A		
	Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	\$1,467	\$88	\$300		
	No controls required	N/A	N/A	N/A		
	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	\$190,000	\$11,400	\$33,700		
Floor Person Warehouse Operator Maintenance Person Solid Waste Handler	Increase air supply and general exhaust ventilation	\$41,800	\$3,954	\$8,900		
	Replace manually-unloaded filter press with automatic pressure filter equipment	\$95,000	\$5,700	\$16,800		
	Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	\$68,210	\$4,093	\$12,100		
	No controls required	N/A	N/A	N/A		
No controls required	N/A	N/A	N/A			
No controls required	N/A	N/A	N/A			

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions				
			ACFM	Length of ductwork, feet	Room size	Other	
4 Chromate (chromite ore) production	Process Operators	Upgrade LEV by grinders and kiln access doors	N/A	N/A	N/A	2 LEV Process (Company M, 2003)	
		Upgrade LEV and use closed sample collection containers	N/A	N/A	N/A	1 LEV Process (Company M, 2003)	
	Packaging Workers Maintenance workers Other Exposed Workers	Upgrade equipment LEV, automate manual valves, use Strahman sample valves with closed collection containers	N/A	N/A	N/A	1 LEV Process (Company M, 2003)	
		Ventilation leader to two railcars	N/A	N/A	N/A	(Company M, 2003) Portable Nederman Filtercart with HEPA filter	
5 Chromate Pigment Producers	Strike Tank Operator Drying/Blending/Packaging Operator	Use portable LEV	650	10	N/A	N/A	
		Fume Hood	800	N/A	N/A	N/A	
	Maintenance Worker Laborer Laboratory Technician Wastewater Treatment Operator Manager/Supervisor Proprietary Process Operator Dispersion Operator	No controls required	Install a dust collection spill hopper for 50 pound bag tube packing machine	N/A	N/A	N/A	N/A
			Install enclosure around packaging operation. Install bag handler on 50 pound packaging unit and sealed access door for bag-hanging task. Install closed HVAC unit	N/A	N/A	N/A	N/A
			Install an air replacement system to provide building make up air	14000	400	56,000 sq ft	NA
			Retrofit open-cab forklift to closed-cab with HEPA filtered air	N/A	N/A	N/A	N/A
			No controls required	N/A	N/A	N/A	N/A
			Install ventilated sample collection boxes	N/A	N/A	N/A	N/A
			No controls required	N/A	N/A	N/A	N/A
			Install dust tight covers on existing conveyors	N/A	N/A	N/A	N/A
			No controls required	N/A	N/A	N/A	N/A
			No controls required	N/A	N/A	N/A	N/A
No controls required	N/A	N/A	N/A	N/A			
6 Chromated Copper Arsenate (CCA) Producers	Production Operator Production Supervisor CCA Truck Loader Warehouse Operator	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
7 Chromium Catalyst Producers	Wet Process Operator	Wash down filter press, associated tools, and entire filter press area after completion	N/A	N/A	N/A	N/A	
		Improve existing slide draft LEV at 55-gallon loading station	N/A	N/A	N/A	N/A	
	Dry Process Operator	Replace hand-loaded tablet forming machines with automatically-loaded, fully automatic tablet forming machine	N/A	N/A	N/A	N/A	
		Upgrade flat deck screening equipment to ACGIH standard	1200 cfm	N/A	3' x 8' screen area	Hood Opening is 6ft	
	Screening Operator Quality Control Inspector Dry Mix Operator	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
	Process Control Operator Control Room Operator	No controls required	N/A	N/A	N/A	N/A	
		Install HEPA filter to control room HVAC and modify to provide positive pressure inside control room	256	15	10' x 20' x 8'	2-1 (1), 4 to 12 air changes per hour, or 8 air changes per hour for control room	
	Forming Operator Team Leader Lead Person	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
	Floor Person	Replace manually loaded dryers by automated mechanical loading equipment equipped with LEV	N/A	N/A	N/A	N/A	
		Increase air supply and general exhaust ventilation	12,000 cfm/person	200	N/A	N/A	
Warehouse Operator Maintenance Person Solids Waste Handler	No controls required	Replace manually-unloaded filter press with automatic pressure filter equipment	N/A	N/A	N/A	N/A	
		Upgrade existing drum and box filling system with a system that includes a sealed connection between the filling head and the drum or box. A ventilated enclosure will surround the filling equipment	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	
8 Automatic Drum Fill System (Four drums on a pallet) Turntable, Conveyor and Drum Fill, 10' Accumulation Conveyor	Donaldson Torit Truckline (2)	No controls required	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		
		No controls required	N/A	N/A	N/A		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
8 Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	\$23,667	\$1,456	\$4,200
		Partially enclosed drum opening/ dumping station	\$59,089	\$4,788	\$11,700
9 Printing Ink Producers	Packager/ Shipping/receiving Technician Laboratory Chemist/Technician	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
10 Plastic Colorant Producers and Users	Batch Weigher Mill Operator Utility Worker Maintenance Worker Production Supervisor	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
11 Plating Mixture Producers	Dry Color Handler Wet Mill Operator Dry Color Blender/packager Production Supervisor	No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A
12 Wood Preserving	Blender/Mixer Operator-Dry Chrome Process Laboratory Chemist	Partially enclosed drum opening/ dumping station	\$59,089	\$4,788	\$11,700
		Totally enclosed automated bag splitter and dumping station	\$74,943	\$4,756	\$13,500
		Totally enclosed ventilated drum-dumping station	\$43,510	\$2,776	\$7,900
		Barrel and bag filling stations with effective ventilation systems	\$800	\$213	\$300
		Barrel stations with effective ventilation systems Partially enclosed manual drum filling station	\$800	\$213	\$300
12 Wood Preserving	Blender/Mixer Operator-Liquid Chrome Process	Totally enclosed automated drum dumping station	\$30,965	\$2,133	\$5,900
		Partially enclosed automated drum dumping station	\$67,049	\$4,311	\$12,200
12 Wood Preserving	Laboratory Chemist	No controls required	N/A	N/A	N/A
		Not Applicable	N/A	N/A	N/A

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Assumptions	
							Design Basis	
8 Paint and Coatings Producers	Batchmaker	Improved LEV at Cr(VI) mixing tanks	NA	20'	NA	N/A	Steel half tank cover with port attached to 8' flexible exhaust hose	
		Partially enclosed drum opening/dumping station	3600	20	6' x 8' x 8'	includes dust collector and enclosure booth	Drum dumper (1), enclosure (2), VS-60-01, Mixer and Muller Hood, VS-15-20, Toxic Material Bag Opening	
	Packager	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Shipping/receiving Technician Laboratory Chemist/Technician	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
9 Printing Ink Producers	Batch Weigher Mill Operator Utility Worker Maintenance Worker Production Supervisor	No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
		No controls required	N/A	N/A	N/A	N/A	N/A	
	Dry Color Handler Wet Mill Operator Dry Color Blender/packager Production Supervisor	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
10 Plastic Colorant Producers and Users	Blender/Mixer Operator-Dry Chrome Process	Partially enclosed drum opening/dumping station	3600	20	6' x 8' x 8'	includes dust collector and enclosure booth	Drum dumper (1), enclosure (2), VS-60-01, Mixer and Muller Hood, VS-15-20, Toxic Material Bag Opening (8)	
		Totally enclosed automated bag slitter and dumping station	600	20	NA	integrated dust collector and bag compactor	Luxme automatic twin blade bag slitter with compactor, filter, fan (6)	
		Totally enclosed ventilated drum-dumping station	1060	0	10' x 20' x 10'	N/A	VS-75-04, Large Drive-Through Spray Paint Booth (8)	
		Barrel and bag filling stations with effective ventilation systems	1060	40	N/A	N/A	Barrel Filling -VS-15-01, Bag Filling - VS-15-02 (8)	
		Barrel stations with effective ventilation systems	1060	40	N/A	N/A	Barrel Filling -VS-15-01	
		Partially enclosed manual drum filling station	400	20	NA	N/A	Barrel Filling - VS-15-01, Option 4 (5)	
		Totally enclosed automated drum dumping station	500	20	NA	NA	VS-15-01, Option 2 and 3 (8)	
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		No controls required	N/A	N/A	N/A	N/A	N/A	N/A
		11 Paving Mixture Producers	Laboratory Chemist	Not Applicable	N/A	N/A	N/A	N/A
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
Not Applicable	N/A			N/A	N/A	N/A	N/A	
12 Wood Preserving	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	
		Not Applicable	N/A	N/A	N/A	N/A	N/A	



Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
13 Chromium Material Producers	Leach Operator	Strahman valves and ventilated sample box	\$846	\$122	\$200
	Aggr Operator	Covers and tank head space ventilation on aggr tanks	\$73,989	\$4,583	\$13,300
	Lower-cell-room Operator	Cell covers to completely cover the cell and improved LEV	\$78,713	\$4,723	\$13,900
	Cell Assembler	Enclosed, ventilated cell-component cleaning room or enclosure	\$2,683	\$305	\$600
	Cell Operator	Cell covers to completely cover the cell and improved LEV	\$78,713	\$4,723	\$13,900
	Plate Hooker	Upgrade existing slide-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	\$31,097	\$2,010	\$5,700
	Plater Stripper	Install Booth around chromic acid tank with remote hoist controls	\$8,292	\$534	\$1,500
	Mill Operator	No controls required	N/A	N/A	N/A
	Blender Operator	No controls required	N/A	N/A	N/A
	Briquetting Operator	No controls required	N/A	N/A	N/A
	Furnace Loader	No controls required	N/A	N/A	N/A
	Furnace Operator	No controls required	N/A	N/A	N/A
	VG Picker	No controls required	N/A	N/A	N/A
	Brick Layer	No controls required	N/A	N/A	N/A
Shipper	No controls required	N/A	N/A	N/A	
Bagger	No controls required	N/A	N/A	N/A	
14 Steel Mills (stainless)	Raw Material Handler	HEPA-filtered vacuum system	\$0	\$0	\$0
	Furnace Operator	No controls required	N/A	N/A	N/A
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	\$1,064,000	\$64,592	\$189,300
	Crane Operator	Change to Bottom-Pour Method from Lip and Pour Method	\$47,500	\$2,850	\$8,400
		Ladle LEV with traveling cantilevered exhaust hood	\$180,500	\$11,582	\$32,700
		Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$300
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$76,000	\$4,560	\$13,500
		Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,700
		Annual Maintenance	\$1,900	\$114	\$300
		Annual Maintenance	\$1,900	\$114	\$300
	Continuous Casting Operator	Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,700
		Replace SMAW with GMAW	\$1,353	\$82	\$200
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,000
	Rolling-Mill Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,700
Upgrade existing ventilation hood exhaust air flow rates		\$1,800	\$114	\$500	
Welders					
Steel Conditioning Operator					

Table iii.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions					
			ACFM	Length of ductwork, feet	Room size	Other		
13 Chromium Material Producers	Leach Operator	Strahman valves and ventilated sample box	N/A	N/A	N/A	N/A	N/A	N/A
	Agar Operator	Covers and tank head space ventilation on agar tanks	N/A	N/A	N/A	N/A	N/A	N/A
	Lower-cell-room Operator	Cell covers to completely cover the cell and improved LEV	N/A	N/A	N/A	N/A	N/A	N/A
	Cell Assembler	Enclosed, ventilated cell-component cleaning room or enclosure	N/A	N/A	N/A	N/A	N/A	N/A
	Cell Operator	Cell covers to completely cover the cell and improved LEV	N/A	N/A	N/A	N/A	N/A	N/A
	Plate Hooker	Upgrade existing side-draft hood at the chromic acid tank with push-pull LEV system for open surface tanks	N/A	N/A	N/A	N/A	N/A	Design Data Push-Pull Hood - VS-70-10, VS-70-11
	Plater Stripper	Install Booth around chromic acid tank with remote hoist controls	N/A	10' x 10' x 15'	8' x 7' overhead garage door	N/A	N/A	N/A
	Mill Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Blender Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Briquetting Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Furnace Loader	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Furnace Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	VG Picker	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
Brick Layer	No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
Shipper	No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
Bagger	No controls required	N/A	N/A	N/A	N/A	N/A	N/A	
14 Steel Mills (stainless)	Raw Material Handler	HEPA-filtered vacuum system	N/A	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost
	Furnace Operator	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	N/A	N/A	N/A	N/A	N/A	N/A
		Change to Bottom-Pour Method from Lip and Pour Method	N/A	N/A	N/A	N/A	N/A	N/A
		Ladle LEV with traveling cantilevered exhaust hood	N/A	N/A	N/A	N/A	N/A	N/A
		Periodic inspection and maintenance of furnace LEV	N/A	N/A	N/A	N/A	N/A	N/A
		Substitute lip pour ladle with bottom-pour ladle with LEV	N/A	N/A	N/A	N/A	N/A	N/A
		Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	N/A	N/A
	Crane Operator	Annual Maintenance	N/A	N/A	N/A	N/A	N/A	N/A
	Continuous Casting Operator	Annual Maintenance	N/A	N/A	N/A	N/A	N/A	N/A
	Rolling-Mill Operator	Install HEPA Filtration in the Operator Control Room	N/A	N/A	N/A	N/A	N/A	N/A
	Welders	Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	Hobart 175 amp MIG welder = GMAW (NIOSH, January, 1979), Lincoln Electric FEG Fume Extractor Gun (FEG)
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	N/A	N/A	N/A	N/A	N/A	N/A
	Upgrade existing ventilation hood exhaust air flow rates	N/A	N/A	N/A	N/A	N/A	N/A	

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost	
14A Steel Mills (carbon)	Raw Material Handler	HEPA-filtered vacuum system	\$0	\$0	\$0	
	Furnace Operator	No controls required	N/A	N/A	N/A	
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	\$1,064,000	\$64,592	\$189,300	
		Change to Bottom-Pour Method from Lip and Pour Method	\$47,500	\$2,850	\$8,400	
		Ladle LEV with traveling canistered exhaust hood	\$180,500	\$11,582	\$32,700	
		Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$300	
		Substitute lip pour ladle with bottom-pour ladle with LEV	\$76,000	\$4,580	\$13,500	
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,700	
	Continuous Casting Operator	Annual Maintenance	\$1,900	\$114	\$300	
	Rolling-Mill Operator	Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,700	
	Welders	Replace SMAW with GMAW	\$1,353	\$82	\$200	
		Fume Extractor Gun (FEG)	\$5,411	\$325	\$1,000	
		Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,700
	14B Reshaping		Upgrade existing ventilation hood exhaust air flow rates	\$1,900	\$114	\$300
Raw Material Handler		No controls required	N/A	N/A	N/A	
Laborers		Periodic inspection and maintenance of furnace LEV	\$1,900	\$114	\$300	
Crane Operator		Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,700	
Rolling-Mill/Forging Operator		Annual Maintenance	\$1,900	\$114	\$300	
		Install HEPA Filtration in the Operator Control Room	\$9,500	\$570	\$1,700	
Steel Conditioning Operator		Perform Maintenance on Grinding Station Booth Ventilation and LEV	\$9,500	\$570	\$1,700	
		Upgrade existing ventilation hood exhaust air flow rates	\$1,900	\$114	\$300	
15 Iron and Steel Foundries		Molders	No controls required	N/A	N/A	N/A
		Furnace Operator	Install LEV in the form of hoods over the furnace	\$38,000	\$8,868	\$13,300
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	\$9,500	\$570	\$1,700	
	Pourers	No controls required	N/A	N/A	N/A	
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	\$9,500	\$570	\$1,700	
		Install enclosed booths for manual blasting	\$1,960	\$118	\$300	
	Torch Cutter/Grinder	Install a moveable hood and an HVLV fume exhaust system	\$6,605	\$968	\$1,800	
	Welder	Install a moveable hood and an HVLV fume exhaust system	\$6,605	\$968	\$1,800	
	Grinder Operator	Grinding wheel hood	\$476	\$29	\$100	
		Downdraft Ventilation Booth with Air Shower	\$20,900	\$1,290	\$3,700	
	Laborer	HVLV Grinders	\$950	\$58	\$200	
		No controls required	N/A	N/A	N/A	
	16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A
Not Applicable		Not Applicable	N/A	N/A	N/A	
17 Chromium Dye Producers	Color Maker	No controls required	N/A	N/A	N/A	
	Drying/Blending/Packaging Operator	No controls required	N/A	N/A	N/A	
	Maintenance Worker	No controls required	N/A	N/A	N/A	
	Laborer	No controls required	N/A	N/A	N/A	
	Laboratory Technician	No controls required	N/A	N/A	N/A	
	Wastewater Treatment Operator	No controls required	N/A	N/A	N/A	
Manager/Supervisor	No controls required	N/A	N/A	N/A		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions					Design Basis
			ACFM	Length of ductwork, feet	Room size	Other		
14A Steel Mills (carbon)	Raw Material Handler	HEPA-filtered vacuum system						
	Furnace Operator	No controls required	N/A	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost
	Furnace Helper/Laborer	Direct-Shell Evacuation Control Collection (DEC) Collection System	N/A	N/A	N/A	N/A	N/A	
		Change to Bottom-Pour Method from Lip and Pour Method	N/A	N/A	N/A	N/A	N/A	
		Ladle LEV with traveling cantilevered exhaust hood	N/A	N/A	N/A	N/A	N/A	
		Periodic inspection and maintenance of furnace LEV	N/A	N/A	N/A	N/A	N/A	
		Substitute lip pour ladle with bottom-pour ladle with LEV	N/A	N/A	N/A	N/A	N/A	
		Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	N/A	
		Annual Maintenance	N/A	N/A	N/A	N/A	N/A	
		Annual Maintenance	N/A	N/A	N/A	N/A	N/A	
14B Reshaping	Continuous Casting Operator	Install HEPA Filtration in the Operator Control Room	N/A	N/A	N/A	N/A	N/A	Hebart 175 amp MIG welder = GMAW
	Rolling-Mill Operator	Replace SMAW with GMAW	N/A	N/A	N/A	N/A	N/A	(NIOSH, January, 1979), Lincoln Electric FEG
	Welders	Fume Extractor Gun (FEG)	N/A	N/A	N/A	N/A	N/A	High-Vacuum, Exhaust Hose
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	N/A	N/A	N/A	N/A	N/A	
		Upgrade existing ventilation hood exhaust air flow rates	N/A	N/A	N/A	N/A	N/A	
15 Iron and Steel Foundries	Raw Material Handler	No controls required	N/A	N/A	N/A	N/A	N/A	
	Laborers	Periodic inspection and maintenance of furnace LEV	N/A	N/A	N/A	N/A	N/A	
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A	N/A	
	Rolling-Mill/Forging Operator	Annual Maintenance	N/A	N/A	N/A	N/A	N/A	
		Install HEPA Filtration in the Operator Control Room	N/A	N/A	N/A	N/A	N/A	
	Steel Conditioning Operator	Perform Maintenance on Grinding Station Booth Ventilation and LEV	N/A	N/A	N/A	N/A	N/A	
		Upgrade existing ventilation hood exhaust air flow rates	N/A	N/A	N/A	N/A	N/A	
	Molders	No controls required	N/A	N/A	N/A	N/A	N/A	
	Furnace Operator	Install LEV in the form of hoods over the furnace	11,000	N/A	N/A	N/A	N/A	VS-55-03, Electrode Melting Furnace, Top Electrode
	Crane Operator	Retrofit crane cab with HEPA-filtered air supply	N/A	N/A	N/A	N/A	N/A	
	Pourers	No controls required	N/A	N/A	N/A	N/A	N/A	
	Shake-out and Abrasive Blasting Operators	Equip enclosed abrasive blasting machines with exhaust ventilation under negative pressure	N/A	N/A	N/A	N/A	N/A	
	Torch Cutter/Gouger	Install enclosed booths for manual blasting	N/A	N/A	N/A	N/A	N/A	
	Welder	Install a moveable hood and an HVLV fume exhaust system	650	N/A	N/A	N/A	N/A	Nederman 5000
	Grinder Operator	Install a moveable hood and an HVLV fume exhaust system	650	N/A	N/A	N/A	N/A	Nederman 5000
Laborer	Grinding wheel hood	1,000	N/A	N/A	N/A	N/A	(NIOSH, 1997)	
	Downdraft Ventilation Booth with Air Shower	N/A	N/A	N/A	N/A	N/A		
	HVLV Grinders	N/A	N/A	N/A	N/A	N/A		
	No controls required	N/A	N/A	N/A	N/A	N/A		
16 Chromium Dioxide Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	
17 Chromium Dye Producers	Color Maker	No controls required	N/A	N/A	N/A	N/A	N/A	
	Drying/Blending/Packaging Operator	No controls required	N/A	N/A	N/A	N/A	N/A	
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A	N/A	
	Laborer	No controls required	N/A	N/A	N/A	N/A	N/A	
	Laboratory Technician	No controls required	N/A	N/A	N/A	N/A	N/A	
Wastewater Treatment Operator	No controls required	N/A	N/A	N/A	N/A	N/A		
Manager/Supervisor	No controls required	N/A	N/A	N/A	N/A	N/A		

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total		Rounded Total Annualized Cost
			Capital	Total O&M	
18 Chromium Sulfate Producers	Reactor Operators	No controls required	N/A	N/A	N/A
	Reactor Operators	No controls required	N/A	N/A	N/A
19 Chemical Distributors	Shipping	No controls required	N/A	N/A	N/A
20 Textile Dyeing	Blender	No controls required	N/A	N/A	N/A
	Dyer	No controls required	N/A	N/A	N/A
21 Colored Glass Producers	Maintenance Worker	No controls required	N/A	N/A	N/A
21 Lab Assistant	Batch Mixer	Install a moveable canopy hood connected to a dust collector	\$6,605	\$998	\$1,800
	Batch Mixer	No controls required	N/A	N/A	N/A
	Furnace Worker	No controls required	N/A	N/A	N/A
21A Fiber, Flat, and Container Glass	Batch Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,700
	Furnace Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,700
	EP/Baghouse Operator	No controls required	N/A	N/A	N/A
	Forehearth Operator	HEPA Filtration in Control Room	\$9,500	\$570	\$1,700
22 Printing	Hot End/Maintenance	No controls required	N/A	N/A	N/A
	Printer	No controls required	N/A	N/A	N/A
	Mixer	No controls required	N/A	N/A	N/A
	Shipper	No controls required	N/A	N/A	N/A
23 Leather Tanning	Not Applicable	Not Applicable	N/A	N/A	N/A
24 Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	Equip the catalyst vessel with exhaust ventilation to maintain the catalyst vessel under negative pressure when catalyst is loaded	\$15,248	\$1,140	\$2,900
	Process Operators, all Catalyst Plants except Phillips Polyethylene	No controls required	N/A	N/A	N/A
	Field Technician	No controls required	N/A	N/A	N/A
25 Refractory Brick Producers	Cleaner	No controls required	N/A	N/A	N/A
	Crusher Operator	No controls required	N/A	N/A	N/A
	Pressman	No controls required	N/A	N/A	N/A
	Batchman	3 sided LEV enclosures	\$2,850	\$2,712	\$3,000
	Mold Filler	No controls required	N/A	N/A	N/A
	Brick Loader	Install overhead doors that open to the outside in kiln work area	\$1,781	\$107	\$300
26 Woodworking	Grinder Operator	No controls required	N/A	N/A	N/A
	Saw Operator	No controls required	N/A	N/A	N/A
	Engineering Intern	No controls required	N/A	N/A	N/A
26 Construction		Install HEPA-filtered vacuum	\$4,425	\$301	\$800
		Improve LEV at workstation	\$1,460	\$88	\$300
		No controls required	N/A	N/A	N/A
26 Maritime General Industry		Install HEPA-filtered vacuum	\$0	\$0	\$0
26 Government		Improve LEV at workstation	\$1,460	\$163	\$300
		Install HEPA-filtered vacuum	\$4,425	\$301	\$800
		Improve LEV at workstation	\$1,460	\$88	\$300

Table iii.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions			Design Basis
			ACFM	Length of ductwork, feet	Room size	
18 Chromium Sulfate Producers	Reactor Operators	No controls required	N/A	N/A	N/A	N/A
	Reactor Operators	No controls required	N/A	N/A	N/A	N/A
19 Chemical Distributors	Shipping	No controls required	N/A	N/A	N/A	N/A
	Blender	No controls required	N/A	N/A	N/A	N/A
20 Textile Dyeing	Dyer	No controls required	N/A	N/A	N/A	N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A
21 Colored Glass Producers	Lab Assistant	Install a moveable canopy hood connected to a dust collector	650	16.5'	N/A	N/A
	Batch Mixer	No controls required	N/A	N/A	N/A	N/A
	Furnace Worker	No controls required	N/A	N/A	N/A	N/A
21A Fiber, Flat, and Container Glass	Batch Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A
	Furnace Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A
	EP/Baghouse Operator	No controls required	N/A	N/A	N/A	N/A
	Forehearth Operator	HEPA Filtration in Control Room	N/A	N/A	N/A	N/A
	Hot End/Maintenance	No controls required	N/A	N/A	N/A	N/A
22 Printing	Printer	No controls required	N/A	N/A	N/A	N/A
	Mixer	No controls required	N/A	N/A	N/A	N/A
	Shipper	No controls required	N/A	N/A	N/A	N/A
23 Leather Tanning	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A
24 Chromium Catalyst Users	Process Operators, Phillips Polyethylene Plants	Equip the catalyst vessel with exhaust ventilation to maintain the catalyst vessel under negative pressure when catalyst is loaded	1380	30	N/A	Design similar to Company L
	Process Operators, all Catalyst Plants except Phillips Polyethylene Plants	No controls required	N/A	N/A	N/A	N/A
	Field Technician	No controls required	N/A	N/A	N/A	N/A
25 Refractory Brick Producers	Cleaner	No controls required	N/A	N/A	N/A	N/A
	Crusher Operator	No controls required	N/A	N/A	N/A	N/A
	Pressman	No controls required	N/A	N/A	N/A	N/A
	Batchman	3 sided LEV enclosure	4000 acfm	50'	N/A	N/A
	Mold Filler	No controls required	N/A	N/A	N/A	N/A
	Brick Loader	Install overhead doors that open to the outside in kiln work area	15'x16' Industrial Sheet	Model 626	N/A	N/A
26 Woodworking	Grinder Operator	No controls required	N/A	N/A	N/A	N/A
	Saw Operator	No controls required	N/A	N/A	N/A	N/A
	Engineering Intern	No controls required	N/A	N/A	N/A	N/A
	Construction	Install HEPA-filtered vacuum	NA	100'	NA	NA
Maritime General Industry	Improve LEV at workstation	Improve LEV at workstation	1200 fpm	100'	10 Ducts	NA
	No controls required	No controls required	N/A	N/A	N/A	1.5' Diameter
	Install HEPA-filtered vacuum	Install HEPA-filtered vacuum	NA	NA	NA	NA
Government	Improve LEV at workstation	Improve LEV at workstation	1200 fpm	100'	10 Ducts	1.5' Diameter
	Install HEPA-filtered vacuum	Install HEPA-filtered vacuum	NA	100'	NA	NA
	Improve LEV at workstation	Improve LEV at workstation	1200 fpm	100'	10 Ducts	1.5' Diameter

Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost

Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
27 Solid Waste Incineration	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Shredder/Heavy Equipment Maintenance Mechanic/ Maintenance Helper	No controls required Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Shredder/Heavy Equipment Operator	No controls required	N/A	N/A	N/A
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
28 Oil and Gas Well Drilling	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	\$0	\$0	\$0
	Not Applicable	Not Applicable	N/A	N/A	N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A
30 Superalloy Producers	Melt Specialist	No controls required	N/A	N/A	N/A
	Reclaim Weigh Operator	No controls required	N/A	N/A	N/A
	EAF Operator	No controls required	N/A	N/A	N/A
	VIM/AM Furnace Operator	No controls required	N/A	N/A	N/A
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	\$9,500	\$570	\$1,700
	Refining Unit Operator	No controls required	N/A	N/A	N/A
	Floor Person	No controls required	N/A	N/A	N/A
	Welder	Portable LEV	\$5,548	\$368	\$1,000
	Inert Screener	Replace SMAW with GMAW	\$1,353	\$82	\$200
	Laboratory Technician	No controls required	N/A	N/A	N/A
	Machine Operator	No controls required	N/A	N/A	N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A

Table iii.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	ACFM	Length of ductwork, feet	Room size	Other	Assumptions	
							Design Basis	
27 Solid Waste Incineration	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Shredder/Heavy Equipment Maintenance Mechanic/ Maintenance Helper	No controls required Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Truck Operator (ash hauling)	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
27A Solid Waste Incineration (government)	Laborer	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Shredder/Heavy Equipment Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	Maintenance Mechanic/ Maintenance Helper	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Boiler Operator/Assistant Operator	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
	Maintenance Electrician	Replace dry sweeping and compressed air cleaning of dust and ash residue with wet cleaning or HEPA vacuuming	N/A	N/A	N/A	N/A	Note: No Cost has been placed for this control because HEPA vacuuming falls under the Housekeeping Ancillary Cost	N/A
28 Oil and Gas Well Drilling	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A		N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A		N/A
29 Portland Cement Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A		N/A
	Melt Specialist	No controls required	N/A	N/A	N/A	N/A		N/A
	Reclaim Weigh Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	EAF Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	VIM/AIM Furnace Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	Crane Operator	Retrofit Crane Cab with HEPA-filtered air	N/A	N/A	N/A	N/A		N/A
	Refining Unit Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	Floor Person	No controls required	N/A	N/A	N/A	N/A		N/A
	Welder	Portable LEV	N/A	N/A	N/A	N/A		N/A
	Inert Screener	Replace SMAW with GMAW	N/A	N/A	N/A	N/A		Hobart 175 amp MIG welder = GMAW
30 Superalloy Producers	Laboratory Technician	No controls required	N/A	N/A	N/A	N/A		N/A
	Machine Operator	No controls required	N/A	N/A	N/A	N/A		N/A
	Maintenance Worker	No controls required	N/A	N/A	N/A	N/A		N/A



Table III.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Total Capital	Total O&M	Rounded Total Annualized Cost
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	\$14,600	\$976	\$2,600
	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A
31 Construction (government)	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A
	Not Applicable	Not Applicable	N/A	N/A	N/A

Table iii.24 Detailed Engineering Cost Associated with the Draft Revised Chromium Standard (by Industry Sector, Job Category, and Control Technology)  
Using a Discount Rate of 3%

Industry Sector	Job Category	Control Technology	Assumptions					Design Basis
			ACFM	Length of ductwork, feet	Room size	Other		
31 Construction	Refractory Brick Repairer	Maintain Operating Existing LEV, Improve LEV, and Pre-Wet	N/A	N/A	N/A	N/A	N/A	N/A
	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
31 Construction (government)	Hazardous Waste Site Worker	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
	Industrial Rehabilitation	No controls required	N/A	N/A	N/A	N/A	N/A	N/A
32A Ready-Mix Concrete	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A
32 Precast Concrete Products Producers	Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	N/A	N/A

## Abbreviations

ug/m <sup>3</sup>	micrograms per cubic meter
LOD	level of detection
PEL	permissible exposure limit
LEV	local exhaust ventilation
SMAW	shielded metal arc welding
GMAW	gas metal arc welding
TIG	tungsten inert gas
SAW	submerged arc welding
FCAW	flux cored arc welding
CO <sub>2</sub>	carbon dioxide
Ar	argon
HVLP	high volume, low pressure
ft/min	feet per minute
HEPA	high efficiency particulate air
HVAC	heating, ventilation, air-conditioning
ACGIH	American Conference of Governmental Industrial Hygienists
Cr(VI)	hexavalent chromium
DEC	direct-shell evacuation control
HVLV	high volume, low velocity

**Table III.25. Estimated Annualized Compliance Costs in General Industry Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 3%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$16,805,415	\$37,853,525	\$75,822,578	\$187,539,295	\$282,719,098	\$742,648,196
Initial Exposure Assessment	\$9,051,086	\$9,066,463	\$9,739,054	\$9,544,296	\$10,714,796	\$11,234,516
Periodic Monitoring	\$7,957,871	\$10,866,338	\$15,899,803	\$42,750,084	\$112,073,851	\$136,311,685
Respirator Protection	\$8,319,509	\$20,019,300	\$40,302,075	\$93,543,119	\$210,485,861	\$350,191,080
PPE (supplied prior to reg.)	\$2,741,750	\$2,740,529	\$2,740,529	\$2,740,524	\$2,720,911	\$2,706,277
PPE (not supplied prior to reg.)	\$81,151,496	\$80,075,116	\$80,075,116	\$80,053,313	\$80,047,877	\$79,892,611
Hygiene Areas	\$8,643,300	\$8,555,200	\$8,555,200	\$8,552,800	\$8,544,500	\$8,484,400
Housekeeping	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080
Medical Surveillance	\$2,646,272	\$3,966,271	\$7,135,714	\$12,015,828	\$21,631,520	\$31,176,158
Communication of Hazards	\$8,839,838	\$8,813,331	\$8,820,991	\$8,898,228	\$9,126,585	\$9,201,419
Recordkeeping	\$1,265,460	\$1,265,260	\$1,264,960	\$1,264,410	\$1,264,410	\$1,264,110
<b>Total Cost</b>	<b>\$172,296,077</b>	<b>\$208,095,412</b>	<b>\$275,230,101</b>	<b>\$471,775,977</b>	<b>\$764,203,488</b>	<b>\$1,397,984,532</b>

**Table III.26. Estimated Annualized Compliance Costs in Maritime Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 3%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$2,315,001	\$3,004,913	\$3,687,487	\$7,093,254	\$11,428,257	\$15,522,641
Initial Exposure Assessment	\$336,255	\$361,385	\$369,329	\$491,290	\$558,364	\$685,649
Periodic Monitoring	\$299,663	\$451,034	\$510,185	\$1,613,589	\$3,126,173	\$4,483,730
Respirator Protection	\$1,490,136	\$13,374,179	\$16,894,181	\$24,278,541	\$37,703,964	\$50,139,755
PPE (supplied prior to reg.)	\$1,220,626	\$1,220,626	\$1,220,626	\$1,220,626	\$1,220,626	\$1,052,893
PPE (not supplied prior to reg.)	\$5,661,140	\$5,661,140	\$5,661,140	\$5,661,140	\$5,661,140	\$5,154,231
Hygiene Areas	\$383,700	\$383,700	\$383,700	\$383,700	\$383,700	\$378,100
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$405,725	\$490,500	\$659,699	\$1,196,724	\$1,502,898	\$1,573,984
Communication of Hazards	\$526,616	\$526,616	\$526,716	\$526,816	\$527,616	\$527,916
Recordkeeping	\$60,700	\$60,700	\$60,700	\$60,700	\$60,700	\$60,700
<b>Total Cost</b>	<b>\$12,699,563</b>	<b>\$25,534,793</b>	<b>\$29,973,763</b>	<b>\$42,526,381</b>	<b>\$62,173,438</b>	<b>\$79,579,600</b>

**Table III.27. Estimated Annualized Compliance Costs in Construction Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 3%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$6,126,990	\$10,623,553	\$27,207,738	\$62,948,338	\$136,674,160	\$198,828,183
Initial Exposure Assessment	\$2,909,115	\$2,818,520	\$3,443,258	\$3,858,061	\$5,567,801	\$4,339,638
Periodic Monitoring	\$2,779,241	\$2,223,544	\$7,228,443	\$12,837,254	\$30,201,298	\$26,384,718
Respirator Protection	\$1,392,408	\$3,162,387	\$11,891,350	\$34,109,666	\$63,507,271	\$116,129,833
PPE (supplied prior to reg.)	\$1,293,887	\$1,244,297	\$1,244,297	\$1,194,707	\$1,194,707	\$1,014,309
PPE (not supplied prior to reg.)	\$6,592,356	\$5,995,559	\$5,995,559	\$5,398,761	\$5,398,761	\$550,721
Hygiene Areas	\$3,005,500	\$2,997,400	\$2,997,400	\$2,955,900	\$2,955,900	\$198,500
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$1,023,163	\$1,999,029	\$6,755,490	\$11,082,121	\$19,380,207	\$18,527,706
Communication of Hazards	\$7,085,568	\$7,085,668	\$7,085,868	\$7,086,568	\$7,087,568	\$7,089,008
Recordkeeping	\$703,210	\$703,210	\$703,210	\$703,210	\$703,210	\$703,210
<b>Total Cost</b>	<b>\$32,911,437</b>	<b>\$38,853,167</b>	<b>\$74,552,612</b>	<b>\$142,174,586</b>	<b>\$272,670,883</b>	<b>\$373,765,825</b>

**Table III.28. Estimated Annualized Compliance Costs in Government Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 3%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$267	\$20,457	\$77,437	\$371,372	\$1,107,491	\$1,258,185
Initial Exposure Assessment	\$234,037	\$241,697	\$264,036	\$310,650	\$408,805	\$529,741
Periodic Monitoring	\$263,839	\$309,286	\$856,365	\$1,095,086	\$1,898,241	\$2,753,377
Respirator Protection	\$23,418	\$26,783	\$152,393	\$168,224	\$246,964	\$383,309
PPE (supplied prior to reg.)	\$298,506	\$298,506	\$298,506	\$298,506	\$298,506	\$292,829
PPE (not supplied prior to reg.)	\$48,096	\$48,096	\$48,096	\$48,096	\$48,096	\$0
Hygiene Areas	\$102,900	\$102,900	\$102,900	\$102,900	\$102,900	\$73,500
Housekeeping	\$0	\$0	\$0	\$0	\$0	\$0
Medical Surveillance	\$105,243	\$66,503	\$166,854	\$328,421	\$640,728	\$672,261
Communication of Hazards	\$749,425	\$914,214	\$914,214	\$914,414	\$914,614	\$914,664
Recordkeeping	\$58,290	\$58,780	\$58,780	\$58,780	\$58,780	\$58,780
<b>Total Cost</b>	<b>\$1,884,021</b>	<b>\$2,087,222</b>	<b>\$2,939,581</b>	<b>\$3,696,449</b>	<b>\$5,725,125</b>	<b>\$6,936,645</b>

**Table III.29. Estimated Total Annualized Compliance Costs Associated with the Draft Revised Standard for Hexavalent Chromium, by Provision, Using a Discount Rate of 3%**

Cost Category	PEL Option ( $\mu\text{g}/\text{m}^3$ )					
	20	10	5	1	0.5	0.25
Engineering Controls	\$25,247,673	\$51,502,449	\$106,795,241	\$257,952,259	\$431,929,006	\$958,257,206
Initial Exposure Assessment	\$12,530,493	\$12,488,064	\$13,815,677	\$14,204,297	\$17,249,766	\$16,789,545
Periodic Monitoring	\$11,300,614	\$13,850,201	\$24,494,795	\$58,296,013	\$147,299,563	\$169,933,510
Respirator Protection	\$11,225,471	\$36,582,649	\$69,239,999	\$152,099,550	\$311,944,060	\$516,843,977
PPE (supplied prior to reg.)	\$5,554,768	\$5,503,957	\$5,503,957	\$5,454,363	\$5,434,749	\$5,066,306
PPE (not supplied prior to reg.)	\$93,453,088	\$91,779,911	\$91,779,911	\$91,161,311	\$91,155,875	\$85,597,562
Hygiene Areas	\$12,135,400	\$12,039,200	\$12,039,200	\$11,995,300	\$11,987,000	\$9,134,500
Housekeeping	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080	\$24,874,080
Medical Surveillance	\$4,180,402	\$6,522,303	\$14,717,756	\$24,623,094	\$43,155,352	\$51,950,109
Communication of Hazards	\$17,201,448	\$17,339,829	\$17,347,789	\$17,426,025	\$17,656,382	\$17,733,007
Recordkeeping	\$2,087,660	\$2,087,950	\$2,087,650	\$2,087,100	\$2,087,100	\$2,086,800
<b>Total Cost</b>	<b>\$219,791,098</b>	<b>\$274,570,594</b>	<b>\$382,696,056</b>	<b>\$660,173,391</b>	<b>\$1,104,772,934</b>	<b>\$1,858,266,602</b>



Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		< 20 employees	20 ug/m <sup>3</sup> > 20 employees	Total	< 20 employees	10 ug/m <sup>3</sup> > 20 employees	Total
1	Electroplating	\$12,525,858	\$18,582,477	\$31,108,335	\$15,916,222	\$28,002,941	\$43,919,162
2A	Welding (general industry)	\$4,951,716	\$8,631,639	\$13,583,355	\$7,659,117	\$21,797,652	\$29,456,769
2B	Welding (maritime industry)	\$96,364	\$2,958,319	\$3,054,683	\$338,238	\$14,786,519	\$15,124,758
2C	Welding (construction industry)	\$5,172,812	\$5,411,384	\$10,584,196	\$8,017,597	\$8,961,872	\$16,979,469
2D	Welding (government)	\$0	\$336,756	\$336,756	\$0	\$350,135	\$350,135
2A1	Welding (general industry - carbon steel)	\$2,020,558	\$2,836,304	\$4,856,862	\$2,040,235	\$2,905,428	\$4,945,663
2B1	Welding (maritime industry - carbon steel)	\$70,534	\$102,740	\$173,274	\$70,534	\$104,366	\$174,900
2C1	Welding (construction industry - carbon steel)	\$2,166,536	\$1,393,113	\$3,559,649	\$2,224,116	\$1,594,679	\$3,818,795
3A	Painting (general industry - aerospace)	\$582,279	\$16,708,752	\$17,291,031	\$633,110	\$18,452,882	\$19,085,992
3A1	Painting (general industry - auto repair)	\$30,212,698	\$45,562,387	\$75,775,084	\$31,059,669	\$48,290,965	\$79,350,634
3A2	Painting (general industry - coil coating)	\$250,101	\$3,180,406	\$3,430,507	\$250,101	\$3,133,006	\$3,383,107
3B	Painting (maritime industry)	\$4,600,114	\$4,802,475	\$9,402,589	\$4,887,223	\$5,278,896	\$10,166,118
3C	Painting (construction industry)	\$2,673,920	\$1,454,631	\$4,128,551	\$3,725,709	\$1,712,759	\$5,438,468
3D	Painting (government)	\$0	\$1,135,534	\$1,135,534	\$0	\$1,355,573	\$1,355,573
4	Chromate (chromite ore) production	\$0	\$15,636	\$15,636	\$0	\$15,636	\$15,636
5	Chromate Pigment Producers	\$4,019	\$96,988	\$101,007	\$5,239	\$98,319	\$103,558
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$15,310	\$15,310	\$0	\$22,588	\$22,588
8	Paint and Coatings Producers	\$3,324,193	\$741,890	\$741,890	\$0	\$1,650,480	\$1,650,480
9	Printing Ink Producers	\$25,835	\$1,834,052	\$5,158,246	\$3,346,992	\$1,803,883	\$5,150,875
10	Plastic Colorant Producers and Users	\$134,871	\$14,130	\$39,965	\$25,835	\$14,130	\$39,965
11	Plating Mixture Producers	\$14,501	\$406,478	\$541,349	\$183,560	\$562,707	\$746,267
12	Wood Preserving	\$0	\$25,960	\$40,461	\$14,501	\$25,960	\$40,461
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$74,708	\$8,411	\$8,411	\$0	\$15,874	\$15,874
14A	Steel Mills (carbon)	\$217,655	\$878,176	\$952,885	\$74,727	\$534,050	\$608,777
14B	reshaping (Alloy and Stainless)	\$166,677	\$1,808,460	\$2,026,115	\$219,462	\$2,571,963	\$2,791,425
15	Iron and Steel Foundries	\$618,386	\$200,882	\$367,559	\$166,677	\$200,882	\$367,559
16	Chromium Dioxide Producers	\$0	\$1,921,647	\$2,540,034	\$618,386	\$2,406,056	\$3,024,442
17	Chromium Dye Producers	\$12,036	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$51,709	\$142,449	\$154,484	\$13,377	\$158,518	\$171,894
			\$0	\$51,709	\$51,709	\$0	\$51,709

Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	Total		
1	Electroplating	\$19,489,934	\$46,695,860	\$66,185,794	\$21,857,028	\$118,828,048	\$140,685,076
2A	Welding (general industry)	\$10,975,376	\$40,158,841	\$51,134,218	\$22,772,831	\$71,452,596	\$94,225,427
2B	Welding (maritime industry)	\$408,171	\$17,831,835	\$18,240,006	\$532,456	\$23,369,137	\$23,901,594
2C	Welding (construction industry)	\$16,349,666	\$20,612,976	\$36,962,641	\$31,380,627	\$40,044,595	\$71,425,222
2D	Welding (government)	\$0	\$974,074	\$974,074	\$0	\$1,207,829	\$1,207,829
2A1	Welding (general industry - carbon steel)	\$3,858,622	\$11,161,535	\$15,020,157	\$19,529,928	\$51,380,235	\$70,910,162
2B1	Welding (maritime industry - carbon steel)	\$74,608	\$304,183	\$378,791	\$186,700	\$1,963,468	\$2,150,169
2C1	Welding (construction industry - carbon steel)	\$6,671,923	\$6,970,750	\$13,642,673	\$20,663,597	\$21,399,075	\$42,062,672
3A	Painting (general industry - aerospace)	\$668,483	\$20,226,590	\$20,895,072	\$767,680	\$24,991,529	\$25,759,209
3A1	Painting (general industry - auto repair)	\$31,461,395	\$49,199,396	\$80,660,791	\$31,477,130	\$49,504,080	\$80,981,210
3A2	Painting (general industry - coil coating)	\$266,564	\$3,297,482	\$3,564,046	\$285,101	\$3,462,588	\$3,747,689
3B	Painting (maritime industry)	\$5,081,449	\$6,204,831	\$11,286,280	\$6,756,716	\$9,660,029	\$16,416,745
3C	Painting (construction industry)	\$3,985,169	\$2,203,473	\$6,188,642	\$9,877,106	\$3,618,793	\$13,495,898
3D	Painting (government)	\$0	\$1,519,563	\$1,519,563	\$0	\$2,018,810	\$2,018,810
4	Chromate (chromite ore) production	\$0	\$33,889	\$33,889	\$0	\$258,129	\$258,129
5	Chromate Pigment Producers	\$5,865	\$108,116	\$113,980	\$4,055	\$102,348	\$106,402
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$22,615	\$22,615	\$0	\$22,746	\$22,746
7	Chromium Catalyst Producers	\$0	\$1,734,118	\$1,734,118	\$0	\$2,442,390	\$2,442,390
8	Paint and Coatings Producers	\$3,392,737	\$1,876,619	\$5,271,356	\$5,055,565	\$2,937,330	\$7,992,895
9	Printing Ink Producers	\$58,854	\$36,222	\$95,076	\$120,199	\$125,051	\$245,250
10	Plastic Colorant Producers and Users	\$266,242	\$974,935	\$1,243,177	\$403,969	\$1,386,950	\$1,790,919
11	Plating Mixture Producers	\$24,346	\$49,355	\$73,701	\$61,501	\$166,836	\$228,337
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$25,428	\$25,428	\$0	\$49,402	\$49,402
14	Steel Mills (stainless)	\$103,408	\$2,624,024	\$2,727,432	\$1,521,937	\$6,639,431	\$8,161,368
14A	Steel Mills (carbon)	\$260,366	\$1,539,746	\$1,800,113	\$380,727	\$9,061,134	\$9,441,861
14B	reshaping (Alloy and Stainless)	\$255,068	\$402,246	\$657,314	\$286,233	\$656,740	\$942,973
15	Iron and Steel Foundries	\$1,752,260	\$8,338,829	\$10,091,088	\$1,444,311	\$6,962,812	\$8,407,123
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$18,326	\$207,100	\$225,425	\$21,233	\$245,451	\$266,683
18	Chromium Sulfate Producers	\$58,235	\$0	\$58,235	\$33,284	\$0	\$33,284

Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$37,823,794	\$149,496,737	\$187,320,531	\$587,909,524
2A	Welding (general industry)	\$31,949,079	\$105,771,147	\$137,720,226	\$155,117,446
2B	Welding (maritime industry)	\$933,995	\$39,042,385	\$39,976,380	\$52,609,386
2C	Welding (construction industry)	\$47,385,531	\$59,456,146	\$106,841,678	\$134,941,800
2D	Welding (government)	\$0	\$2,250,616	\$2,250,616	\$2,498,982
2A1	Welding (general industry - carbon steel)	\$55,110,978	\$144,014,882	\$199,125,860	\$340,491,478
2B1	Welding (maritime industry - carbon steel)	\$665,575	\$3,028,810	\$3,694,384	\$5,573,854
2C1	Welding (construction industry - carbon steel)	\$60,186,771	\$63,868,601	\$124,055,372	\$211,175,966
3A	Painting (general industry - aerospace)	\$866,579	\$29,302,288	\$30,168,867	\$36,817,287
3A1	Painting (general industry - auto repair)	\$35,349,164	\$55,724,518	\$91,073,683	\$116,559,682
3A2	Painting (general industry - coil coating)	\$312,101	\$3,447,220	\$3,759,321	\$3,855,505
3B	Painting (maritime industry)	\$7,523,192	\$10,954,114	\$18,477,306	\$21,367,272
3C	Painting (construction industry)	\$15,762,847	\$4,793,395	\$20,556,242	\$17,240,781
3D	Painting (government)	\$0	\$2,818,907	\$2,818,907	\$2,957,566
4	Chromate (chromite ore) production	\$0	\$571,221	\$571,221	\$958,911
5	Chromate Pigment Producers	\$4,055	\$199,319	\$203,373	\$265,268
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$35,166	\$35,166	\$176,573
7	Chromium Catalyst Producers	\$0	\$2,485,455	\$2,485,455	\$2,888,516
8	Paint and Coatings Producers	\$5,728,376	\$3,365,794	\$9,094,170	\$11,096,049
9	Printing Ink Producers	\$135,026	\$159,099	\$294,125	\$368,097
10	Plastic Colorant Producers and Users	\$408,753	\$1,408,471	\$1,817,224	\$2,107,012
11	Plating Mixture Producers	\$72,537	\$220,932	\$293,469	\$747,709
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$46,026	\$46,026	\$102,148
14	Steel Mills (stainless)	\$1,857,403	\$17,361,681	\$19,219,084	\$18,690,455
14A	Steel Mills (carbon)	\$5,786,648	\$44,596,222	\$50,382,870	\$60,060,689
14B	reshaping (Alloy and Stainless)	\$322,916	\$876,619	\$1,199,535	\$1,187,703
15	Iron and Steel Foundries	\$2,193,551	\$10,051,560	\$12,245,110	\$37,261,004
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$21,242	\$245,081	\$266,322	\$266,113
18	Chromium Sulfate Producers	\$33,284	\$0	\$33,284	\$51,364

Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)			Total
	< 20 employees	> 20 employees	10 ug/m <sup>3</sup>	
19	\$3,135,999	\$607,893	\$3,743,892	\$3,743,892
20	\$964,604	\$2,865,260	\$3,829,864	\$3,829,864
21	\$20,065	\$18,521	\$38,586	\$38,586
21A	\$46,809	\$963,773	\$1,010,582	\$1,024,268
22	\$331,285	\$457,421	\$788,707	\$788,707
23	\$0	\$0	\$0	\$0
24	\$0	\$718,855	\$718,855	\$788,055
24A	\$26,449	\$154,815	\$183,264	\$238,253
25	\$0	\$59,965	\$59,965	\$59,965
26A	\$460,693	\$777,787	\$1,238,480	\$871,158
26B	\$8,300	\$10,148	\$18,448	\$18,448
26C	\$9,743,980	\$3,402,250	\$13,146,230	\$11,072,156
26D	\$0	\$155,832	\$155,832	\$120,814
27	\$77,462	\$334,795	\$412,256	\$412,256
27A	\$0	\$38,038	\$38,038	\$38,038
28	\$0	\$0	\$0	\$0
29	\$0	\$0	\$0	\$0
30	\$0	\$106,077	\$106,077	\$74,868
31B	\$253,661	\$424,142	\$677,803	\$728,977
31C	\$234,768	\$90,289	\$325,057	\$325,057
31CG	\$0	\$156,959	\$156,959	\$156,959
31D	\$11,251	\$46,440	\$57,691	\$57,691
31DG	\$0	\$27,364	\$27,364	\$32,144
32A	\$0	\$0	\$0	\$0
32	\$0	\$0	\$0	\$0
Total (General Industry)	\$60,253,166	\$110,677,597	\$170,930,762	\$206,812,710
Total (Maritime Industry)	\$4,775,312	\$7,873,681	\$12,648,993	\$25,484,223
Total (Construction Industry)	\$20,256,928	\$12,222,248	\$32,479,176	\$38,420,613
Total (Government)	\$0	\$1,850,484	\$1,850,484	\$2,053,664
Total Industry	\$85,285,406	\$132,624,010	\$217,909,416	\$272,771,210

Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	5 ug/m <sup>3</sup> > 20 employees	1 ug/m <sup>3</sup> > 20 employees	
19	Chemical Distributors	\$3,135,999	\$607,893	\$607,893	\$3,743,892
20	Textile Dyeing	\$964,604	\$2,865,260	\$2,865,260	\$3,829,864
21	Colored Glass Producers	\$20,093	\$33,993	\$34,086	\$54,085
21A	Fiber, Flat, and Container Glass	\$50,840	\$1,306,445	\$1,357,285	\$1,357,285
22	Printing	\$331,285	\$457,421	\$788,707	\$788,707
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$788,055	\$788,055	\$788,055
24A	Chromium Catalyst Users (Service)	\$39,427	\$274,586	\$314,013	\$314,013
25	Refractory Brick Producers	\$0	\$59,965	\$59,965	\$59,965
26A	Woodworking (general industry)	\$302,288	\$568,870	\$871,158	\$871,158
26B	Woodworking (maritime industry)	\$8,300	\$10,148	\$18,448	\$18,448
26C	Woodworking (construction industry)	\$12,687,297	\$3,292,424	\$15,979,721	\$15,979,721
26D	Woodworking (government)	\$0	\$197,340	\$197,340	\$197,340
27	Solid Waste Incineration	\$77,462	\$334,795	\$412,256	\$412,256
27A	Incinerators (government)	\$0	\$38,038	\$38,038	\$38,038
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$123,885	\$123,885	\$123,885
31B	Construction (Refractory Repair)	\$488,621	\$511,423	\$1,000,045	\$1,000,045
31C	Construction (Hazardous Waste Work)	\$234,768	\$90,289	\$325,057	\$325,057
31CG	Haz. Waste (government)	\$0	\$156,959	\$156,959	\$156,959
31D	Construction (Industrial Rehabilitation)	\$11,251	\$46,440	\$57,691	\$57,691
31DG	Industrial Rehab. (government)	\$0	\$32,144	\$32,144	\$32,144
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)		\$77,840,080	\$196,136,113	\$273,976,194	\$273,976,194
Total (Maritime Industry)		\$5,572,528	\$24,350,996	\$29,923,524	\$29,923,524
Total (Construction Industry)		\$40,428,695	\$33,727,774	\$74,156,469	\$74,156,469
Total (Government)		\$0	\$2,918,119	\$2,918,119	\$2,918,119
Total Industry		\$123,841,304	\$257,133,002	\$380,974,305	\$380,974,305
		\$111,105,515	\$360,238,256	\$471,343,771	\$471,343,771
		\$7,484,173	\$35,002,782	\$42,486,955	\$42,486,955
		\$74,049,247	\$67,820,392	\$141,869,639	\$141,869,639
		\$0	\$3,673,753	\$3,673,753	\$3,673,753
		\$192,638,935	\$466,735,183	\$659,374,118	\$659,374,118

Table III.30 Summary of Total Annualized Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)			
	0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>	
	< 20 employees	≥ 20 employees	Total	Total
19 Chemical Distributors	\$3,135,999	\$607,893	\$3,743,892	\$3,743,892
20 Textile Dyeing	\$1,406,322	\$4,873,650	\$6,279,972	\$9,648,249
21 Colored Glass Producers	\$20,093	\$16,680	\$36,772	\$52,098
21A Fiber, Flat, and Container Glass	\$67,747	\$2,527,063	\$2,594,810	\$4,510,439
22 Printing	\$331,285	\$457,421	\$788,707	\$788,707
23 Leather Tanning	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$1,114,418	\$1,114,418	\$1,285,981
24A Chromium Catalyst Users (Service)	\$40,510	\$323,569	\$364,079	\$403,802
25 Refractory Brick Producers	\$0	\$72,734	\$72,734	\$193,231
26A Woodworking (general industry)	\$306,463	\$576,678	\$883,141	\$883,141
26B Woodworking (maritime industry)	\$8,300	\$10,148	\$18,448	\$39,535
26C Woodworking (construction industry)	\$15,653,377	\$3,575,912	\$19,229,289	\$7,344,171
26D Woodworking (government)	\$0	\$257,194	\$257,194	\$115,112
27 Solid Waste Incineration	\$253,469	\$1,443,159	\$1,696,628	\$376,514
27A Incinerators (government)	\$0	\$126,042	\$126,042	\$35,274
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$667,165	\$667,165	\$1,132,604
31B Construction (Refractory Repair)	\$821,461	\$623,123	\$1,444,585	\$1,529,198
31C Construction (Hazardous Waste Work)	\$282,217	\$106,029	\$388,246	\$1,483,450
31CG Haz. Waste (government)	\$0	\$223,740	\$223,740	\$1,284,800
31D Construction (Industrial Rehabilitation)	\$11,251	\$46,440	\$57,691	\$57,691
31DG Industrial Rehab. (government)	\$0	\$32,144	\$32,144	\$32,144
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)	\$183,537,374	\$582,059,867	\$765,597,240	\$1,399,997,192
Total (Maritime Industry)	\$9,131,061	\$53,035,456	\$62,166,517	\$79,590,046
Total (Construction Industry)	\$140,103,457	\$132,469,646	\$272,573,103	\$373,773,057
Total (Government)	\$0	\$5,708,643	\$5,708,643	\$6,923,877
Total Industry	\$332,771,891	\$773,273,612	\$1,106,045,503	\$1,860,284,172

Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	20 ug/m <sup>3</sup> > 20 employees	< 20 employees	10 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$578,569	\$6,882,426	\$7,460,995	\$13,764,852	\$14,921,990
2A	Welding (general industry)	\$1,075,300	\$3,847,200	\$4,922,500	\$9,600,400	\$12,274,000
2B	Welding (maritime industry)	\$57,800	\$2,204,446	\$2,262,246	\$2,837,237	\$2,928,465
2C	Welding (construction industry)	\$2,668,616	\$3,458,374	\$6,126,990	\$5,606,478	\$9,932,915
2D	Welding (government)	\$0	\$267	\$267	\$9,350	\$9,350
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$8,056	\$399,413	\$407,469	\$647,682	\$671,176
3A1	Painting (general industry - auto repair)	\$729,100	\$1,490,400	\$2,219,500	\$4,687,200	\$6,950,580
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0
3B	Painting (maritime industry)	\$33,311	\$19,445	\$52,755	\$48,023	\$76,448
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$33,900	\$33,900	\$33,900	\$33,900
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$544,737	\$544,737	\$1,472,344	\$1,472,344
8	Paint and Coatings Producers	\$637,073	\$12,338	\$849,411	\$35,691	\$909,463
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$615	\$9,588	\$10,203	\$615	\$34,460
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$1,808	\$30,547
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$356,700	\$356,700	\$535,050	\$535,050
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0

Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$2,507,133	\$29,934,364	\$32,441,497	\$5,259,711	\$93,467,713	\$98,727,424
2A	Welding (general industry)	\$5,290,700	\$19,038,300	\$24,329,000	\$9,978,400	\$35,785,200	\$45,763,600
2B	Welding (maritime industry)	\$108,066	\$3,353,901	\$3,461,967	\$184,088	\$6,228,329	\$6,412,417
2C	Welding (construction industry)	\$7,586,720	\$12,551,866	\$20,138,586	\$16,788,092	\$24,320,015	\$41,108,107
2D	Welding (government)	\$0	\$66,330	\$66,330	\$0	\$330,810	\$330,810
2A1	Welding (general industry - carbon steel)	\$1,057,400	\$3,796,800	\$4,854,200	\$3,169,400	\$11,364,800	\$14,534,200
2B1	Welding (maritime industry - carbon steel)	\$2,199	\$100,153	\$102,352	\$8,717	\$374,225	\$382,942
2C1	Welding (construction industry - carbon steel)	\$2,775,044	\$3,574,870	\$6,349,914	\$8,308,238	\$10,706,149	\$19,014,387
3A	Painting (general industry - aerospace)	\$35,514	\$956,795	\$992,308	\$72,071	\$1,989,919	\$2,061,990
3A1	Painting (general industry - auto repair)	\$3,131,960	\$6,573,600	\$9,705,560	\$3,496,510	\$7,318,800	\$10,815,310
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$11,100	\$77,700	\$88,800
3B	Painting (maritime industry)	\$68,601	\$54,566	\$123,168	\$155,754	\$142,141	\$297,895
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$217,971	\$217,971
4	Chromate (chromite ore) production	\$0	\$33,900	\$33,900	\$0	\$39,933	\$39,933
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	\$0
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,483,469	\$1,483,469	\$0	\$1,600,668	\$1,600,668
7	Chromium Catalyst Producers	\$873,772	\$35,691	\$909,463	\$2,570,208	\$1,115,242	\$3,685,450
8	Paint and Coatings Producers	\$0	\$0	\$0	\$0	\$0	\$0
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$0	\$0	\$0	\$46,800	\$140,400	\$187,200
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$5,700	\$5,700	\$0	\$21,100	\$21,100
14	Steel Mills (stainless)	\$944	\$36,412	\$37,356	\$1,428,946	\$4,895,333	\$6,324,279
14A	Steel Mills (carbon)	\$6,387	\$101,555	\$107,942	\$34,197	\$543,731	\$577,927
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$86,974	\$312,106	\$399,080
15	Iron and Steel Foundries	\$0	\$891,150	\$891,150	\$339,452	\$2,022,642	\$2,362,094
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0



Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)						
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total		
		<20 employees	≥ 20 employees	<20 employees	≥ 20 employees		<20 employees	≥ 20 employees
1	Electroplating	\$5,838,280	\$100,568,867	\$106,397,147	\$18,415,959	\$472,358,826	\$490,774,785	
2A	Welding (general industry)	\$13,790,200	\$48,927,800	\$62,718,000	\$15,124,600	\$53,700,800	\$68,825,400	
2B	Welding (maritime industry)	\$281,884	\$10,047,255	\$10,329,139	\$373,393	\$13,845,803	\$14,219,196	
2C	Welding (construction industry)	\$25,652,047	\$35,607,761	\$61,259,808	\$29,582,514	\$43,154,835	\$72,737,349	
2D	Welding (government)	\$0	\$1,066,929	\$1,066,929	\$0	\$1,173,987	\$1,173,987	
2A1	Welding (general industry - carbon steel)	\$12,975,300	\$46,524,800	\$59,500,100	\$20,726,700	\$74,466,200	\$95,192,900	
2B1	Welding (maritime industry - carbon steel)	\$14,305	\$732,688	\$746,993	\$16,318	\$880,465	\$896,783	
2C1	Welding (construction industry - carbon steel)	\$31,683,752	\$40,818,956	\$72,502,708	\$52,636,846	\$67,810,848	\$120,447,694	
3A	Painting (general industry - aerospace)	\$80,815	\$2,382,319	\$2,463,134	\$88,814	\$2,727,529	\$2,816,342	
3A1	Painting (general industry - auto repair)	\$3,496,510	\$7,318,800	\$10,815,310	\$10,508,233	\$27,370,800	\$37,879,033	
3A2	Painting (general industry - coil coating)	\$44,400	\$233,100	\$277,500	\$44,400	\$233,100	\$277,500	
3B	Painting (maritime industry)	\$178,348	\$173,777	\$352,125	\$204,143	\$202,519	\$406,662	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$486,337	\$486,337	\$0	\$489,037	\$489,037	
5	Chromate Pigment Producers	\$0	\$39,933	\$39,933	\$0	\$39,933	\$39,933	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0	
7	Chromium Catalyst Producers	\$0	\$1,600,668	\$1,600,668	\$0	\$1,628,668	\$1,628,668	
8	Paint and Coatings Producers	\$3,242,628	\$1,543,145	\$4,785,773	\$4,203,645	\$2,154,701	\$6,358,346	
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0	
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0	
11	Plating Mixture Producers	\$46,800	\$140,400	\$187,200	\$209,200	\$466,200	\$675,400	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$21,100	\$21,100	\$0	\$21,300	\$21,300	
14	Steel Mills (stainless)	\$1,568,684	\$5,402,178	\$6,970,863	\$1,609,383	\$5,964,722	\$7,574,105	
14A	Steel Mills (carbon)	\$5,076,861	\$17,253,648	\$22,330,509	\$5,216,300	\$18,669,509	\$23,885,808	
14B	reshaping (Alloy and Stainless)	\$105,062	\$402,549	\$507,611	\$126,048	\$566,120	\$692,169	
15	Iron and Steel Foundries	\$538,903	\$2,927,234	\$3,466,138	\$1,010,555	\$4,224,276	\$5,234,831	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0	
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0	

Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)						Total
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	Total	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees			
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$11,016	\$11,016	\$11,016
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$529,702	\$132,337	\$662,038	\$662,038
26D	Woodworking (government)	\$0	\$0	\$0	\$11,107	\$11,107	\$11,107
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$21,580	\$21,580	\$21,580
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$3,228,714	\$13,576,701	\$6,993,807	\$30,859,719	\$37,853,525	\$37,853,525
	Total (Maritime Industry)	\$91,111	\$2,223,891	\$139,251	\$2,865,662	\$3,004,913	\$3,004,913
	Total (Construction Industry)	\$2,668,616	\$3,458,374	\$4,877,719	\$5,745,834	\$10,623,553	\$10,623,553
	Total (Government)	\$0	\$267	\$0	\$20,457	\$20,457	\$20,457
	Total Industry	\$5,988,441	\$19,259,232	\$12,010,776	\$39,491,673	\$51,502,449	\$51,502,449

Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	Total
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$1,772	\$1,772
21A	Fiber, Flat, and Container Glass	\$0	\$22,032	\$22,032	\$0	\$69,156	\$69,156
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$4,175	\$11,983
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$529,702	\$132,337	\$662,038	\$1,986,382	\$496,262	\$2,482,644
26D	Woodworking (government)	\$0	\$11,107	\$11,107	\$0	\$40,562	\$40,562
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$9,000	\$9,000	\$0	\$49,356	\$49,356
31B	Construction (Refractory Repair)	\$43,160	\$14,040	\$57,200	\$258,960	\$84,240	\$343,200
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$12,903,810	\$62,918,769	\$75,822,578	\$26,497,944	\$161,041,350	\$187,539,295
	Total (Maritime Industry)	\$178,866	\$3,508,620	\$3,687,487	\$348,559	\$6,744,695	\$7,093,254
	Total (Construction Industry)	\$10,934,626	\$16,273,112	\$27,207,738	\$27,341,671	\$35,606,667	\$62,948,338
	Total (Government)	\$0	\$77,437	\$77,437	\$0	\$371,372	\$371,372
	Total Industry	\$24,017,302	\$82,777,939	\$106,795,241	\$54,188,174	\$203,764,084	\$257,952,259

Table III.31 Summary of Total Annualized Engineering Controls Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)						Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees			
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0	
21	Colored Glass Producers	\$0	\$1,772	\$1,772	\$0	\$1,772	\$1,772	
21A	Fiber, Flat, and Container Glass	\$0	\$69,156	\$69,156	\$0	\$69,156	\$69,352	
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$0	\$0	\$0	\$0	\$101,345	
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0	
25	Chromium Catalyst Users	\$0	\$12,165	\$12,165	\$0	\$12,165	\$21,486	
25A	Refractory Brick Producers	\$4,175	\$7,808	\$11,983	\$4,175	\$11,983	\$11,983	
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0	
26B	Woodworking (maritime industry)	\$0	\$496,262	\$2,482,644	\$4,171,872	\$1,042,268	\$5,214,140	
26C	Woodworking (construction industry)	\$1,986,382	\$40,562	\$40,562	\$0	\$84,198	\$84,198	
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0	
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0	
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$56,700	\$56,700	\$0	\$56,700	\$56,700	
31B	Construction (Refractory Repair)	\$323,700	\$105,300	\$429,000	\$323,700	\$105,300	\$429,000	
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0	
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0	
	Total (General Industry)	\$46,808,619	\$235,910,479	\$282,719,098	\$77,288,013	\$665,360,183	\$742,648,196	
	Total (Maritime Industry)	\$474,537	\$10,953,720	\$11,428,257	\$593,854	\$14,928,787	\$15,522,641	
	Total (Construction Industry)	\$59,645,880	\$77,028,280	\$136,674,160	\$86,714,931	\$112,113,251	\$198,828,183	
	Total (Government)	\$0	\$1,107,491	\$1,107,491	\$0	\$1,258,185	\$1,258,185	
	Total Industry	\$106,929,036	\$324,999,970	\$431,929,006	\$164,596,799	\$793,660,407	\$958,257,206	

Table III.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	> 20 employees	10 ug/m <sup>3</sup>	
1	Electroplating	\$930,834	\$937,437	\$937,437	\$1,868,271
2A	Welding (general industry)	\$915,873	\$946,999	\$946,999	\$1,862,872
2B	Welding (maritime industry)	\$26,687	\$32,323	\$32,323	\$59,010
2C	Welding (construction industry)	\$188,168	\$26,777	\$26,777	\$214,945
2D	Welding (government)	\$0	\$71,233	\$71,233	\$71,233
2A1	Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$1,269,691	\$2,385,283
2B1	Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$69,758	\$127,460
2C1	Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$40,214	\$306,615
3A	Painting (general industry - aerospace)	\$21,442	\$20,682	\$26,980	\$52,788
3A1	Painting (general industry - auto repair)	\$242,578	\$22,321	\$202,968	\$221,217
3A2	Painting (general industry - coil coating)	\$2,211	\$13,749	\$2,211	\$15,960
3B	Painting (maritime industry)	\$92,574	\$37,727	\$112,436	\$155,431
3C	Painting (construction industry)	\$172,527	\$56,470	\$323,433	\$403,709
3D	Painting (government)	\$0	\$27,923	\$0	\$39,911
4	Chromate (chromite ore) production	\$0	\$2,229	\$0	\$2,229
5	Chromate Pigment Producers	\$105	\$2,929	\$205	\$3,305
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,167	\$0	\$1,665
7	Chromium Catalyst Producers	\$0	\$9,057	\$0	\$7,861
8	Paint and Coatings Producers	\$35,682	\$22,700	\$33,703	\$55,150
9	Printing Ink Producers	\$5,926	\$3,673	\$5,926	\$9,599
10	Plastic Colorant Producers and Users	\$15,821	\$68,998	\$22,086	\$108,696
11	Plating Mixture Producers	\$1,295	\$2,012	\$1,295	\$3,308
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$3,947	\$0	\$4,459
14	Steel Mills (stainless)	\$7,232	\$87,615	\$7,232	\$94,847
14A	Steel Mills (carbon)	\$21,272	\$262,844	\$21,272	\$284,116
14B	reshaping (Alloy and Stainless)	\$11,951	\$24,955	\$11,951	\$36,906
15	Iron and Steel Foundries	\$39,365	\$273,844	\$39,365	\$334,964
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,519	\$15,081	\$1,675	\$18,436
18	Chromium Sulfate Producers	\$2,222	\$0	\$2,222	\$2,222

Table III.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	Total	Total		
1	Electroplating	\$930,834	\$937,437	\$1,868,271	\$930,834	\$937,437	\$1,868,271
2A	Welding (general industry)	\$915,873	\$946,999	\$1,862,872	\$915,873	\$946,999	\$1,862,872
2B	Welding (maritime industry)	\$26,687	\$32,323	\$59,010	\$26,687	\$32,323	\$59,010
2C	Welding (construction industry)	\$188,168	\$26,777	\$214,945	\$188,168	\$26,777	\$214,945
2D	Welding (government)	\$0	\$71,233	\$71,233	\$0	\$71,233	\$71,233
2A1	Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$2,385,283	\$1,115,592	\$1,269,691	\$2,385,283
2B1	Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$127,460	\$57,702	\$69,758	\$127,460
2C1	Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$306,615	\$266,401	\$40,214	\$306,615
3A	Painting (general industry - aerospace)	\$30,255	\$32,385	\$62,640	\$38,043	\$41,697	\$79,740
3A1	Painting (general industry - auto repair)	\$174,692	\$15,088	\$189,780	\$157,536	\$13,266	\$170,801
3A2	Painting (general industry - coil coating)	\$2,695	\$15,713	\$18,408	\$3,108	\$17,436	\$20,544
3B	Painting (maritime industry)	\$104,078	\$59,297	\$163,375	\$190,444	\$94,891	\$285,336
3C	Painting (construction industry)	\$344,761	\$113,606	\$458,367	\$1,140,196	\$260,297	\$1,400,493
3D	Painting (government)	\$0	\$53,594	\$53,594	\$0	\$102,657	\$102,657
4	Chromate (chromite ore) production	\$0	\$3,054	\$3,054	\$0	\$2,627	\$2,627
5	Chromate Pigment Producers	\$290	\$4,026	\$4,316	\$105	\$3,570	\$3,675
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,665	\$1,665	\$0	\$1,665	\$1,665
7	Chromium Catalyst Producers	\$0	\$13,742	\$13,742	\$0	\$18,084	\$18,084
8	Paint and Coatings Producers	\$39,996	\$25,405	\$65,401	\$35,155	\$22,358	\$57,513
9	Printing Ink Producers	\$9,315	\$5,439	\$14,753	\$6,880	\$4,029	\$10,909
10	Plastic Colorant Producers and Users	\$34,772	\$126,348	\$161,120	\$53,594	\$176,878	\$230,472
11	Plating Mixture Producers	\$2,491	\$3,878	\$6,369	\$1,295	\$2,012	\$3,308
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,659	\$4,659	\$0	\$4,858	\$4,858
14	Steel Mills (stainless)	\$9,488	\$105,625	\$115,093	\$8,058	\$92,726	\$100,784
14A	Steel Mills (carbon)	\$21,272	\$262,844	\$284,116	\$34,399	\$373,044	\$407,443
14B	reshaping (Alloy and Stainless)	\$21,932	\$43,009	\$64,940	\$13,859	\$39,292	\$53,151
15	Iron and Steel Foundries	\$157,082	\$721,265	\$878,347	\$64,907	\$368,012	\$432,919
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$2,230	\$21,217	\$23,448	\$2,586	\$25,887	\$28,473
18	Chromium Sulfate Producers	\$2,734	\$0	\$2,734	\$2,222	\$0	\$2,222

Table III.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$930,834	\$937,437	\$1,868,271	\$930,834	\$937,437	\$1,868,271
2A	Welding (general industry)	\$915,873	\$946,999	\$1,862,872	\$915,873	\$946,999	\$1,862,872
2B	Welding (maritime industry)	\$26,687	\$32,323	\$59,010	\$26,687	\$32,323	\$59,010
2C	Welding (construction industry)	\$188,168	\$26,777	\$214,945	\$188,168	\$26,777	\$214,945
2D	Welding (government)	\$0	\$71,233	\$71,233	\$0	\$71,233	\$71,233
2A1	Welding (general industry - carbon steel)	\$1,115,592	\$1,269,691	\$2,385,283	\$1,115,592	\$1,269,691	\$2,385,283
2B1	Welding (maritime industry - carbon steel)	\$57,702	\$69,758	\$127,460	\$57,702	\$69,758	\$127,460
2C1	Welding (construction industry - carbon steel)	\$266,401	\$40,214	\$306,615	\$266,401	\$40,214	\$306,615
3A	Painting (general industry - aerospace)	\$53,021	\$65,474	\$118,495	\$58,075	\$65,474	\$123,549
3A1	Painting (general industry - auto repair)	\$374,619	\$35,918	\$410,536	\$544,090	\$28,215	\$572,306
3A2	Painting (general industry - coil coating)	\$2,211	\$13,749	\$15,960	\$2,880	\$16,454	\$19,334
3B	Painting (maritime industry)	\$243,523	\$108,887	\$352,410	\$333,534	\$146,162	\$479,695
3C	Painting (construction industry)	\$1,886,824	\$413,852	\$2,300,675	\$1,446,265	\$310,243	\$1,756,508
3D	Painting (government)	\$0	\$181,164	\$181,164	\$0	\$192,369	\$192,369
4	Chromate (chromite ore) production	\$0	\$4,464	\$4,464	\$0	\$6,685	\$6,685
5	Chromate Pigment Producers	\$105	\$4,994	\$5,099	\$105	\$5,179	\$5,284
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$2,676	\$2,676	\$0	\$6,833	\$6,833
7	Chromium Catalyst Producers	\$0	\$22,541	\$22,541	\$0	\$28,791	\$28,791
8	Paint and Coatings Producers	\$35,155	\$22,358	\$57,513	\$36,607	\$23,270	\$59,877
9	Printing Ink Producers	\$5,926	\$5,083	\$11,009	\$13,601	\$6,834	\$20,434
10	Plastic Colorant Producers and Users	\$54,192	\$178,828	\$233,020	\$55,829	\$215,063	\$270,893
11	Plating Mixture Producers	\$2,491	\$3,878	\$6,369	\$2,491	\$3,878	\$6,369
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,659	\$4,659	\$0	\$6,481	\$6,481
14	Steel Mills (stainless)	\$25,058	\$229,864	\$254,922	\$20,915	\$158,205	\$179,120
14A	Steel Mills (carbon)	\$54,190	\$381,345	\$435,534	\$60,810	\$443,549	\$504,360
14B	reshaping (Alloy and Stainless)	\$16,365	\$44,162	\$60,526	\$15,909	\$31,234	\$47,143
15	Iron and Steel Foundries	\$157,082	\$784,538	\$941,620	\$157,082	\$1,020,699	\$1,177,782
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$2,586	\$25,887	\$28,473	\$2,586	\$25,887	\$28,473
18	Chromium Sulfate Producers	\$2,222	\$0	\$2,222	\$3,845	\$0	\$3,845

Table III.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$443,847	\$58,823	\$502,670	\$443,847	\$58,823	\$502,670
20	Textile Dyeing	\$204,804	\$234,781	\$439,585	\$204,804	\$234,781	\$439,585
21	Colored Glass Producers	\$6,496	\$12,124	\$18,619	\$6,496	\$12,124	\$18,619
21A	Fiber, Flat, and Container Glass	\$1,207	\$28,801	\$30,008	\$1,236	\$29,328	\$30,564
22	Printing	\$108,126	\$48,987	\$157,113	\$108,126	\$48,987	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$84,556	\$84,556	\$0	\$94,408	\$94,408
24A	Chromium Catalyst Users (Service)	\$1,039	\$7,627	\$8,666	\$1,039	\$17,579	\$18,618
25	Refractory Brick Producers	\$0	\$14,484	\$14,484	\$0	\$14,484	\$14,484
26A	Woodworking (general industry)	\$31,133	\$58,760	\$89,892	\$26,263	\$49,577	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$19,485	\$9,126	\$10,359	\$19,485
26C	Woodworking (construction industry)	\$1,684,891	\$420,940	\$2,105,831	\$1,469,986	\$367,250	\$1,837,236
26D	Woodworking (government)	\$0	\$33,925	\$33,925	\$0	\$29,597	\$29,597
27	Solid Waste Incineration	\$33,376	\$264,965	\$298,340	\$33,376	\$264,965	\$298,340
27A	Incinerators (government)	\$0	\$16,688	\$16,688	\$0	\$16,688	\$16,688
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$44,303	\$44,303	\$0	\$42,068	\$42,068
31B	Construction (Refractory Repair)	\$3,211	\$1,050	\$4,262	\$5,703	\$1,848	\$7,551
31C	Construction (Hazardous Waste Work)	\$36,196	\$11,016	\$47,213	\$36,196	\$11,016	\$47,213
31CG	Haz. Waste (government)	\$0	\$51,035	\$51,035	\$0	\$51,035	\$51,035
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$1,251	\$977	\$274	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$33,233	\$0	\$33,233	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,200,947	\$4,850,139	\$9,051,086	\$4,166,577	\$4,899,886	\$9,066,463
	Total (Maritime Industry)	\$186,089	\$150,166	\$336,255	\$205,950	\$155,434	\$361,385
	Total (Construction Industry)	\$2,352,372	\$556,742	\$2,909,115	\$2,290,865	\$527,655	\$2,818,520
	Total (Government)	\$0	\$234,037	\$234,037	\$0	\$241,697	\$241,697
	Total Industry	\$6,739,408	\$5,791,085	\$12,530,493	\$6,663,392	\$5,824,672	\$12,488,064



Table III.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$443,847	\$58,823	\$443,847	\$58,823	\$502,670
20	Textile Dyeing	\$204,804	\$234,781	\$204,804	\$234,781	\$439,585
21	Colored Glass Producers	\$6,496	\$13,690	\$6,496	\$12,124	\$18,619
21A	Fiber, Flat, and Container Glass	\$1,264	\$33,500	\$1,691	\$34,809	\$36,501
22	Printing	\$108,126	\$48,987	\$108,126	\$48,987	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$94,408	\$0	\$98,779	\$98,779
24A	Chromium Catalyst Users (Service)	\$1,039	\$27,545	\$1,039	\$27,545	\$28,584
25	Refractory Brick Producers	\$0	\$14,484	\$0	\$17,189	\$17,189
26A	Woodworking (general industry)	\$26,263	\$49,577	\$26,263	\$49,577	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$9,126	\$10,359	\$19,485
26C	Woodworking (construction industry)	\$1,899,795	\$474,631	\$1,469,986	\$367,250	\$1,837,236
26D	Woodworking (government)	\$0	\$38,254	\$0	\$29,597	\$29,597
27	Solid Waste Incineration	\$33,376	\$264,965	\$45,777	\$333,861	\$379,638
27A	Incinerators (government)	\$0	\$16,688	\$0	\$22,895	\$22,895
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$42,068	\$0	\$44,161	\$44,161
31B	Construction (Refractory Repair)	\$30,519	\$9,920	\$37,966	\$12,341	\$50,307
31C	Construction (Hazardous Waste Work)	\$36,196	\$11,016	\$36,196	\$11,016	\$47,213
31CG	Haz. Waste (government)	\$0	\$51,035	\$0	\$51,035	\$51,035
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$977	\$274	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$0	\$33,233	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,296,738	\$5,442,316	\$4,222,090	\$5,322,206	\$9,544,296
	Total (Maritime Industry)	\$197,593	\$171,736	\$283,959	\$207,331	\$491,290
	Total (Construction Industry)	\$2,766,819	\$676,439	\$3,139,891	\$718,170	\$3,858,061
	Total (Government)	\$0	\$264,036	\$0	\$310,650	\$310,650
	<b>Total Industry</b>	<b>\$7,261,150</b>	<b>\$6,554,527</b>	<b>\$7,645,939</b>	<b>\$6,558,357</b>	<b>\$14,204,297</b>

Table iii.32 Summary of Total Initial Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total	
19	Chemical Distributors	\$443,847	\$58,823	\$502,670	\$443,847	\$58,823	\$502,670
20	Textile Dyeing	\$243,289	\$262,146	\$505,434	\$316,997	\$320,535	\$637,532
21	Colored Glass Producers	\$6,496	\$12,124	\$18,619	\$6,496	\$13,690	\$20,185
21A	Fiber, Flat, and Container Glass	\$1,691	\$37,016	\$38,708	\$1,748	\$35,835	\$37,583
22	Printing	\$108,126	\$48,987	\$157,113	\$108,126	\$48,987	\$157,113
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$140,197	\$140,197	\$0	\$175,749	\$175,749
24A	Chromium Catalyst Users (Service)	\$1,039	\$27,545	\$28,584	\$1,039	\$27,545	\$28,584
25	Refractory Brick Producers	\$0	\$15,082	\$15,082	\$0	\$27,440	\$27,440
26A	Woodworking (general industry)	\$26,263	\$49,577	\$75,840	\$26,263	\$49,577	\$75,840
26B	Woodworking (maritime industry)	\$9,126	\$10,359	\$19,485	\$9,126	\$10,359	\$19,485
26C	Woodworking (construction industry)	\$2,114,700	\$528,322	\$2,643,022	\$1,469,986	\$367,250	\$1,837,236
26D	Woodworking (government)	\$0	\$42,582	\$42,582	\$0	\$29,597	\$29,597
27	Solid Waste Incineration	\$51,002	\$377,244	\$428,246	\$33,376	\$264,965	\$298,340
27A	Incinerators (government)	\$0	\$25,501	\$25,501	\$0	\$16,688	\$16,688
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$72,238	\$72,238	\$0	\$89,494	\$89,494
31B	Construction (Refractory Repair)	\$37,966	\$12,341	\$50,307	\$37,966	\$12,341	\$50,307
31C	Construction (Hazardous Waste Work)	\$39,087	\$11,899	\$50,986	\$132,486	\$40,289	\$172,775
31CG	Haz. Waste (government)	\$0	\$55,092	\$55,092	\$0	\$186,621	\$186,621
31D	Construction (Industrial Rehabilitation)	\$977	\$274	\$1,251	\$977	\$274	\$1,251
31DG	Industrial Rehab. (government)	\$0	\$33,233	\$33,233	\$0	\$33,233	\$33,233
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,629,275	\$6,085,520	\$10,714,796	\$4,875,019	\$6,359,497	\$11,234,516
	Total (Maritime Industry)	\$337,037	\$221,327	\$558,364	\$427,048	\$258,601	\$685,649
	Total (Construction Industry)	\$4,534,122	\$1,033,679	\$5,567,801	\$3,542,249	\$797,389	\$4,339,638
	Total (Government)	\$0	\$408,805	\$408,805	\$0	\$529,741	\$529,741
	Total Industry	\$9,500,435	\$7,749,331	\$17,249,766	\$8,844,317	\$7,945,228	\$16,789,545

Table III.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total
1	Electroplating	\$1,087,029	\$657,510	\$1,744,540	\$3,549,377	\$5,276,335
2A	Welding (general industry)	\$2,161,613	\$2,456,198	\$4,617,810	\$1,921,163	\$3,893,539
2B	Welding (maritime industry)	\$0	\$2,754	\$2,754	\$0	\$2,754
2C	Welding (construction industry)	\$386,899	\$53,091	\$439,990	\$378,564	\$429,998
2D	Welding (government)	\$0	\$147,631	\$147,631	\$0	\$146,938
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$83,875	\$66,723	\$150,599	\$117,237	\$214,834
3A1	Painting (general industry - auto repair)	\$742,358	\$54,545	\$796,903	\$503,767	\$533,784
3A2	Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0
3B	Painting (maritime industry)	\$237,904	\$59,004	\$296,909	\$357,543	\$448,279
3C	Painting (construction industry)	\$605,910	\$95,625	\$701,535	\$1,514,904	\$1,753,924
3D	Painting (government)	\$0	\$90,136	\$90,136	\$0	\$162,348
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$9,948	\$9,948	\$600	\$11,578
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$3,002
7	Chromium Catalyst Producers	\$0	\$17,067	\$17,067	\$0	\$9,863
8	Paint and Coatings Producers	\$11,921	\$7,547	\$19,468	\$0	\$0
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$67,409	\$199,998	\$267,407	\$105,145	\$411,230
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$3,087
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$142,022	\$142,022	\$0	\$273,067
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$6,689	\$64,322	\$71,011	\$7,633	\$82,074
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0

Table iii.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$5,409,653	\$2,628,141	\$8,037,794	\$3,495,663	\$1,969,216	\$5,464,880
2A	Welding (general industry)	\$1,066,969	\$1,038,934	\$2,105,903	\$6,490,012	\$6,260,069	\$12,750,082
2B	Welding (maritime industry)	\$8,541	\$5,509	\$14,050	\$14,413	\$11,381	\$25,795
2C	Welding (construction industry)	\$1,471,702	\$200,034	\$1,671,735	\$1,394,947	\$190,756	\$1,585,703
2D	Welding (government)	\$0	\$559,456	\$559,456	\$0	\$517,391	\$517,391
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$9,637,017	\$10,315,143	\$19,952,160
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$78,549	\$278,471	\$357,020
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$2,796,303	\$399,942	\$3,196,246
3A	Painting (general industry - aerospace)	\$136,962	\$137,220	\$274,182	\$183,874	\$193,308	\$377,182
3A1	Painting (general industry - auto repair)	\$333,444	\$10,978	\$344,421	\$230,100	\$0	\$230,100
3A2	Painting (general industry - coil coating)	\$2,916	\$11,835	\$14,751	\$5,403	\$22,212	\$27,615
3B	Painting (maritime industry)	\$307,200	\$188,934	\$496,135	\$827,434	\$403,340	\$1,230,774
3C	Painting (construction industry)	\$1,643,376	\$439,789	\$2,083,165	\$6,434,742	\$1,323,397	\$7,758,139
3D	Painting (government)	\$0	\$244,765	\$244,765	\$0	\$540,302	\$540,302
4	Chromate (chromite ore) production	\$0	\$4,974	\$4,974	\$0	\$2,401	\$2,401
5	Chromate Pigment Producers Chromated Copper Arsenate (CCA) Producers	\$1,115	\$16,552	\$17,667	\$0	\$13,808	\$13,808
6	Chromium Catalyst Producers	\$0	\$3,002	\$3,002	\$0	\$3,002	\$3,002
7	Paint and Coatings Producers	\$0	\$45,282	\$45,282	\$0	\$71,440	\$71,440
8	Printing Ink Producers	\$37,907	\$23,842	\$61,749	\$8,748	\$5,489	\$14,237
9	Plastic Colorant Producers and Users	\$20,411	\$10,635	\$31,046	\$5,746	\$2,144	\$7,890
10	Plating Mixture Producers	\$181,559	\$545,448	\$727,007	\$294,936	\$849,818	\$1,144,755
11	Wood Preserving	\$7,204	\$11,235	\$18,439	\$0	\$0	\$0
12	Chromium Material Producers	\$0	\$4,288	\$4,288	\$0	\$5,489	\$5,489
13	Steel Mills (stainless)	\$13,465	\$108,489	\$121,954	\$4,974	\$30,789	\$35,763
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$79,073	\$663,800	\$742,873
14B	reshaping (Alloy and Stainless)	\$60,119	\$108,747	\$168,866	\$11,492	\$86,363	\$97,855
15	Iron and Steel Foundries	\$709,082	\$2,837,101	\$3,546,183	\$153,857	\$709,254	\$863,111
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$10,978	\$101,285	\$112,263	\$13,122	\$129,415	\$142,537
18	Chromium Sulfate Producers	\$3,087	\$0	\$3,087	\$0	\$0	\$0

Table III.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees
1	Electroplating	\$15,463,873	\$8,121,278	\$23,585,152	\$11,446,721	\$7,403,839	\$18,850,560
2A	Welding (general industry)	\$8,651,013	\$8,347,644	\$16,998,657	\$11,640,685	\$11,247,658	\$22,888,342
2B	Welding (maritime industry)	\$100,562	\$94,856	\$195,418	\$152,335	\$149,643	\$301,978
2C	Welding (construction industry)	\$1,983,933	\$274,563	\$2,258,496	\$2,325,281	\$318,327	\$2,643,607
2D	Welding (government)	\$0	\$729,302	\$729,302	\$0	\$855,973	\$855,973
	Welding (general industry - carbon steel)	\$28,911,051	\$30,945,429	\$59,856,479	\$38,548,068	\$41,260,572	\$79,808,639
2A1	Welding (maritime industry - carbon steel)	\$529,037	\$766,918	\$1,295,955	\$803,344	\$976,894	\$1,780,237
2B1	Welding (construction industry - carbon steel)	\$8,388,910	\$1,199,827	\$9,588,737	\$11,185,213	\$1,599,770	\$12,784,983
2C1	Painting (general industry - aerospace)	\$274,096	\$336,531	\$610,627	\$304,542	\$336,531	\$641,073
3A	Painting (general industry - auto repair)	\$1,537,717	\$136,448	\$1,674,165	\$2,558,545	\$90,050	\$2,648,596
3A1	Painting (general industry - auto repair)	\$0	\$0	\$0	\$4,031	\$16,295	\$20,326
3A2	Painting (general industry - coil coating)	\$1,147,156	\$487,644	\$1,634,800	\$1,689,345	\$712,170	\$2,401,515
3B	Painting (maritime industry)	\$10,932,114	\$2,248,343	\$13,180,457	\$8,278,373	\$1,624,251	\$9,902,624
3C	Painting (construction industry)	\$0	\$1,013,195	\$1,013,195	\$0	\$1,080,690	\$1,080,690
3D	Painting (government)	\$0	\$13,465	\$13,465	\$0	\$26,844	\$26,844
4	Chromate (chromite ore) production	\$0	\$22,384	\$22,384	\$0	\$23,499	\$23,499
5	Chromate Pigment Producers	\$0	\$9,091	\$9,091	\$0	\$34,133	\$34,133
5	Chromated Copper Arsenate (CCA) Producers	\$0	\$98,284	\$98,284	\$0	\$135,933	\$135,933
6	Chromium Catalyst Producers	\$6,748	\$5,489	\$12,237	\$17,495	\$10,978	\$28,473
7	Chromium Catalyst Producers	\$0	\$8,490	\$8,490	\$46,226	\$19,039	\$65,265
8	Paint and Coatings Producers	\$298,538	\$861,568	\$1,160,106	\$308,401	\$1,079,832	\$1,388,234
9	Printing Ink Producers	\$7,204	\$11,235	\$18,439	\$7,204	\$11,235	\$18,439
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$0	\$4,288	\$4,288	\$0	\$15,266	\$15,266
12	Wood Preserving	\$107,374	\$856,851	\$964,225	\$82,418	\$425,209	\$507,627
13	Chromium Material Producers	\$198,282	\$713,799	\$912,082	\$238,162	\$1,088,494	\$1,326,656
14	Steel Mills (stainless)	\$26,586	\$115,693	\$142,280	\$23,842	\$37,821	\$61,663
14A	Steel Mills (carbon)	\$709,082	\$3,218,228	\$3,927,311	\$709,082	\$4,640,767	\$5,349,849
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$13,122	\$129,415	\$142,537	\$13,122	\$129,415	\$142,537
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$9,777	\$0	\$9,777
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0

Table iii.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)				Total
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		
	< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	
19	Chemical Distributors	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$515	\$22,470	\$22,984	\$26,329
22	Printing	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$0	\$0	\$59,347
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$59,948
25	Refractory Brick Producers	\$0	\$0	\$0	\$0
26A	Woodworking (general industry)	\$29,331	\$55,317	\$84,647	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$1,294,495	\$323,409	\$1,617,905	\$0
26D	Woodworking (government)	\$0	\$26,072	\$26,072	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$13,465	\$13,465	\$0
31B	Construction (Refractory Repair)	\$14,923	\$4,888	\$19,811	\$9,691
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
	Total (General Industry)	\$4,190,740	\$3,767,131	\$7,957,871	\$6,265,140
	Total (Maritime Industry)	\$237,904	\$61,759	\$299,663	\$93,491
	Total (Construction Industry)	\$2,302,228	\$477,014	\$2,779,241	\$300,144
	Total (Government)	\$0	\$263,839	\$263,839	\$309,286
	Total Industry	\$6,730,872	\$4,569,742	\$11,300,614	\$8,546,082
					\$5,304,119
					\$13,850,201

Table III.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	
21	Colored Glass Producers	\$0	\$9,434	\$9,434	\$0	\$0	
21A	Fiber, Flat, and Container Glass	\$858	\$50,771	\$51,629	\$3,430	\$58,661	
22	Printing	\$0	\$0	\$0	\$0	\$0	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$59,347	\$59,347	\$0	\$85,676	
24A	Chromium Catalyst Users (Service)	\$16,552	\$119,981	\$136,534	\$16,552	\$119,981	
25	Refractory Brick Producers	\$0	\$0	\$0	\$0	\$16,295	
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	
26C	Woodworking (construction industry)	\$2,588,991	\$646,819	\$3,235,810	\$0	\$0	
26D	Woodworking (government)	\$0	\$52,143	\$52,143	\$0	\$0	
27	Solid Waste Incineration	\$0	\$0	\$0	\$74,699	\$415,004	
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$37,392	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$12,607	
31B	Construction (Refractory Repair)	\$179,415	\$66,318	\$237,733	\$224,268	\$72,898	
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$8,012,282	\$7,887,521	\$15,899,803	\$20,708,700	\$22,041,384	
Total (Maritime Industry)		\$315,742	\$194,443	\$510,185	\$920,397	\$693,192	
Total (Construction Industry)		\$5,883,483	\$1,344,960	\$7,228,443	\$10,850,260	\$1,986,994	
Total (Government)		\$0	\$856,365	\$856,365	\$0	\$1,095,086	
Total Industry		\$14,211,506	\$10,283,289	\$24,494,795	\$32,479,357	\$25,816,656	
						\$58,296,013	

Table III.33 Summary of Total Annualized Periodic Exposure Monitoring Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$231,815	\$164,835	\$396,650	\$675,807	\$1,192,353
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$9,434
21A	Fiber, Flat, and Container Glass	\$3,430	\$71,955	\$75,385	\$3,774	\$68,610
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$335,159	\$335,159	\$0	\$549,307
24A	Chromium Catalyst Users (Service)	\$16,552	\$119,981	\$136,534	\$16,552	\$136,534
25	Refractory Brick Producers	\$0	\$3,602	\$3,602	\$0	\$78,044
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$3,883,486	\$970,228	\$4,853,715	\$0	\$0
26D	Woodworking (government)	\$0	\$78,215	\$78,215	\$0	\$0
27	Solid Waste Incineration	\$106,174	\$676,321	\$782,495	\$0	\$0
27A	Incinerators (government)	\$0	\$53,087	\$53,087	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$181,730	\$181,730	\$0	\$285,674
31B	Construction (Refractory Repair)	\$224,268	\$72,898	\$297,166	\$224,268	\$297,166
31C	Construction (Hazardous Waste Work)	\$17,410	\$5,317	\$22,727	\$580,010	\$756,337
31CG	Haz. Waste (government)	\$0	\$24,442	\$24,442	\$0	\$816,714
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$56,564,659	\$55,509,192	\$112,073,851	\$66,654,452	\$136,311,685
Total (Maritime Industry)		\$1,776,755	\$1,349,418	\$3,126,173	\$2,645,023	\$4,483,730
Total (Construction Industry)		\$25,430,121	\$4,771,177	\$30,201,298	\$22,593,145	\$26,384,718
Total (Government)		\$0	\$1,898,241	\$1,898,241	\$0	\$2,753,377
Total Industry		\$83,771,535	\$63,528,028	\$147,299,563	\$91,892,620	\$169,933,510



Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					Total
	< 20 employees	≥ 20 employees	Total	< 20 employees	≥ 20 employees	
1 Electroplating	\$182,686	\$990,559	\$1,173,245	\$381,619	\$2,068,684	\$2,450,303
2A Welding (general industry)	\$30,051	\$194,366	\$224,417	\$1,181,618	\$7,641,903	\$8,823,521
2B Welding (maritime industry)	\$0	\$67,792	\$67,792	\$208,453	\$11,189,206	\$11,397,659
2C Welding (construction industry)	\$612,419	\$779,989	\$1,392,408	\$1,390,851	\$1,771,536	\$3,162,387
2D Welding (government)	\$0	\$23,418	\$23,418	\$0	\$26,783	\$26,783
2A1 Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1 Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1 Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A Painting (general industry - aerospace)	\$11,516	\$3,424,214	\$3,435,730	\$9,420	\$5,063,151	\$5,072,571
3A1 Painting (general industry - auto repair)	\$523,836	\$1,122,607	\$1,646,443	\$291,020	\$1,245,664	\$1,536,684
3A2 Painting (general industry - coil coating)	\$0	\$0	\$0	\$0	\$0	\$0
3B Painting (maritime industry)	\$334,947	\$1,087,397	\$1,422,344	\$465,489	\$1,511,031	\$1,976,520
3C Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4 Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0
5 Chromate Pigment Producers	\$0	\$44,337	\$44,337	\$363	\$44,337	\$44,700
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7 Chromium Catalyst Producers	\$0	\$0	\$0	\$0	\$2,675	\$2,675
8 Paint and Coatings Producers	\$0	\$20,292	\$20,292	\$0	\$11,601	\$11,601
9 Printing Ink Producers	\$0	\$32,725	\$32,725	\$0	\$0	\$0
10 Plastic Colorant Producers and Users	\$15,624	\$0	\$101,951	\$20,193	\$118,696	\$138,889
11 Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0	\$0
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$0	\$0	\$0	\$2,997	\$2,997
14 Steel Mills (stainless)	\$6,380	\$285,607	\$291,987	\$6,380	\$31,690	\$38,070
14A Steel Mills (carbon)	\$18,663	\$380,876	\$399,539	\$18,663	\$856,921	\$875,584
14B reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15 Iron and Steel Foundries	\$96,383	\$202,538	\$298,921	\$96,383	\$303,806	\$400,189
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$1,870	\$32,238	\$34,108	\$2,111	\$36,497	\$38,608
18 Chromium Sulfate Producers	\$0	\$0	\$0	\$0	\$0	\$0

Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent.

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		<20 employees	≥20 employees	<20 employees	≥20 employees		
1	Electroplating	\$596,349	\$3,232,697	\$2,197,481	\$12,754,935	\$14,952,416	
2A	Welding (general industry)	\$2,609,857	\$16,790,214	\$3,952,401	\$25,342,097	\$29,294,498	
2B	Welding (maritime industry)	\$252,753	\$13,617,925	\$292,704	\$15,860,266	\$16,152,970	
2C	Welding (construction industry)	\$4,330,540	\$5,516,000	\$9,702,955	\$12,358,997	\$22,061,952	
2D	Welding (government)	\$0	\$152,393	\$0	\$157,248	\$157,248	
2A1	Welding (general industry - carbon steel)	\$644,888	\$4,065,427	\$3,778,817	\$24,374,792	\$28,153,609	
2B1	Welding (maritime industry - carbon steel)	\$1,775	\$93,704	\$21,593	\$1,119,087	\$1,140,680	
2C1	Welding (construction industry - carbon steel)	\$920,295	\$1,124,515	\$5,422,372	\$6,625,342	\$12,047,714	
3A	Painting (general industry - aerospace)	\$9,420	\$6,266,611	\$12,485	\$9,782,626	\$9,795,111	
3A1	Painting (general industry - auto repair)	\$135,910	\$630,180	\$3,474	\$271,688	\$275,162	
3A2	Painting (general industry - coil coating)	\$7,202	\$102,565	\$10,675	\$153,798	\$164,473	
3B	Painting (maritime industry)	\$689,939	\$2,238,085	\$1,667,921	\$5,316,970	\$6,984,891	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$8,118	\$0	\$13,916	\$13,916	
5	Chromate Pigment Producers	\$363	\$46,621	\$0	\$39,769	\$39,769	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$2,675	\$0	\$2,675	\$2,675	
7	Chromium Catalyst Producers	\$0	\$34,793	\$0	\$587,039	\$587,039	
8	Paint and Coatings Producers	\$0	\$32,725	\$0	\$32,725	\$32,725	
9	Printing Ink Producers	\$9,219	\$9,692	\$89,466	\$108,761	\$198,227	
10	Plastic Colorant Producers and Users	\$15,705	\$251,754	\$18,762	\$308,289	\$327,051	
11	Plating Mixture Producers	\$1,338	\$5,030	\$0	\$0	\$0	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$4,791	\$0	\$10,182	\$10,182	
14	Steel Mills (stainless)	\$12,659	\$1,332,967	\$12,659	\$793,442	\$806,101	
14A	Steel Mills (carbon)	\$37,327	\$95,169	\$37,327	\$4,284,607	\$4,321,934	
14B	reshaping (Alloy and Stainless)	\$18,288	\$68,314	\$18,288	\$34,157	\$52,445	
15	Iron and Steel Foundries	\$240,859	\$2,126,944	\$240,859	\$2,025,675	\$2,266,534	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$3,150	\$53,769	\$3,551	\$59,290	\$62,841	
18	Chromium Sulfate Producers	\$1,914	\$0	\$0	\$0	\$0	

Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$4,968,221	\$28,858,260	\$33,826,481	\$8,092,245	\$46,879,009	\$54,911,254
2A	Welding (general industry)	\$6,725,272	\$43,227,835	\$49,953,107	\$7,377,103	\$47,433,108	\$54,810,211
2B	Welding (maritime industry)	\$505,507	\$27,343,138	\$27,848,645	\$660,759	\$35,809,858	\$36,470,617
2C	Welding (construction industry)	\$15,289,058	\$19,474,168	\$34,763,226	\$22,414,483	\$28,550,123	\$50,964,606
2D	Welding (government)	\$0	\$235,988	\$235,988	\$0	\$246,099	\$246,099
2A1	Welding (general industry - carbon steel)	\$8,966,956	\$58,154,534	\$67,121,490	\$19,528,320	\$127,116,309	\$146,644,629
2B1	Welding (maritime industry - carbon steel)	\$26,078	\$1,350,616	\$1,376,694	\$48,716	\$2,524,853	\$2,573,569
2C1	Welding (construction industry - carbon steel)	\$12,937,013	\$15,807,032	\$28,744,045	\$29,221,453	\$35,704,010	\$64,925,463
3A	Painting (general industry - aerospace)	\$3,474	\$13,743,713	\$13,747,187	\$227,688	\$19,582,565	\$19,810,253
3A1	Painting (general industry - auto repair)	\$1,296,492	\$3,964,493	\$5,260,985	\$1,192,327	\$2,364,354	\$3,556,681
3A2	Painting (general industry - coil coating)	\$10,675	\$51,233	\$61,908	\$10,675	\$102,565	\$113,240
3B	Painting (maritime industry)	\$2,036,343	\$6,442,282	\$8,478,625	\$2,649,161	\$8,446,408	\$11,095,569
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$34,790	\$34,790	\$0	\$404,144	\$404,144
5	Chromate Pigment Producers	\$0	\$123,469	\$123,469	\$0	\$184,046	\$184,046
5	Chromated Copper Arsenate (CCA) Producers	\$0	\$6,692	\$6,692	\$0	\$116,843	\$116,843
7	Chromium Catalyst Producers	\$0	\$595,730	\$595,730	\$0	\$914,443	\$914,443
8	Paint and Coatings Producers	\$0	\$32,725	\$32,725	\$0	\$327,245	\$327,245
9	Printing Ink Producers	\$110,993	\$135,409	\$246,402	\$114,489	\$139,625	\$254,114
10	Plastic Colorant Producers and Users	\$19,346	\$316,110	\$335,456	\$21,251	\$345,663	\$366,914
11	Plating Mixture Producers	\$2,675	\$20,111	\$22,786	\$1,338	\$3,357	\$4,695
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$8,388	\$8,388	\$0	\$52,090	\$52,090
14	Steel Mills (stainless)	\$76,945	\$9,338,488	\$9,415,433	\$76,945	\$9,028,713	\$9,105,658
14A	Steel Mills (carbon)	\$226,416	\$23,209,483	\$23,435,899	\$226,416	\$29,371,195	\$29,597,611
14B	reshaping (Alloy and Stainless)	\$18,288	\$119,449	\$137,737	\$18,288	\$17,078	\$35,366
15	Iron and Steel Foundries	\$192,667	\$1,417,963	\$1,610,630	\$240,859	\$20,588,613	\$20,829,472
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$3,560	\$58,920	\$62,480	\$3,564	\$58,692	\$62,256
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$3,829	\$0	\$3,829

Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	Total
	< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19 Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20 Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21 Colored Glass Producers	\$0	\$0	\$0	\$0	\$0	\$0
21A Fiber, Flat, and Container Glass	\$15,792	\$566,551	\$582,343	\$15,792	\$566,551	\$582,343
22 Printing	\$0	\$0	\$0	\$0	\$0	\$0
23 Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$565	\$565	\$0	\$565	\$565
24A Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	\$0
25 Refractory Brick Producers	\$0	\$0	\$0	\$0	\$0	\$0
26A Woodworking (general industry)	\$4,882	\$12,565	\$17,447	\$0	\$0	\$0
26B Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27 Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$15,459	\$15,459	\$0	\$0	\$0
31B Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)	\$907,683	\$7,411,826	\$8,319,509	\$2,023,562	\$17,995,738	\$20,019,300
Total (Maritime Industry)	\$334,947	\$1,155,189	\$1,490,136	\$673,942	\$12,700,237	\$13,374,179
Total (Construction Industry)	\$612,419	\$779,989	\$1,392,408	\$1,390,851	\$1,771,536	\$3,162,387
Total (Government)	\$0	\$23,418	\$23,418	\$0	\$26,783	\$26,783
Total Industry	\$1,855,049	\$9,370,422	\$11,225,471	\$4,088,355	\$32,494,294	\$36,582,649

Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>	
		< 20 employees	> 20 employees	Total	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$0	\$3,221	\$3,221	\$0
21A	Fiber, Flat, and Container Glass	\$17,577	\$744,290	\$761,867	\$1,879,399
22	Printing	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$565	\$565	\$565
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$0	\$0	\$5,514
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$224,303
27A	Incinerators (government)	\$0	\$0	\$0	\$10,976
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$30,918	\$30,918	\$23,194
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)		\$4,362,025	\$35,940,050	\$40,302,075	\$10,429,681
Total (Maritime Industry)		\$944,467	\$15,949,714	\$16,894,181	\$1,982,218
Total (Construction Industry)		\$5,250,835	\$6,640,515	\$11,891,350	\$15,125,327
Total (Government)		\$0	\$152,393	\$152,393	\$0
Total Industry		\$10,557,327	\$58,682,672	\$69,239,999	\$27,537,226
					\$124,562,324
					\$152,099,550

Table III.34 Summary of Total Annualized Respirator Protection Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$171,418	\$1,816,190	\$1,987,608	\$373,038	\$4,427,585
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$3,221
21A	Fiber, Flat, and Container Glass	\$31,484	\$1,909,022	\$1,940,506	\$37,038	\$3,130,885
22	Printing	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$6,271	\$6,271	\$0	\$6,271
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$1,838	\$1,838	\$0	\$16,541
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$21,952	\$195,031	\$216,983	\$0	\$0
27A	Incinerators (government)	\$0	\$10,976	\$10,976	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$292,880	\$292,880	\$0	\$501,583
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$105,817	\$239,764
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$137,210
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$22,846,834	\$187,639,027	\$210,485,861	\$37,485,413	\$350,191,080
Total (Maritime Industry)		\$2,567,928	\$35,136,036	\$37,703,964	\$3,358,636	\$50,139,755
Total (Construction Industry)		\$28,226,071	\$35,281,200	\$63,507,271	\$51,741,753	\$116,129,833
Total (Government)		\$0	\$246,964	\$246,964	\$0	\$383,309
Total Industry		\$53,640,833	\$258,303,227	\$311,944,060	\$92,585,802	\$516,843,977

Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)					
	20 ug/m <sup>3</sup>			10 ug/m <sup>3</sup>		
	< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
1 Electroplating	\$0	\$0	\$0	\$0	\$0	\$0
2A Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1 Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1 Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1 Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A Painting (general industry - aerospace)	\$191,389	\$11,727,984	\$11,919,372	\$191,389	\$11,520,194	\$11,711,583
3A1 Painting (general industry - auto repair)	\$22,305,229	\$38,155,040	\$60,460,269	\$22,305,229	\$37,479,031	\$59,784,259
3A2 Painting (general industry - coil coating)	\$168,872	\$2,675,718	\$2,844,590	\$168,872	\$2,628,311	\$2,797,183
3B Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$2,534,545	\$5,661,140
3C Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4 Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0
5 Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	\$0
6 Chromated Copper Arsenate (CCA) Producers	\$0	\$12,587	\$12,587	\$0	\$12,587	\$12,587
7 Chromium Catalyst Producers	\$0	\$110,290	\$110,290	\$0	\$110,290	\$110,290
8 Paint and Coatings Producers	\$2,204,621	\$1,572,817	\$3,777,438	\$2,204,621	\$1,572,817	\$3,777,438
9 Printing Ink Producers	\$3,781	\$3,789	\$7,570	\$3,781	\$3,789	\$7,570
10 Plastic Colorant Producers and Users	\$4,639	\$26,392	\$31,030	\$4,639	\$26,392	\$31,030
11 Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0	\$0
12 Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13 Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14 Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14A Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14B reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15 Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0
16 Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17 Chromium Dye Producers	\$0	\$21,250	\$21,250	\$0	\$21,250	\$21,250
18 Chromium Sulfate Producers	\$36,226	\$0	\$36,226	\$36,226	\$0	\$36,226

Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total			
		< 20 employees	> 20 employees	5 ug/m <sup>3</sup>				
					< 20 employees	> 20 employees	1 ug/m <sup>3</sup>	Total
1	Electroplating	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$191,389	\$11,520,194	\$11,711,583	\$11,711,583	\$191,389	\$11,520,194	\$11,711,583
3A1	Painting (general industry - auto repair)	\$22,305,229	\$37,479,031	\$59,784,259	\$59,784,259	\$22,305,229	\$37,479,031	\$59,784,259
3A2	Painting (general industry - coil coating)	\$168,872	\$2,628,311	\$2,797,183	\$2,797,183	\$168,872	\$2,628,311	\$2,797,183
3B	Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$5,661,140	\$3,126,595	\$2,534,545	\$5,661,140
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$12,587	\$12,587	\$12,587	\$0	\$12,587	\$12,587
8	Paint and Coatings Producers	\$0	\$110,290	\$110,290	\$110,290	\$0	\$110,290	\$110,290
9	Printing Ink Producers	\$3,781	\$1,572,817	\$3,777,438	\$3,777,438	\$2,204,621	\$1,572,817	\$3,777,438
10	Plastic Colorant Producers and Users	\$4,639	\$26,392	\$31,030	\$31,030	\$4,639	\$26,392	\$31,030
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$21,250	\$21,250	\$21,250	\$0	\$21,250	\$21,250
18	Chromium Sulfate Producers	\$36,226	\$0	\$36,226	\$36,226	\$36,226	\$0	\$36,226



Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	
1	Electroplating	\$0	\$0	\$0	\$0	\$0
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$191,389	\$11,520,194	\$11,711,583	\$11,520,194	\$11,711,583
3A1	Painting (general industry - auto repair)	\$22,305,229	\$37,479,031	\$59,784,259	\$22,305,229	\$59,784,259
3A2	Painting (general industry - coil coating)	\$168,872	\$2,628,311	\$2,797,183	\$168,872	\$2,797,183
3B	Painting (maritime industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$5,154,231
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$0	\$0	\$0	\$0
5	Chromate Pigment Producers	\$0	\$12,587	\$12,587	\$12,587	\$12,587
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$110,290	\$110,290	\$102,550	\$102,550
7	Chromium Catalyst Producers	\$2,204,621	\$1,572,817	\$3,777,438	\$2,204,621	\$3,777,438
8	Paint and Coatings Producers	\$2,836	\$3,599	\$6,435	\$2,836	\$6,435
9	Printing Ink Producers	\$4,639	\$26,392	\$31,030	\$4,639	\$26,661
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$0	\$0	\$0	\$0	\$0
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$21,250	\$21,250	\$0	\$21,250
18	Chromium Sulfate Producers	\$18,113	\$0	\$18,113	\$18,113	\$18,113

Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$127,387	\$1,108,991	\$1,236,379	\$127,387	\$1,108,991	
21	Colored Glass Producers	\$0	\$2,555	\$2,555	\$0	\$2,555	
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	
22	Printing	\$114,711	\$258,997	\$373,708	\$114,711	\$258,997	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$143,158	\$143,158	\$0	\$143,158	
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0	
25	Refractory Brick Producers	\$0	\$29,900	\$29,900	\$0	\$29,900	
26A	Woodworking (general industry)	\$70,224	\$74,950	\$145,174	\$0	\$0	
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	
26C	Woodworking (construction industry)	\$4,251,244	\$1,790,392	\$6,041,635	\$4,251,244	\$1,193,594	
26D	Woodworking (government)	\$0	\$48,096	\$48,096	\$0	\$48,096	
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	
31B	Construction (Refractory Repair)	\$129,319	\$330,840	\$460,158	\$129,319	\$330,840	
31C	Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$90,563	\$0	
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$25,227,080	\$55,924,416	\$81,151,496	\$25,156,856	\$54,918,260	
Total (Maritime Industry)		\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$2,534,545	
Total (Construction Industry)		\$4,471,125	\$2,121,231	\$6,592,356	\$4,471,125	\$1,524,434	
Total (Government)		\$0	\$48,096	\$48,096	\$0	\$48,096	
Total Industry		\$32,824,799	\$60,628,290	\$93,453,088	\$32,754,575	\$59,025,336	
Total						\$91,779,911	

Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		<20 employees	≥ 20 employees	5 ug/m <sup>3</sup> ≥ 20 employees	1 ug/m <sup>3</sup> ≥ 20 employees	
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$127,387	\$1,108,991	\$1,236,379	\$127,387	\$1,236,379
21	Colored Glass Producers	\$0	\$2,555	\$2,555	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$114,711	\$258,997	\$373,708	\$114,711	\$373,708
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$143,158	\$143,158	\$0	\$143,158
24A	Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25	Refractory Brick Producers	\$0	\$29,900	\$29,900	\$0	\$29,900
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$4,251,244	\$1,193,594	\$5,444,838	\$4,251,244	\$4,848,041
26D	Woodworking (government)	\$0	\$48,096	\$48,096	\$0	\$48,096
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$129,319	\$330,840	\$460,158	\$129,319	\$460,158
31C	Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$90,563	\$90,563
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$25,156,856	\$54,918,260	\$80,075,116	\$25,137,798	\$80,053,313
Total (Maritime Industry)		\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$5,661,140
Total (Construction Industry)		\$4,471,125	\$1,524,434	\$5,995,559	\$4,471,125	\$5,398,761
Total (Government)		\$0	\$48,096	\$48,096	\$0	\$48,096
Total Industry		\$32,754,575	\$59,025,336	\$91,779,911	\$32,735,517	\$91,161,311

Table III.35 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Not Supply PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)				Total
	< 20 employees	> 20 employees	< 20 employees	> 20 employees	
	0.5 ug/m <sup>3</sup>	0.25 ug/m <sup>3</sup>	0.5 ug/m <sup>3</sup>	0.25 ug/m <sup>3</sup>	Total
19 Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20 Textile Dyeing	\$127,387	\$1,108,991	\$1,236,379	\$127,387	\$1,236,379
21 Colored Glass Producers	\$0	\$0	\$0	\$0	\$0
21A Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22 Printing	\$114,711	\$258,997	\$373,708	\$114,711	\$373,708
23 Leather Tanning	\$0	\$0	\$0	\$0	\$0
24 Chromium Catalyst Users	\$0	\$143,158	\$143,158	\$0	\$0
24A Chromium Catalyst Users (Service)	\$0	\$0	\$0	\$0	\$0
25 Refractory Brick Producers	\$0	\$24,463	\$24,463	\$0	\$24,463
26A Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C Woodworking (construction industry)	\$4,251,244	\$596,797	\$4,848,041	\$0	\$0
26D Woodworking (government)	\$0	\$48,096	\$48,096	\$0	\$0
27 Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0
27A Incinerators (government)	\$0	\$0	\$0	\$0	\$0
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29 Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30 Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B Construction (Refractory Repair)	\$129,319	\$330,840	\$460,158	\$129,319	\$460,158
31C Construction (Hazardous Waste Work)	\$90,563	\$0	\$90,563	\$90,563	\$90,563
31CG Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0
31D Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)	\$25,137,798	\$54,910,079	\$80,047,877	\$25,137,798	\$79,892,611
Total (Maritime Industry)	\$3,126,595	\$2,534,545	\$5,661,140	\$3,126,595	\$5,154,231
Total (Construction Industry)	\$4,471,125	\$927,637	\$5,398,761	\$219,881	\$550,721
Total (Government)	\$0	\$48,096	\$48,096	\$0	\$0
Total Industry	\$32,735,517	\$58,420,358	\$91,155,875	\$28,484,273	\$85,597,562

Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$218,357	\$1,001,268	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$11	\$1,617	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$277,783	\$1,117,286	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$9	\$348	\$358
3B	Painting (maritime industry)	\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$495,757	\$435,178	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$0	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$0	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$1	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$0	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$0	\$40	\$40
8	Paint and Coatings Producers	\$73	\$140	\$213	\$73	\$140	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$0	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$9	\$130	\$139
11	Plating Mixture Producers	\$2	\$17	\$20	\$2	\$17	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$0	\$2	\$2
18	Chromium Sulfate Producers	\$1	\$0	\$1	\$1	\$0	\$1

Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$218,357	\$1,001,268	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$11	\$1,617	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$277,783	\$1,117,286	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$9	\$348	\$358
3B	Painting (maritime industry)	\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$495,757	\$435,178	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$0	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$0	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$1	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$0	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$0	\$40	\$40
8	Paint and Coatings Producers	\$73	\$140	\$213	\$73	\$140	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$0	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$9	\$130	\$139
11	Plating Mixture Producers	\$2	\$17	\$20	\$2	\$17	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$0	\$2	\$2
18	Chromium Sulfate Producers	\$1	\$0	\$1	\$0	\$0	\$1

Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$218,357	\$1,001,268	\$1,219,625	\$1,219,625
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$11	\$1,617	\$1,628	\$1,628
3A1	Painting (general industry - auto repair)	\$277,783	\$1,117,286	\$1,395,069	\$1,395,069
3A2	Painting (general industry - coil coating)	\$9	\$348	\$358	\$358
3B	Painting (maritime industry)	\$381,959	\$638,667	\$1,220,626	\$1,052,893
3C	Painting (construction industry)	\$495,757	\$435,178	\$930,935	\$930,935
3D	Painting (government)	\$0	\$256,945	\$256,945	\$256,945
4	Chromate (chromite ore) production	\$0	\$30	\$30	\$30
5	Chromate Pigment Producers	\$1	\$10	\$10	\$10
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$3	\$3	\$3
7	Chromium Catalyst Producers	\$0	\$40	\$40	\$37
8	Paint and Coatings Producers	\$73	\$140	\$213	\$213
9	Printing Ink Producers	\$0	\$1	\$1	\$1
10	Plastic Colorant Producers and Users	\$9	\$130	\$139	\$118
11	Plating Mixture Producers	\$2	\$17	\$20	\$20
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$2	\$2	\$2
18	Chromium Sulfate Producers	\$0	\$0	\$0	\$0

Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No. Sector	Proposed Permissible Exposure Limit (PEL)						Total
	20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	Total	
	< 20 employees	> 20 employees	< 20 employees	> 20 employees			
19 Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0	
20 Textile Dyeing	\$1,903	\$42,703	\$44,605	\$1,903	\$42,703	\$44,605	
21 Colored Glass Producers	\$0	\$4	\$4	\$0	\$4	\$4	
21A Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0	
22 Printing	\$555	\$3,302	\$3,857	\$555	\$3,302	\$3,857	
23 Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0	
24 Chromium Catalyst Users	\$0	\$45	\$45	\$0	\$45	\$45	
24A Chromium Catalyst Users (Service)	\$760	\$7,976	\$8,735	\$760	\$7,976	\$8,735	
25 Refractory Brick Producers	\$0	\$42	\$42	\$0	\$42	\$42	
26A Woodworking (general industry)	\$317	\$904	\$1,221	\$0	\$0	\$0	
26B Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0	
26C Woodworking (construction industry)	\$130,808	\$148,770	\$279,578	\$130,808	\$99,180	\$229,988	
26D Woodworking (government)	\$0	\$3,997	\$3,997	\$0	\$3,997	\$3,997	
27 Solid Waste Incineration	\$10,083	\$56,017	\$66,100	\$10,083	\$56,017	\$66,100	
27A Incinerators (government)	\$0	\$5,042	\$5,042	\$0	\$5,042	\$5,042	
28 Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0	
29 Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0	
30 Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0	
31B Construction (Refractory Repair)	\$3,643	\$25,178	\$28,821	\$3,643	\$25,178	\$28,821	
31C Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$54,552	\$21,742	\$32,810	\$54,552	
31CG Haz. Waste (government)	\$0	\$32,523	\$32,523	\$0	\$32,523	\$32,523	
31D Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0	
31DG Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0	
32A Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0	
32 Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)	\$509,864	\$2,231,886	\$2,741,750	\$509,547	\$2,230,982	\$2,740,529	
Total (Maritime Industry)	\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626	
Total (Construction Industry)	\$651,951	\$641,936	\$1,293,887	\$651,951	\$592,346	\$1,244,297	
Total (Government)	\$0	\$298,506	\$298,506	\$0	\$298,506	\$298,506	
Total Industry	\$1,543,774	\$4,010,994	\$5,554,768	\$1,543,457	\$3,960,500	\$5,503,957	



Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total				
		< 20 employees	> 20 employees	5 ug/m <sup>3</sup>					
					1 ug/m <sup>3</sup>				
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$1,903	\$42,703	\$44,605	\$1,903	\$42,703	\$44,605	\$0	\$44,605
21	Colored Glass Producers	\$0	\$4	\$4	\$0	\$0	\$4	\$0	\$4
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$555	\$3,302	\$3,857	\$555	\$3,302	\$3,857	\$0	\$3,857
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$45	\$45	\$0	\$45	\$45	\$0	\$45
24A	Chromium Catalyst Users (Service)	\$760	\$7,976	\$8,735	\$760	\$7,976	\$8,735	\$0	\$8,735
25	Refractory Brick Producers	\$0	\$42	\$42	\$0	\$42	\$42	\$0	\$42
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$130,808	\$99,180	\$229,988	\$130,808	\$99,180	\$229,988	\$49,590	\$180,398
26D	Woodworking (government)	\$0	\$3,997	\$3,997	\$0	\$3,997	\$3,997	\$0	\$3,997
27	Solid Waste Incineration	\$10,083	\$56,017	\$66,100	\$10,083	\$56,017	\$66,100	\$0	\$66,100
27A	Incinerators (government)	\$0	\$5,042	\$5,042	\$0	\$5,042	\$5,042	\$0	\$5,042
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$3,643	\$25,178	\$28,821	\$3,643	\$25,178	\$28,821	\$0	\$28,821
31C	Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$54,552	\$21,742	\$32,810	\$54,552	\$0	\$54,552
31CG	Haz. Waste (government)	\$0	\$32,523	\$32,523	\$0	\$32,523	\$32,523	\$0	\$32,523
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$509,547	\$2,230,982	\$2,740,529	\$509,546	\$2,230,978	\$2,740,524	\$2,230,978	\$2,740,524
	Total (Maritime Industry)	\$381,959	\$838,667	\$1,220,626	\$381,959	\$838,667	\$1,220,626	\$838,667	\$1,220,626
	Total (Construction Industry)	\$651,951	\$592,346	\$1,244,297	\$651,951	\$542,756	\$1,194,707	\$542,756	\$1,194,707
	Total (Government)	\$0	\$298,506	\$298,506	\$0	\$298,506	\$298,506	\$298,506	\$298,506
	Total Industry	\$1,543,457	\$3,960,500	\$5,503,957	\$1,543,457	\$3,910,906	\$5,454,363	\$3,910,906	\$5,454,363

Table III.36 Summary of Total Annualized Personal Protective Equipment Cost for Companies that Do Supply (but do not pay for) PPE in the Baseline for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$1,903	\$42,703	\$1,903	\$42,703	\$44,605
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$555	\$3,302	\$555	\$3,302	\$3,857
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$45	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$760	\$7,976	\$760	\$7,976	\$8,735
25	Refractory Brick Producers	\$0	\$34	\$0	\$34	\$34
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$130,808	\$49,590	\$0	\$0	\$180,398
26D	Woodworking (government)	\$0	\$3,997	\$0	\$0	\$3,997
27	Solid Waste Incineration	\$10,083	\$36,411	\$6,722	\$25,208	\$31,930
27A	Incinerators (government)	\$0	\$5,042	\$0	\$3,361	\$3,361
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$3,643	\$25,178	\$3,643	\$25,178	\$28,821
31C	Construction (Hazardous Waste Work)	\$21,742	\$32,810	\$21,742	\$32,810	\$54,552
31CG	Haz. Waste (government)	\$0	\$32,523	\$0	\$32,523	\$32,523
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
	Total (General Industry)	\$509,546	\$2,211,364	\$506,185	\$2,200,091	\$2,706,277
	Total (Maritime Industry)	\$381,959	\$838,667	\$381,959	\$670,933	\$1,052,893
	Total (Construction Industry)	\$651,951	\$542,756	\$521,143	\$493,166	\$1,014,309
	Total (Government)	\$0	\$298,506	\$0	\$292,829	\$292,829
	Total Industry	\$1,543,457	\$3,891,293	\$1,409,287	\$3,657,019	\$5,066,306

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total
1	Electroplating	\$3,260,100	\$886,300	\$3,260,100	\$886,300	\$4,146,400
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$60,500	\$194,100	\$60,500	\$194,100	\$254,600
3A1	Painting (general industry - auto repair)	\$1,411,000	\$959,700	\$1,411,000	\$959,700	\$2,370,700
3A2	Painting (general industry - coil coating)	\$17,800	\$92,800	\$17,800	\$92,800	\$110,600
3B	Painting (maritime industry)	\$291,600	\$92,100	\$291,600	\$92,100	\$383,700
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,000	\$0	\$4,000	\$4,000
5	Chromate Pigment Producers	\$700	\$2,100	\$700	\$2,100	\$2,800
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$0	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$11,900	\$0	\$11,900	\$11,900
8	Paint and Coatings Producers	\$77,700	\$53,900	\$77,700	\$53,900	\$131,600
9	Printing Ink Producers	\$3,600	\$2,600	\$3,600	\$2,600	\$6,200
10	Plastic Colorant Producers and Users	\$19,200	\$9,700	\$19,200	\$9,700	\$28,900
11	Plating Mixture Producers	\$2,300	\$6,200	\$2,300	\$6,200	\$8,500
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$600	\$4,300	\$600	\$4,300	\$4,900
18	Chromium Sulfate Producers	\$3,100	\$0	\$3,100	\$0	\$3,100

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
1	Electroplating	\$3,260,100	\$886,300	\$3,260,100	\$886,300	\$4,146,400
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$60,500	\$194,100	\$60,500	\$194,100	\$254,600
3A1	Painting (general industry - auto repair)	\$1,411,000	\$959,700	\$1,411,000	\$959,700	\$2,370,700
3A2	Painting (general industry - coil coating)	\$17,800	\$92,800	\$17,800	\$92,800	\$110,600
3B	Painting (maritime industry)	\$291,600	\$92,100	\$291,600	\$92,100	\$383,700
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,000	\$0	\$4,000	\$4,000
5	Chromate Pigment Producers	\$700	\$2,100	\$700	\$2,100	\$2,800
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$0	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$11,900	\$0	\$11,900	\$11,900
8	Paint and Coatings Producers	\$77,700	\$53,900	\$77,700	\$53,900	\$131,600
9	Printing Ink Producers	\$3,600	\$2,600	\$2,900	\$2,500	\$5,400
10	Plastic Colorant Producers and Users	\$19,200	\$9,700	\$19,200	\$9,700	\$28,900
11	Plating Mixture Producers	\$2,300	\$6,200	\$2,300	\$6,200	\$8,500
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$600	\$4,300	\$600	\$4,300	\$4,900
18	Chromium Sulfate Producers	\$3,100	\$0	\$2,700	\$0	\$2,700

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	0.25 ug/m <sup>3</sup> > 20 employees	
1	Electroplating	\$3,260,100	\$886,300	\$4,146,400	\$4,146,400
2A	Welding (general industry)	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$60,500	\$194,100	\$254,600	\$254,600
3A1	Painting (general industry - auto repair)	\$1,411,000	\$959,700	\$2,370,700	\$2,370,700
3A2	Painting (general industry - coil coating)	\$17,800	\$92,800	\$110,600	\$110,600
3B	Painting (maritime industry)	\$291,600	\$92,100	\$383,700	\$378,100
3C	Painting (construction industry)	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$4,000	\$4,000	\$4,000
5	Chromate Pigment Producers	\$700	\$2,100	\$2,800	\$2,800
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,200	\$1,200	\$1,200
7	Chromium Catalyst Producers	\$0	\$11,900	\$11,900	\$11,600
8	Paint and Coatings Producers	\$77,700	\$53,900	\$131,600	\$131,600
9	Printing Ink Producers	\$2,900	\$2,500	\$5,400	\$5,400
10	Plastic Colorant Producers and Users	\$19,200	\$9,700	\$28,900	\$25,200
11	Plating Mixture Producers	\$2,300	\$6,200	\$8,500	\$8,500
12	Wood Preserving	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0
14	Steel Mills (stainless)	\$0	\$0	\$0	\$0
14A	Steel Mills (carbon)	\$0	\$0	\$0	\$0
14B	reshaping (Alloy and Stainless)	\$0	\$0	\$0	\$0
15	Iron and Steel Foundries	\$0	\$0	\$0	\$0
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$600	\$4,300	\$4,900	\$4,900
18	Chromium Sulfate Producers	\$2,700	\$0	\$2,700	\$2,700

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$153,800	\$1,019,900	\$1,173,700	\$153,800	\$1,019,900	
21	Colored Glass Producers	\$0	\$1,200	\$1,200	\$0	\$1,200	
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	
22	Printing	\$67,400	\$79,800	\$147,200	\$67,400	\$79,800	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$37,700	\$37,700	\$0	\$37,700	
24A	Chromium Catalyst Users (Service)	\$7,700	\$23,500	\$31,200	\$7,700	\$23,500	
25	Refractory Brick Producers	\$0	\$4,800	\$4,800	\$0	\$4,800	
26A	Woodworking (general industry)	\$43,600	\$44,500	\$88,100	\$0	\$0	
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	
26C	Woodworking (construction industry)	\$2,426,700	\$380,300	\$2,807,000	\$2,426,700	\$372,200	
26D	Woodworking (government)	\$0	\$26,700	\$26,700	\$0	\$26,700	
27	Solid Waste Incineration	\$36,200	\$37,800	\$74,000	\$36,200	\$37,800	
27A	Incinerators (government)	\$0	\$18,100	\$18,100	\$0	\$18,100	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	
31B	Construction (Refractory Repair)	\$67,600	\$28,500	\$96,100	\$67,600	\$28,500	
31C	Construction (Hazardous Waste Work)	\$75,400	\$27,000	\$102,400	\$75,400	\$27,000	
31CG	Haz. Waste (government)	\$0	\$58,100	\$58,100	\$0	\$58,100	
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
	Total (General Industry)	\$5,165,300	\$3,478,000	\$8,643,300	\$5,121,700	\$3,433,500	
	Total (Maritime Industry)	\$291,600	\$92,100	\$383,700	\$291,600	\$92,100	
	Total (Construction Industry)	\$2,569,700	\$435,800	\$3,005,500	\$2,569,700	\$427,700	
	Total (Government)	\$0	\$102,900	\$102,900	\$0	\$102,900	
	Total Industry	\$8,026,600	\$4,108,800	\$12,135,400	\$7,983,000	\$4,056,200	
						\$12,039,200	

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		< 20 employees	≥ 20 employees	5 ug/m <sup>3</sup>	1 ug/m <sup>3</sup>	
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$153,800	\$1,019,900	\$1,173,700	\$153,800	\$1,173,700
21	Colored Glass Producers	\$0	\$1,200	\$1,200	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0
22	Printing	\$67,400	\$79,800	\$147,200	\$67,400	\$147,200
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$37,700	\$37,700	\$0	\$37,700
24A	Chromium Catalyst Users (Service)	\$7,700	\$23,500	\$31,200	\$7,700	\$31,200
25	Refractory Brick Producers	\$0	\$4,800	\$4,800	\$0	\$4,800
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$2,426,700	\$372,200	\$2,798,900	\$2,426,700	\$2,757,400
26D	Woodworking (government)	\$0	\$26,700	\$26,700	\$0	\$26,700
27	Solid Waste Incineration	\$36,200	\$37,800	\$74,000	\$36,200	\$74,000
27A	Incinerators (government)	\$0	\$18,100	\$18,100	\$0	\$18,100
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$67,600	\$28,500	\$96,100	\$67,600	\$96,100
31C	Construction (Hazardous Waste Work)	\$75,400	\$27,000	\$102,400	\$75,400	\$102,400
31CG	Haz. Waste (government)	\$0	\$58,100	\$58,100	\$0	\$58,100
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$5,121,700	\$3,433,500	\$8,555,200	\$5,120,600	\$8,552,800
Total (Maritime Industry)		\$291,600	\$92,100	\$383,700	\$291,600	\$383,700
Total (Construction Industry)		\$2,569,700	\$427,700	\$2,997,400	\$2,569,700	\$2,955,900
Total (Government)		\$0	\$102,900	\$102,900	\$0	\$102,900
Total Industry		\$7,983,000	\$4,066,200	\$12,039,200	\$7,981,900	\$11,995,300

Table III.37 Summary of Total Annualized Hygiene Area Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total		
		< 20 employees	> 20 employees	> 20 employees			
		0.5 ug/m <sup>3</sup>			0.25 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	> 20 employees	< 20 employees	> 20 employees	> 20 employees
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$153,800	\$1,019,900	\$1,173,700	\$153,800	\$1,019,900	\$1,173,700
21	Colored Glass Producers	\$0	\$0	\$0	\$0	\$0	\$0
21A	Fiber, Flat, and Container Glass	\$0	\$0	\$0	\$0	\$0	\$0
22	Printing	\$67,400	\$79,800	\$147,200	\$67,400	\$79,800	\$147,200
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$37,700	\$37,700	\$0	\$0	\$0
24A	Chromium Catalyst Users (Service)	\$7,700	\$23,500	\$31,200	\$7,700	\$23,500	\$31,200
25	Refractory Brick Producers	\$0	\$3,300	\$3,300	\$0	\$3,300	\$3,300
26A	Woodworking (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$2,426,700	\$330,700	\$2,757,400	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$26,700	\$26,700	\$0	\$0	\$0
27	Solid Waste Incineration	\$36,200	\$31,000	\$67,200	\$30,900	\$17,900	\$48,800
27A	Incinerators (government)	\$0	\$18,100	\$18,100	\$0	\$15,400	\$15,400
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
31B	Construction (Refractory Repair)	\$67,600	\$28,500	\$96,100	\$67,600	\$28,500	\$96,100
31C	Construction (Hazardous Waste Work)	\$75,400	\$27,000	\$102,400	\$75,400	\$27,000	\$102,400
31CG	Haz. Waste (government)	\$0	\$58,100	\$58,100	\$0	\$58,100	\$58,100
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$5,120,600	\$3,423,900	\$8,544,500	\$5,112,600	\$3,371,800	\$8,484,400
Total (Maritime Industry)		\$291,600	\$92,100	\$383,700	\$291,600	\$86,500	\$378,100
Total (Construction Industry)		\$2,569,700	\$386,200	\$2,955,900	\$143,000	\$55,500	\$198,500
Total (Government)		\$0	\$102,900	\$102,900	\$0	\$73,500	\$73,500
Total Industry		\$7,981,900	\$4,005,100	\$11,987,000	\$5,547,200	\$3,587,300	\$9,134,500



Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$6,079,500	\$6,154,200	\$12,233,700	\$6,079,500	\$6,154,200	\$12,233,700
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$192,300	\$152,700	\$345,000	\$192,300	\$152,700	\$345,000
3A1	Painting (general industry - auto repair)	\$3,022,800	\$1,018,200	\$4,041,000	\$3,022,800	\$1,018,200	\$4,041,000
3A2	Painting (general industry - coil coating)	\$56,600	\$311,100	\$367,700	\$56,600	\$311,100	\$367,700
3B	Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$6,300	\$6,300	\$0	\$6,300	\$6,300
5	Chromate Pigment Producers	\$3,090	\$0	\$3,090	\$3,090	\$0	\$3,090
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$15,710	\$15,710	\$0	\$15,710	\$15,710
8	Paint and Coatings Producers	\$137,710	\$88,340	\$226,050	\$137,710	\$88,340	\$226,050
9	Printing Ink Producers	\$12,050	\$3,620	\$15,670	\$12,050	\$3,620	\$15,670
10	Plastic Colorant Producers and Users	\$11,230	\$9,160	\$20,390	\$11,230	\$9,160	\$20,390
11	Plating Mixture Producers	\$10,800	\$16,200	\$27,000	\$10,800	\$16,200	\$27,000
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,130	\$4,130	\$0	\$4,130	\$4,130
14	Steel Mills (stainless)	\$53,500	\$166,900	\$220,400	\$53,500	\$166,900	\$220,400
14A	Steel Mills (carbon)	\$157,500	\$500,800	\$658,300	\$157,500	\$500,800	\$658,300
14B	reshaping (Alloy and Stainless)	\$154,300	\$163,800	\$318,100	\$154,300	\$163,800	\$318,100
15	Iron and Steel Foundries	\$295,800	\$408,900	\$704,700	\$295,800	\$408,900	\$704,700
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,260	\$3,790	\$5,050	\$1,260	\$3,790	\$5,050
18	Chromium Sulfate Producers	\$9,900	\$0	\$9,900	\$9,900	\$0	\$9,900

Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$6,079,500	\$6,154,200	\$6,079,500	\$6,154,200	\$12,233,700	
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0	
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0	
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0	
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0	
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0	
3A	Painting (general industry - aerospace)	\$192,300	\$152,700	\$192,300	\$152,700	\$345,000	
3A1	Painting (general industry - auto repair)	\$3,022,800	\$1,018,200	\$3,022,800	\$1,018,200	\$4,041,000	
3A2	Painting (general industry - coil coating)	\$56,600	\$311,100	\$56,600	\$311,100	\$367,700	
3B	Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0	
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0	
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0	
4	Chromate (chromite ore) production	\$0	\$6,300	\$0	\$6,300	\$6,300	
5	Chromate Pigment Producers	\$3,090	\$0	\$3,090	\$0	\$3,090	
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0	
7	Chromium Catalyst Producers	\$0	\$15,710	\$0	\$15,710	\$15,710	
8	Paint and Coatings Producers	\$137,710	\$88,340	\$137,710	\$88,340	\$226,050	
9	Printing Ink Producers	\$12,050	\$3,620	\$12,050	\$3,620	\$15,670	
10	Plastic Colorant Producers and Users	\$11,230	\$9,160	\$11,230	\$9,160	\$20,390	
11	Plating Mixture Producers	\$10,800	\$16,200	\$10,800	\$16,200	\$27,000	
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	
13	Chromium Material Producers	\$0	\$4,130	\$0	\$4,130	\$4,130	
14	Steel Mills (stainless)	\$53,500	\$166,900	\$53,500	\$166,900	\$220,400	
14A	Steel Mills (carbon)	\$157,500	\$500,800	\$157,500	\$500,800	\$658,300	
14B	reshaping (Alloy and Stainless)	\$154,300	\$163,800	\$154,300	\$163,800	\$318,100	
15	Iron and Steel Foundries	\$295,800	\$408,900	\$295,800	\$408,900	\$704,700	
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	
17	Chromium Dye Producers	\$1,260	\$3,790	\$1,260	\$3,790	\$5,050	
18	Chromium Sulfate Producers	\$9,900	\$0	\$9,900	\$0	\$9,900	

Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	Total
1	Electroplating	\$6,079,500	\$6,154,200	\$6,079,500	\$6,154,200	\$12,233,700
2A	Welding (general industry)	\$0	\$0	\$0	\$0	\$0
2B	Welding (maritime industry)	\$0	\$0	\$0	\$0	\$0
2C	Welding (construction industry)	\$0	\$0	\$0	\$0	\$0
2D	Welding (government)	\$0	\$0	\$0	\$0	\$0
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2B1	Welding (maritime industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$0	\$0
3A	Painting (general industry - aerospace)	\$192,300	\$152,700	\$192,300	\$152,700	\$345,000
3A1	Painting (general industry - auto repair)	\$3,022,800	\$1,018,200	\$3,022,800	\$1,018,200	\$4,041,000
3A2	Painting (general industry - coil coating)	\$56,600	\$311,100	\$56,600	\$311,100	\$367,700
3B	Painting (maritime industry)	\$0	\$0	\$0	\$0	\$0
3C	Painting (construction industry)	\$0	\$0	\$0	\$0	\$0
3D	Painting (government)	\$0	\$0	\$0	\$0	\$0
4	Chromate (chromite ore) production	\$0	\$6,300	\$0	\$6,300	\$6,300
5	Chromate Pigment Producers	\$3,090	\$0	\$3,090	\$0	\$3,090
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$0	\$0	\$0	\$0
7	Chromium Catalyst Producers	\$0	\$15,710	\$0	\$15,710	\$15,710
8	Paint and Coatings Producers	\$137,710	\$88,340	\$137,710	\$88,340	\$226,050
9	Printing Ink Producers	\$12,050	\$3,620	\$12,050	\$3,620	\$15,670
10	Plastic Colorant Producers and Users	\$11,230	\$9,160	\$11,230	\$9,160	\$20,390
11	Plating Mixture Producers	\$10,800	\$16,200	\$10,800	\$16,200	\$27,000
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$4,130	\$0	\$4,130	\$4,130
14	Steel Mills (stainless)	\$53,500	\$166,900	\$53,500	\$166,900	\$220,400
14A	Steel Mills (carbon)	\$157,500	\$500,800	\$157,500	\$500,800	\$658,300
14B	reshaping (Alloy and Stainless)	\$154,300	\$163,800	\$154,300	\$163,800	\$318,100
15	Iron and Steel Foundries	\$295,800	\$408,900	\$295,800	\$408,900	\$704,700
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$1,260	\$3,790	\$1,260	\$3,790	\$5,050
18	Chromium Sulfate Producers	\$9,900	\$0	\$9,900	\$0	\$9,900

Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$2,745,200	\$556,100	\$3,301,300	\$2,745,200	\$556,100	\$3,301,300
20	Textile Dyeing	\$485,600	\$192,000	\$677,600	\$485,600	\$192,000	\$677,600
21	Colored Glass Producers	\$14,100	\$4,200	\$18,300	\$14,100	\$4,200	\$18,300
21A	Fiber, Flat, and Container Glass	\$27,200	\$223,900	\$251,100	\$27,200	\$223,900	\$251,100
22	Printing	\$39,400	\$10,900	\$50,300	\$39,400	\$10,900	\$50,300
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$456,730	\$456,730	\$0	\$456,730	\$456,730
24A	Chromium Catalyst Users (Service)	\$11,210	\$58,840	\$70,050	\$11,210	\$58,840	\$70,050
25	Refractory Brick Producers	\$0	\$12,120	\$12,120	\$0	\$12,120	\$12,120
26A	Woodworking (general industry)	\$278,100	\$520,000	\$798,100	\$278,100	\$520,000	\$798,100
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,290	\$16,290	\$0	\$16,290	\$16,290
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080

Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		< 20 employees	≥ 20 employees	Total	< 20 employees	≥ 20 employees	Total
19	Chemical Distributors	\$2,745,200	\$556,100	\$3,301,300	\$2,745,200	\$556,100	\$3,301,300
20	Textile Dyeing	\$485,600	\$192,000	\$677,600	\$485,600	\$192,000	\$677,600
21	Colored Glass Producers	\$14,100	\$4,200	\$18,300	\$14,100	\$4,200	\$18,300
21A	Fiber, Flat, and Container Glass	\$27,200	\$223,900	\$251,100	\$27,200	\$223,900	\$251,100
22	Printing	\$39,400	\$10,900	\$50,300	\$39,400	\$10,900	\$50,300
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$456,730	\$456,730	\$0	\$456,730	\$456,730
24A	Chromium Catalyst Users (Service)	\$11,210	\$58,840	\$70,050	\$11,210	\$58,840	\$70,050
25	Refractory Brick Producers	\$0	\$12,120	\$12,120	\$0	\$12,120	\$12,120
26A	Woodworking (general industry)	\$278,100	\$520,000	\$798,100	\$278,100	\$520,000	\$798,100
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,290	\$16,290	\$0	\$16,290	\$16,290
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080

Table III.38 Summary of Total Annualized Housekeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total	
19	Chemical Distributors	\$2,745,200	\$556,100	\$3,301,300	\$2,745,200	\$556,100	\$3,301,300
20	Textile Dyeing	\$485,600	\$192,000	\$677,600	\$485,600	\$192,000	\$677,600
21	Colored Glass Producers	\$14,100	\$4,200	\$18,300	\$14,100	\$4,200	\$18,300
21A	Fiber, Flat, and Container Glass	\$27,200	\$223,900	\$251,100	\$27,200	\$223,900	\$251,100
22	Printing	\$39,400	\$10,900	\$50,300	\$39,400	\$10,900	\$50,300
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$456,730	\$456,730	\$0	\$456,730	\$456,730
24A	Chromium Catalyst Users (Service)	\$11,210	\$58,840	\$70,050	\$11,210	\$58,840	\$70,050
25	Refractory Brick Producers	\$0	\$12,120	\$12,120	\$0	\$12,120	\$12,120
26A	Woodworking (general industry)	\$278,100	\$520,000	\$798,100	\$278,100	\$520,000	\$798,100
26B	Woodworking (maritime industry)	\$0	\$0	\$0	\$0	\$0	\$0
26C	Woodworking (construction industry)	\$0	\$0	\$0	\$0	\$0	\$0
26D	Woodworking (government)	\$0	\$0	\$0	\$0	\$0	\$0
27	Solid Waste Incineration	\$0	\$0	\$0	\$0	\$0	\$0
27A	Incinerators (government)	\$0	\$0	\$0	\$0	\$0	\$0
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$16,290	\$16,290	\$0	\$16,290	\$16,290
31B	Construction (Refractory Repair)	\$0	\$0	\$0	\$0	\$0	\$0
31C	Construction (Hazardous Waste Work)	\$0	\$0	\$0	\$0	\$0	\$0
31CG	Haz. Waste (government)	\$0	\$0	\$0	\$0	\$0	\$0
31D	Construction (Industrial Rehabilitation)	\$0	\$0	\$0	\$0	\$0	\$0
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080
Total (Maritime Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Construction Industry)		\$0	\$0	\$0	\$0	\$0	\$0
Total (Government)		\$0	\$0	\$0	\$0	\$0	\$0
Total Industry		\$13,799,150	\$11,074,930	\$24,874,080	\$13,799,150	\$11,074,930	\$24,874,080

Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		10 ug/m <sup>3</sup>		20 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees	< 20 employees	> 20 employees
1	Electroplating	\$83,845	\$337,508	\$421,353	\$162,159	\$696,615	\$858,774
2A	Welding (general industry)	\$62,068	\$216,207	\$278,275	\$214,188	\$732,106	\$946,293
2B	Welding (maritime industry)	\$2,268	\$369,978	\$372,246	\$2,261	\$443,973	\$446,234
2C	Welding (construction industry)	\$221,119	\$354,443	\$575,562	\$638,231	\$766,984	\$1,405,216
2D	Welding (government)	\$0	\$11,706	\$11,706	\$0	\$13,350	\$13,350
2A1	Welding (general industry - carbon steel)	\$0	\$0	\$0	\$19,677	\$69,124	\$88,801
2B1	Welding (maritime industry - carbon steel)	\$4,904	\$0	\$4,904	\$4,904	\$1,626	\$6,530
2C1	Welding (construction industry - carbon steel)	\$0	\$0	\$0	\$57,580	\$201,566	\$259,146
3A	Painting (general industry - aerospace)	\$4,661	\$341,652	\$346,313	\$3,203	\$376,439	\$379,643
3A1	Painting (general industry - auto repair)	\$426,148	\$428,966	\$855,114	\$249,855	\$562,388	\$812,243
3A2	Painting (general industry - coil coating)	\$2	\$37	\$39	\$2	\$37	\$39
3B	Painting (maritime industry)	\$2,072	\$26,492	\$28,564	\$4,427	\$33,298	\$37,725
3C	Painting (construction industry)	\$69,300	\$56,347	\$125,647	\$61,089	\$147,275	\$208,364
3D	Painting (government)	\$0	\$74,960	\$74,960	\$0	\$50,299	\$50,299
4	Chromate (chromite ore) production	\$0	\$2	\$2	\$0	\$2	\$2
5	Chromate Pigment Producers	\$49	\$2,867	\$2,916	\$206	\$2,997	\$3,203
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1	\$1	\$0	\$1,104	\$1,104
7	Chromium Catalyst Producers	\$0	\$6,601	\$6,601	\$0	\$4,675	\$4,675
8	Paint and Coatings Producers	\$5,248	\$19,511	\$24,759	\$5,248	\$7,514	\$12,762
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$1	\$3	\$4	\$1	\$3	\$4
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$0	\$0	\$0	\$865	\$865
14	Steel Mills (stainless)	\$5,761	\$149,019	\$154,780	\$5,779	\$34,552	\$40,331
14A	Steel Mills (carbon)	\$17,661	\$190,358	\$208,019	\$17,661	\$449,077	\$466,738
14B	reshaping (Alloy and Stainless)	\$1	\$6	\$7	\$1	\$6	\$7
15	Iron and Steel Foundries	\$106,009	\$97,117	\$203,125	\$106,009	\$149,107	\$255,116
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$295	\$0	\$295	\$295	\$0	\$295

Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
1	Electroplating	\$256,323	\$1,128,402	\$1,384,725	\$198,018	\$861,049	\$1,059,067
2A	Welding (general industry)	\$414,762	\$1,413,682	\$1,828,444	\$597,017	\$2,032,525	\$2,629,542
2B	Welding (maritime industry)	\$2,265	\$541,070	\$543,335	\$4,532	\$955,559	\$960,091
2C	Welding (construction industry)	\$1,645,137	\$1,575,279	\$3,220,416	\$2,181,317	\$2,405,302	\$4,586,619
2D	Welding (government)	\$0	\$30,085	\$30,085	\$0	\$37,803	\$37,803
2A1	Welding (general industry - carbon steel)	\$133,476	\$460,704	\$594,180	\$634,461	\$2,179,738	\$2,814,200
2B1	Welding (maritime industry - carbon steel)	\$4,904	\$7,586	\$12,490	\$9,808	\$80,780	\$90,588
2C1	Welding (construction industry - carbon steel)	\$809,948	\$878,252	\$1,688,200	\$1,887,956	\$2,262,701	\$4,150,657
3A	Painting (general industry - aerospace)	\$3,535	\$591,343	\$594,879	\$8,386	\$741,682	\$750,068
3A1	Painting (general industry - auto repair)	\$136,711	\$222,103	\$358,814	\$40,833	\$152,879	\$193,711
3A2	Painting (general industry - coil coating)	\$5,863	\$48,147	\$54,010	\$6,927	\$72,221	\$79,148
3B	Painting (maritime industry)	\$12,325	\$91,539	\$103,863	\$15,757	\$130,276	\$146,033
3C	Painting (construction industry)	\$170,649	\$403,889	\$574,538	\$475,386	\$788,809	\$1,264,195
3D	Painting (government)	\$0	\$118,190	\$118,190	\$0	\$272,636	\$272,636
4	Chromate (chromite ore) production	\$0	\$4,337	\$4,337	\$0	\$7,807	\$7,807
5	Chromate Pigment Producers	\$232	\$4,010	\$4,242	\$85	\$2,250	\$2,335
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$1,131	\$1,131	\$0	\$1,262	\$1,262
7	Chromium Catalyst Producers	\$0	\$12,676	\$12,676	\$0	\$21,023	\$21,023
8	Paint and Coatings Producers	\$6,793	\$21,724	\$28,518	\$7,185	\$22,285	\$29,470
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$108	\$5,268	\$5,376	\$200	\$479	\$680
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$1,525	\$1,525	\$0	\$3,308	\$3,308
14	Steel Mills (stainless)	\$12,153	\$694,182	\$706,335	\$12,580	\$480,793	\$493,373
14A	Steel Mills (carbon)	\$35,322	\$105,796	\$141,117	\$35,672	\$2,221,570	\$2,257,242
14B	reshaping (Alloy and Stainless)	\$4	\$6,257	\$6,261	\$895	\$8,901	\$9,796
15	Iron and Steel Foundries	\$268,606	\$912,942	\$1,181,548	\$268,606	\$987,802	\$1,256,408
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$1,308	\$0	\$1,308	\$384	\$0	\$384



Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total	Total
		< 20 employees	0.5 ug/m <sup>3</sup> > 20 employees	< 20 employees	0.25 ug/m <sup>3</sup> > 20 employees		
1	Electroplating	\$440,537	\$1,973,107	\$440,537	\$1,973,107	\$2,413,644	\$2,413,644
2A	Welding (general industry)	\$927,229	\$3,148,953	\$1,004,868	\$3,411,447	\$4,076,182	\$4,416,316
2B	Welding (maritime industry)	\$6,797	\$1,240,987	\$6,795	\$1,252,181	\$1,247,784	\$1,258,976
2C	Welding (construction industry)	\$3,129,807	\$3,327,672	\$3,137,352	\$3,344,925	\$6,457,479	\$6,482,277
2D	Welding (government)	\$0	\$47,607	\$0	\$48,419	\$47,607	\$48,419
2A1	Welding (general industry - carbon steel)	\$1,342,991	\$4,600,741	\$2,607,874	\$8,905,345	\$5,943,732	\$11,513,218
2B1	Welding (maritime industry - carbon steel)	\$14,712	\$52,961	\$14,712	\$87,183	\$67,673	\$101,895
2C1	Welding (construction industry - carbon steel)	\$4,764,083	\$4,614,391	\$4,471,090	\$4,610,509	\$9,378,474	\$9,081,599
3A	Painting (general industry - aerospace)	\$2,024	\$531,605	\$22,256	\$707,963	\$533,629	\$730,219
3A1	Painting (general industry - auto repair)	\$1,095,149	\$2,521,412	\$985,444	\$1,621,497	\$3,616,561	\$2,606,941
3A2	Painting (general industry - coil coating)	\$6,927	\$29,917	\$6,927	\$51,069	\$36,844	\$57,996
3B	Painting (maritime industry)	\$18,417	\$169,014	\$17,570	\$174,445	\$187,431	\$192,015
3C	Painting (construction industry)	\$1,116,627	\$884,811	\$1,184,530	\$1,323,147	\$2,001,438	\$2,507,677
3D	Painting (government)	\$0	\$521,133	\$0	\$581,092	\$521,133	\$581,092
4	Chromate (chromite ore) production	\$0	\$18,759	\$0	\$18,760	\$18,759	\$18,760
5	Chromate Pigment Producers	\$85	\$5,521	\$85	\$5,519	\$5,606	\$5,604
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$2,565	\$0	\$4,611	\$2,565	\$4,611
7	Chromium Catalyst Producers	\$0	\$23,977	\$0	\$44,465	\$23,977	\$44,465
8	Paint and Coatings Producers	\$7,576	\$22,846	\$7,576	\$141,031	\$30,422	\$148,607
9	Printing Ink Producers	\$0	\$0	\$0	\$0	\$0	\$0
10	Plastic Colorant Producers and Users	\$0	\$0	\$0	\$0	\$0	\$0
11	Plating Mixture Producers	\$162	\$21,364	\$254	\$5,402	\$21,525	\$5,657
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$3,127	\$0	\$2,547	\$3,127	\$2,547
14	Steel Mills (stainless)	\$24,522	\$1,187,751	\$24,522	\$898,055	\$1,212,273	\$922,576
14A	Steel Mills (carbon)	\$70,640	\$2,062,765	\$70,640	\$3,540,173	\$2,133,405	\$3,610,813
14B	reshaping (Alloy and Stainless)	\$1,890	\$18,846	\$1,890	\$18,827	\$20,736	\$20,717
15	Iron and Steel Foundries	\$219,186	\$654,170	\$268,606	\$3,172,908	\$1,073,355	\$3,441,514
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$0	\$0	\$0	\$0	\$0	\$0
18	Chromium Sulfate Producers	\$384	\$0	\$3,235	\$0	\$384	\$3,235

Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)			Total
		<20 employees	20 ug/m <sup>3</sup> ≥ 20 employees	10 ug/m <sup>3</sup> ≥ 20 employees	
19	Chemical Distributors	\$3	\$0	\$3	\$3
20	Textile Dyeing	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$1	\$2	\$3	\$3
21A	Fiber, Flat, and Container Glass	\$1,845	\$53,843	\$55,688	\$55,640
22	Printing	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$4,488	\$4,488	\$4,488
24A	Chromium Catalyst Users (Service)	\$6,765	\$46,249	\$53,014	\$29,540
25	Refractory Brick Producers	\$0	\$4	\$4	\$4
26A	Woodworking (general industry)	\$5,573	\$15,922	\$21,495	\$4,774
26B	Woodworking (maritime industry)	\$0	\$11	\$11	\$11
26C	Woodworking (construction industry)	\$17,803	\$265,574	\$283,377	\$88,252
26D	Woodworking (government)	\$0	\$18,564	\$18,564	\$2,839
27	Solid Waste Incineration	\$3	\$30	\$34	\$34
27A	Incinerators (government)	\$0	\$2	\$2	\$2
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$9,941	\$9,941	\$891
31B	Construction (Refractory Repair)	\$28,002	\$10,526	\$38,528	\$38,002
31C	Construction (Hazardous Waste Work)	\$9	\$12	\$20	\$20
31CG	Haz. Waste (government)	\$0	\$11	\$11	\$11
31D	Construction (Industrial Rehabilitation)	\$4	\$25	\$28	\$28
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$2
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0
Total (General Industry)		\$725,937	\$1,920,334	\$2,646,272	\$3,176,139
Total (Maritime Industry)		\$9,245	\$396,480	\$405,725	\$490,500
Total (Construction Industry)		\$336,237	\$686,926	\$1,023,163	\$1,999,029
Total (Government)		\$0	\$105,243	\$105,243	\$66,503
Total Industry		\$1,071,419	\$3,108,984	\$4,180,402	\$6,522,303

Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>			1 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$3	\$0	\$3	\$3	\$0	\$3
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0
21	Colored Glass Producers	\$29	\$1,252	\$1,281	\$29	\$147	\$176
21A	Fiber, Flat, and Container Glass	\$3,691	\$166,307	\$169,999	\$3,691	\$134,597	\$138,287
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$4,488	\$4,488	\$0	\$4,488	\$4,488
24A	Chromium Catalyst Users (Service)	\$685	\$26,030	\$26,716	\$1,101	\$49,185	\$50,286
25	Refractory Brick Producers	\$0	\$4	\$4	\$0	\$3,681	\$3,681
26A	Woodworking (general industry)	\$350	\$4,424	\$4,774	\$350	\$4,424	\$4,774
26B	Woodworking (maritime industry)	\$0	\$11	\$11	\$0	\$11	\$11
26C	Woodworking (construction industry)	\$922,018	\$300,799	\$1,222,817	\$922,018	\$105,674	\$1,027,692
26D	Woodworking (government)	\$0	\$18,564	\$18,564	\$0	\$2,839	\$2,839
27	Solid Waste Incineration	\$3	\$30	\$34	\$30,259	\$160,137	\$190,396
27A	Incinerators (government)	\$0	\$2	\$2	\$0	\$15,130	\$15,130
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$18,990	\$18,990	\$0	\$14,911	\$14,911
31B	Construction (Refractory Repair)	\$28,002	\$21,468	\$49,470	\$28,002	\$24,908	\$52,910
31C	Construction (Hazardous Waste Work)	\$9	\$12	\$20	\$9	\$12	\$20
31CG	Haz. Waste (government)	\$0	\$11	\$11	\$0	\$11	\$11
31D	Construction (Industrial Rehabilitation)	\$4	\$25	\$28	\$4	\$25	\$28
31DG	Industrial Rehab. (government)	\$0	\$2	\$2	\$0	\$2	\$2
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$1,279,958	\$5,855,756	\$7,135,714	\$1,846,682	\$10,169,146	\$12,015,828
Total (Maritime Industry)		\$19,493	\$640,205	\$659,699	\$30,097	\$1,166,627	\$1,196,724
Total (Construction Industry)		\$3,575,767	\$3,179,723	\$6,755,490	\$5,494,691	\$5,587,430	\$11,082,121
Total (Government)		\$0	\$166,854	\$166,854	\$0	\$328,421	\$328,421
Total Industry		\$4,875,219	\$9,842,538	\$14,717,756	\$7,371,470	\$17,251,624	\$24,623,094

Table III.39 Summary of Total Annualized Medical Surveillance Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)						Total
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total		
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees			
19	Chemical Distributors	\$3	\$0	\$3	\$0	\$3	\$3	
20	Textile Dyeing	\$0	\$0	\$0	\$0	\$0	\$0	
21	Colored Glass Producers	\$29	\$147	\$176	\$1,252	\$29	\$1,281	
21A	Fiber, Flat, and Container Glass	\$3,691	\$152,933	\$156,624	\$861,630	\$9,229	\$870,859	
22	Printing	\$0	\$0	\$0	\$0	\$0	\$0	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$2,855	\$2,855	\$4,273	\$0	\$4,273	
24A	Chromium Catalyst Users (Service)	\$1,768	\$75,014	\$76,781	\$114,446	\$2,058	\$116,504	
25	Refractory Brick Producers	\$0	\$1,514	\$1,514	\$11,187	\$0	\$11,187	
26A	Woodworking (general industry)	\$350	\$4,424	\$4,774	\$4,424	\$350	\$4,774	
26B	Woodworking (maritime industry)	\$0	\$11	\$11	\$14,260	\$6,838	\$21,098	
26C	Woodworking (construction industry)	\$922,018	\$531,149	\$1,453,167	\$140,899	\$140,993	\$281,892	
26D	Woodworking (government)	\$0	\$18,564	\$18,564	\$2,839	\$0	\$2,839	
27	Solid Waste Incineration	\$30,259	\$151,170	\$181,429	\$20,427	\$3,235	\$23,662	
27A	Incinerators (government)	\$0	\$15,130	\$15,130	\$1,618	\$0	\$1,618	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$40,638	\$40,638	\$176,174	\$0	\$176,174	
31B	Construction (Refractory Repair)	\$28,002	\$24,908	\$52,910	\$109,521	\$28,002	\$137,523	
31C	Construction (Hazardous Waste Work)	\$27,159	\$9,551	\$36,710	\$9,551	\$27,159	\$36,710	
31CG	Haz. Waste (government)	\$0	\$38,292	\$38,292	\$38,292	\$0	\$38,292	
31D	Construction (Industrial Rehabilitation)	\$4	\$25	\$28	\$25	\$4	\$28	
31DG	Industrial Rehab. (government)	\$0	\$2	\$2	\$2	\$0	\$2	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$4,175,399	\$17,456,121	\$21,631,520	\$25,716,541	\$5,459,616	\$31,176,158	
Total (Maritime Industry)		\$39,926	\$1,462,972	\$1,502,898	\$1,528,069	\$45,915	\$1,573,984	
Total (Construction Industry)		\$9,987,700	\$9,392,507	\$19,380,207	\$9,538,577	\$8,989,129	\$18,527,706	
Total (Government)		\$0	\$640,728	\$640,728	\$672,261	\$0	\$672,261	
Total Industry		\$14,203,025	\$28,952,327	\$43,155,352	\$37,455,448	\$14,494,661	\$51,950,109	

Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>			
		< 20 employees	>= 20 employees	Total	< 20 employees	>= 20 employees	Total
1	Electroplating	\$189,770	\$662,861	\$852,631	\$189,770	\$662,861	\$852,631
2A	Welding (general industry)	\$783,793	\$982,010	\$1,765,802	\$783,993	\$982,110	\$1,766,102
2B	Welding (maritime industry)	\$13,323	\$243,054	\$256,377	\$13,323	\$243,054	\$256,377
2C	Welding (construction industry)	\$1,043,281	\$645,984	\$1,689,265	\$1,043,281	\$645,984	\$1,689,265
2D	Welding (government)	\$0	\$79,054	\$79,054	\$0	\$79,054	\$79,054
2A1	Welding (general industry - carbon steel)	\$1,056,004	\$1,629,267	\$2,685,272	\$1,056,004	\$1,629,267	\$2,685,272
2B1	Welding (maritime industry - carbon steel)	\$18,019	\$43,003	\$61,022	\$18,019	\$43,003	\$61,022
2C1	Welding (construction industry - carbon steel)	\$1,806,387	\$1,185,302	\$2,991,688	\$1,806,387	\$1,185,302	\$2,991,688
3A	Painting (general industry - aerospace)	\$9,556	\$348,264	\$357,820	\$9,603	\$342,201	\$351,804
3A1	Painting (general industry - auto repair)	\$514,055	\$1,087,991	\$1,602,046	\$514,055	\$1,067,891	\$1,581,946
3A2	Painting (general industry - coil coating)	\$4,679	\$81,449	\$86,128	\$4,679	\$81,449	\$86,128
3B	Painting (maritime industry)	\$103,080	\$104,143	\$207,224	\$103,080	\$104,143	\$207,224
3C	Painting (construction industry)	\$1,260,488	\$745,659	\$2,006,147	\$1,260,588	\$745,659	\$2,006,247
3D	Painting (government)	\$0	\$645,004	\$645,004	\$0	\$805,504	\$805,504
4	Chromate (chromite ore) production	\$0	\$2,569	\$2,569	\$0	\$2,569	\$2,569
5	Chromate Pigment Producers	\$73	\$843	\$916	\$73	\$843	\$916
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$429	\$429	\$0	\$429	\$429
7	Chromium Catalyst Producers	\$0	\$5,485	\$5,485	\$0	\$5,485	\$5,485
8	Paint and Coatings Producers	\$15,572	\$21,309	\$36,881	\$15,572	\$21,309	\$36,881
9	Printing Ink Producers	\$666	\$836	\$1,502	\$666	\$836	\$1,502
10	Plastic Colorant Producers and Users	\$1,545	\$9,467	\$11,012	\$1,665	\$9,627	\$11,292
11	Plating Mixture Producers	\$264	\$1,440	\$1,704	\$264	\$1,440	\$1,704
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$761	\$761	\$0	\$761	\$761
14	Steel Mills (stainless)	\$1,897	\$149,523	\$151,420	\$1,897	\$149,523	\$151,420
14A	Steel Mills (carbon)	\$4,916	\$401,407	\$406,322	\$4,916	\$401,407	\$406,322
14B	reshaping (Alloy and Stainless)	\$2,136	\$12,328	\$14,464	\$2,136	\$12,328	\$14,464
15	Iron and Steel Foundries	\$9,583	\$377,229	\$386,812	\$9,583	\$377,229	\$386,812
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$130	\$1,704	\$1,834	\$130	\$1,714	\$1,844
18	Chromium Sulfate Producers	\$257	\$0	\$257	\$257	\$0	\$257

Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$189,770	\$662,861	\$852,631	\$231,570	\$685,061	\$916,631
2A	Welding (general industry)	\$786,293	\$983,610	\$1,769,902	\$789,193	\$985,510	\$1,774,702
2B	Welding (maritime industry)	\$13,323	\$243,054	\$256,377	\$13,323	\$243,054	\$256,377
2C	Welding (construction industry)	\$1,043,281	\$645,984	\$1,689,265	\$1,043,281	\$645,984	\$1,689,265
2D	Welding (government)	\$0	\$79,054	\$79,054	\$0	\$79,054	\$79,054
2A1	Welding (general industry - carbon steel)	\$1,058,304	\$1,631,567	\$2,689,872	\$1,063,104	\$1,636,267	\$2,699,372
2B1	Welding (maritime industry - carbon steel)	\$18,119	\$43,003	\$61,122	\$18,119	\$43,003	\$61,122
2C1	Welding (construction industry - carbon steel)	\$1,806,487	\$1,185,302	\$2,991,788	\$1,806,587	\$1,185,402	\$2,991,988
3A	Painting (general industry - aerospace)	\$9,624	\$342,232	\$351,856	\$9,649	\$342,293	\$351,942
3A1	Painting (general industry - auto repair)	\$514,055	\$1,067,891	\$1,581,946	\$514,055	\$1,067,891	\$1,581,946
3A2	Painting (general industry - coil coating)	\$4,679	\$81,449	\$86,128	\$4,679	\$81,449	\$86,128
3B	Painting (maritime industry)	\$103,080	\$104,143	\$207,224	\$103,180	\$104,143	\$207,324
3C	Painting (construction industry)	\$1,260,688	\$745,659	\$2,006,347	\$1,261,088	\$745,759	\$2,006,847
3D	Painting (government)	\$0	\$805,504	\$805,504	\$0	\$805,704	\$805,704
4	Chromate (chromite ore) production	\$0	\$2,569	\$2,569	\$0	\$2,569	\$2,569
5	Chromate Pigment Producers	\$73	\$843	\$916	\$73	\$853	\$926
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$429	\$429	\$0	\$429	\$429
7	Chromium Catalyst Producers	\$0	\$5,505	\$5,505	\$0	\$5,485	\$5,485
8	Paint and Coatings Producers	\$15,572	\$21,309	\$36,881	\$15,572	\$21,309	\$36,881
9	Printing Ink Producers	\$666	\$836	\$1,502	\$543	\$796	\$1,339
10	Plastic Colorant Producers and Users	\$1,735	\$9,697	\$11,432	\$2,205	\$10,277	\$12,482
11	Plating Mixture Producers	\$264	\$1,440	\$1,704	\$264	\$1,440	\$1,704
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$761	\$761	\$0	\$761	\$761
14	Steel Mills (stainless)	\$1,897	\$149,523	\$151,420	\$1,897	\$149,523	\$151,420
14A	Steel Mills (carbon)	\$4,916	\$401,407	\$406,322	\$4,916	\$401,407	\$406,322
14B	reshaping (Alloy and Stainless)	\$2,136	\$12,328	\$14,464	\$2,136	\$12,328	\$14,464
15	Iron and Steel Foundries	\$9,583	\$377,229	\$386,812	\$9,583	\$377,229	\$386,812
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$140	\$1,724	\$1,864	\$146	\$1,754	\$1,900
18	Chromium Sulfate Producers	\$257	\$0	\$257	\$257	\$0	\$257

Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	Total
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
1	Electroplating	\$287,370	\$714,761	\$1,002,131	\$287,370	\$714,761	\$1,002,131
2A	Welding (general industry)	\$826,193	\$1,010,510	\$1,836,702	\$844,193	\$1,022,710	\$1,866,902
2B	Welding (maritime industry)	\$13,323	\$243,154	\$256,477	\$13,423	\$243,154	\$256,577
2C	Welding (construction industry)	\$1,043,381	\$645,984	\$1,689,365	\$1,043,381	\$645,984	\$1,689,365
2D	Welding (government)	\$0	\$79,054	\$79,054	\$0	\$79,054	\$79,054
2A1	Welding (general industry - carbon steel)	\$1,102,404	\$1,674,967	\$2,777,372	\$1,124,204	\$1,696,167	\$2,820,372
2B1	Welding (maritime industry - carbon steel)	\$18,319	\$43,403	\$61,722	\$18,319	\$43,503	\$61,822
2C1	Welding (construction industry - carbon steel)	\$1,806,887	\$1,185,402	\$2,992,288	\$1,807,887	\$1,185,502	\$2,993,388
3A	Painting (general industry - aerospace)	\$9,977	\$342,642	\$352,619	\$10,032	\$342,642	\$352,674
3A1	Painting (general industry - auto repair)	\$514,055	\$1,067,891	\$1,581,946	\$514,055	\$1,067,891	\$1,581,946
3A2	Painting (general industry - coil coating)	\$4,679	\$81,449	\$86,128	\$4,679	\$81,449	\$86,128
3B	Painting (maritime industry)	\$103,180	\$104,243	\$207,424	\$103,280	\$104,243	\$207,524
3C	Painting (construction industry)	\$1,261,588	\$745,859	\$2,007,447	\$1,261,788	\$745,959	\$2,007,747
3D	Painting (government)	\$0	\$805,904	\$805,904	\$0	\$805,904	\$805,904
4	Chromate (chromite ore) production	\$0	\$2,569	\$2,569	\$0	\$2,605	\$2,605
5	Chromate Pigment Producers	\$73	\$853	\$926	\$73	\$873	\$946
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$429	\$429	\$0	\$439	\$439
7	Chromium Catalyst Producers	\$0	\$5,605	\$5,605	\$0	\$5,605	\$5,605
8	Paint and Coatings Producers	\$15,572	\$21,309	\$36,881	\$15,572	\$21,309	\$36,881
9	Printing Ink Producers	\$543	\$796	\$1,339	\$583	\$816	\$1,399
10	Plastic Colorant Producers and Users	\$2,205	\$10,277	\$12,482	\$2,235	\$10,667	\$12,902
11	Plating Mixture Producers	\$264	\$1,440	\$1,704	\$264	\$1,440	\$1,704
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$761	\$761	\$0	\$761	\$761
14	Steel Mills (stainless)	\$1,997	\$149,723	\$151,720	\$1,997	\$149,723	\$151,720
14A	Steel Mills (carbon)	\$5,116	\$402,207	\$407,322	\$5,116	\$402,207	\$407,322
14B	reshaping (Alloy and Stainless)	\$2,136	\$12,328	\$14,464	\$2,136	\$12,328	\$14,464
15	Iron and Steel Foundries	\$9,583	\$377,229	\$386,812	\$9,583	\$378,729	\$388,312
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$146	\$1,754	\$1,900	\$161	\$1,754	\$1,915
18	Chromium Sulfate Producers	\$257	\$0	\$257	\$257	\$0	\$257

Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		10 ug/m <sup>3</sup>		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	< 20 employees	> 20 employees
Total	Total	Total	Total	Total	Total		
19	Chemical Distributors	\$25,342	\$3,359	\$28,701	\$25,342	\$3,359	\$28,701
20	Textile Dyeing	\$22,682	\$237,253	\$259,935	\$22,682	\$237,253	\$259,935
21	Colored Glass Producers	\$515	\$478	\$993	\$515	\$478	\$993
21A	Fiber, Flat, and Container Glass	\$348	\$58,336	\$58,684	\$348	\$57,354	\$57,703
22	Printing	\$16,390	\$49,288	\$65,678	\$16,390	\$49,288	\$65,678
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$5,561	\$5,561	\$0	\$5,561	\$5,561
24A	Chromium Catalyst Users (Service)	\$869	\$8,920	\$9,790	\$869	\$8,920	\$9,790
25	Refractory Brick Producers	\$0	\$874	\$874	\$0	\$874	\$874
26A	Woodworking (general industry)	\$2,013	\$3,326	\$5,339	\$2,013	\$3,326	\$5,339
26B	Woodworking (maritime industry)	\$686	\$1,307	\$1,993	\$686	\$1,307	\$1,993
26C	Woodworking (construction industry)	\$176,071	\$114,828	\$290,899	\$176,071	\$114,828	\$290,899
26D	Woodworking (government)	\$0	\$3,306	\$3,306	\$0	\$3,306	\$3,306
27	Solid Waste Incineration	\$3,154	\$18,521	\$21,675	\$3,154	\$18,521	\$21,675
27A	Incinerators (government)	\$0	\$1,025	\$1,025	\$0	\$1,025	\$1,025
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$10,539	\$10,539	\$0	\$10,539	\$10,539
31B	Construction (Refractory Repair)	\$6,415	\$19,639	\$26,054	\$6,415	\$19,639	\$26,054
31C	Construction (Hazardous Waste Work)	\$14,945	\$18,117	\$33,062	\$14,945	\$18,117	\$33,062
31CG	Haz. Waste (government)	\$0	\$21,037	\$21,037	\$0	\$21,037	\$21,037
31D	Construction (Industrial Rehabilitation)	\$9,383	\$39,069	\$48,452	\$9,383	\$39,069	\$48,452
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	\$0
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$2,666,211	\$6,173,628	\$8,839,838	\$2,666,578	\$6,146,753	\$8,813,331
Total (Maritime Industry)		\$135,108	\$391,508	\$526,616	\$135,108	\$391,508	\$526,616
Total (Construction Industry)		\$4,316,970	\$2,768,598	\$7,085,568	\$4,317,070	\$2,768,598	\$7,085,668
Total (Government)		\$0	\$749,425	\$749,425	\$0	\$914,214	\$914,214
Total Industry		\$7,118,289	\$10,083,159	\$17,201,448	\$7,118,756	\$10,221,072	\$17,339,829



Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees	Total
19	Chemical Distributors	\$25,342	\$3,359	\$25,342	\$3,359	\$28,701
20	Textile Dyeing	\$22,682	\$237,253	\$22,682	\$237,253	\$259,935
21	Colored Glass Producers	\$515	\$478	\$515	\$478	\$993
21A	Fiber, Flat, and Container Glass	\$348	\$56,273	\$348	\$54,210	\$54,558
22	Printing	\$16,390	\$49,288	\$16,390	\$49,288	\$65,678
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$5,561	\$0	\$5,561	\$5,561
24A	Chromium Catalyst Users (Service)	\$889	\$9,010	\$889	\$9,010	\$9,900
25	Refractory Brick Producers	\$0	\$874	\$0	\$874	\$874
26A	Woodworking (general industry)	\$2,013	\$3,326	\$2,013	\$3,326	\$5,339
26B	Woodworking (maritime industry)	\$686	\$1,307	\$686	\$1,307	\$1,993
26C	Woodworking (construction industry)	\$176,071	\$114,828	\$176,071	\$114,828	\$290,899
26D	Woodworking (government)	\$0	\$3,306	\$0	\$3,306	\$3,306
27	Solid Waste Incineration	\$3,154	\$18,521	\$3,154	\$18,521	\$21,675
27A	Incinerators (government)	\$0	\$1,025	\$0	\$1,025	\$1,025
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$10,539	\$0	\$10,539	\$10,539
31B	Construction (Refractory Repair)	\$6,415	\$19,639	\$6,415	\$19,639	\$26,054
31C	Construction (Hazardous Waste Work)	\$14,945	\$18,117	\$14,945	\$18,117	\$33,062
31CG	Haz. Waste (government)	\$0	\$21,037	\$0	\$21,037	\$21,037
31D	Construction (Industrial Rehabilitation)	\$9,383	\$39,069	\$9,383	\$39,069	\$48,452
31DG	Industrial Rehab. (government)	\$0	\$4,288	\$0	\$4,288	\$4,288
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$2,671,299	\$6,149,693	\$2,721,177	\$6,177,051	\$8,898,228
Total (Maritime Industry)		\$135,208	\$391,508	\$135,308	\$391,508	\$526,816
Total (Construction Industry)		\$4,317,270	\$2,768,598	\$4,317,770	\$2,768,798	\$7,086,568
Total (Government)		\$0	\$914,214	\$0	\$914,414	\$914,414
Total Industry		\$7,123,777	\$10,224,012	\$7,174,255	\$10,251,770	\$17,426,025

Table III.40 Summary of Total Annualized Hazard Communication Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>			
		< 20 employees	≥ 20 employees	Total	Total		
19	Chemical Distributors	\$25,342	\$3,359	\$28,701	\$25,342	\$3,359	\$28,701
20	Textile Dyeing	\$22,682	\$237,253	\$259,935	\$22,982	\$237,453	\$260,435
21	Colored Glass Producers	\$515	\$478	\$993	\$515	\$478	\$993
21A	Fiber, Flat, and Container Glass	\$348	\$54,210	\$54,558	\$348	\$53,228	\$53,577
22	Printing	\$16,390	\$49,288	\$65,678	\$16,390	\$49,288	\$65,678
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$6,251	\$6,251	\$0	\$6,251	\$6,251
24A	Chromium Catalyst Users (Service)	\$889	\$9,010	\$9,900	\$889	\$9,010	\$9,900
25	Refractory Brick Producers	\$0	\$874	\$874	\$0	\$874	\$874
26A	Woodworking (general industry)	\$2,013	\$3,326	\$5,339	\$2,013	\$3,326	\$5,339
26B	Woodworking (maritime industry)	\$686	\$1,307	\$1,993	\$686	\$1,307	\$1,993
26C	Woodworking (construction industry)	\$176,071	\$114,828	\$290,899	\$176,071	\$114,828	\$290,899
26D	Woodworking (government)	\$0	\$3,306	\$3,306	\$0	\$3,306	\$3,306
27	Solid Waste Incineration	\$3,154	\$18,521	\$21,675	\$3,154	\$18,521	\$21,675
27A	Incinerators (government)	\$0	\$1,025	\$1,025	\$0	\$1,025	\$1,025
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$10,609	\$10,609	\$0	\$10,609	\$10,609
31B	Construction (Refractory Repair)	\$6,415	\$19,639	\$26,054	\$6,415	\$19,639	\$26,054
31C	Construction (Hazardous Waste Work)	\$14,945	\$18,117	\$33,062	\$14,975	\$18,127	\$33,102
31CG	Haz. Waste (government)	\$0	\$21,037	\$21,037	\$0	\$21,087	\$21,087
31D	Construction (Industrial Rehabilitation)	\$9,383	\$39,069	\$48,452	\$9,383	\$39,069	\$48,452
31DG	Industrial Rehab. (government)	\$0	\$4,288	\$4,288	\$0	\$4,288	\$4,288
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$2,853,905	\$6,272,680	\$9,126,585	\$2,894,145	\$6,307,274	\$9,201,419
Total (Maritime Industry)		\$135,508	\$392,108	\$527,616	\$135,708	\$392,208	\$527,916
Total (Construction Industry)		\$4,318,670	\$2,768,898	\$7,087,568	\$4,319,900	\$2,769,108	\$7,089,008
Total (Government)		\$0	\$914,614	\$914,614	\$0	\$914,664	\$914,664
Total Industry		\$7,308,083	\$10,348,299	\$17,656,382	\$7,349,753	\$10,383,254	\$17,733,007

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>			10 ug/m <sup>3</sup>		
		< 20 employees	> 20 employees	Total	< 20 employees	> 20 employees	Total
1	Electroplating	\$47,700	\$218,700	\$266,400	\$47,700	\$218,700	\$266,400
2A	Welding (general industry)	\$21,400	\$83,900	\$105,300	\$21,400	\$83,900	\$105,300
2B	Welding (maritime industry)	\$1,000	\$43,600	\$44,600	\$1,000	\$43,600	\$44,600
2C	Welding (construction industry)	\$74,200	\$95,900	\$170,100	\$74,200	\$95,900	\$170,100
2D	Welding (government)	\$0	\$11,700	\$11,700	\$0	\$11,700	\$11,700
2A1	Welding (general industry - carbon steel)	\$46,000	\$161,600	\$207,600	\$46,000	\$161,600	\$207,600
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$140,800	\$174,700	\$315,500	\$140,800	\$174,700	\$315,500
3A	Painting (general industry - aerospace)	\$300	\$33,100	\$33,400	\$300	\$33,100	\$33,400
3A1	Painting (general industry - auto repair)	\$38,900	\$107,700	\$146,600	\$38,900	\$107,700	\$146,600
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,400	\$7,900	\$13,300	\$5,400	\$7,900	\$13,300
3C	Painting (construction industry)	\$82,600	\$72,500	\$155,100	\$82,600	\$72,500	\$155,100
3D	Painting (government)	\$0	\$42,800	\$42,800	\$0	\$42,800	\$42,800
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,810	\$1,810	\$0	\$1,810	\$1,810
8	Paint and Coatings Producers	\$4,550	\$6,510	\$11,060	\$4,550	\$6,510	\$11,060
9	Printing Ink Producers	\$860	\$260	\$1,120	\$860	\$260	\$1,120
10	Plastic Colorant Producers and Users	\$210	\$2,630	\$2,840	\$210	\$2,630	\$2,840
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,400	\$46,000	\$600	\$45,400	\$46,000
14A	Steel Mills (carbon)	\$1,400	\$118,600	\$120,000	\$1,400	\$118,600	\$120,000
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,200	\$107,500	\$185,700	\$78,200	\$107,500	\$185,700
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>			
		< 20 employees	≥ 20 employees	Total	< 20 employees	≥ 20 employees	Total
1	Electroplating	\$47,700	\$218,700	\$266,400	\$47,700	\$218,700	\$266,400
2A	Welding (general industry)	\$21,400	\$83,900	\$105,300	\$21,400	\$83,900	\$105,300
2B	Welding (maritime industry)	\$1,000	\$43,600	\$44,600	\$1,000	\$43,600	\$44,600
2C	Welding (construction industry)	\$74,200	\$95,900	\$170,100	\$74,200	\$95,900	\$170,100
2D	Welding (government)	\$0	\$11,700	\$11,700	\$0	\$11,700	\$11,700
2A1	Welding (general industry - carbon steel)	\$46,000	\$161,600	\$207,600	\$46,000	\$161,600	\$207,600
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$140,800	\$174,700	\$315,500	\$140,800	\$174,700	\$315,500
3A	Painting (general industry - aerospace)	\$300	\$33,100	\$33,400	\$300	\$33,100	\$33,400
3A1	Painting (general industry - auto repair)	\$38,900	\$107,700	\$146,600	\$38,900	\$107,700	\$146,600
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,400	\$7,900	\$13,300	\$5,400	\$7,900	\$13,300
3C	Painting (construction industry)	\$82,600	\$72,500	\$155,100	\$82,600	\$72,500	\$155,100
3D	Painting (government)	\$0	\$42,800	\$42,800	\$0	\$42,800	\$42,800
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,810	\$1,810	\$0	\$1,810	\$1,810
8	Paint and Coatings Producers	\$4,550	\$6,510	\$11,060	\$4,550	\$6,510	\$11,060
9	Printing Ink Producers	\$860	\$260	\$1,120	\$820	\$250	\$1,070
10	Plastic Colorant Producers and Users	\$210	\$2,630	\$2,840	\$210	\$2,630	\$2,840
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,400	\$46,000	\$600	\$45,400	\$46,000
14A	Steel Mills (carbon)	\$1,400	\$118,600	\$120,000	\$1,400	\$118,600	\$120,000
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,200	\$107,500	\$185,700	\$78,200	\$107,500	\$185,700
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		0.5 ug/m <sup>3</sup>		0.25 ug/m <sup>3</sup>		Total	
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		
1	Electroplating	\$47,700	\$218,700	\$266,400	\$47,700	\$218,700	\$266,400
2A	Welding (general industry)	\$21,400	\$83,900	\$105,300	\$21,400	\$83,900	\$105,300
2B	Welding (maritime industry)	\$1,000	\$43,600	\$44,600	\$1,000	\$43,600	\$44,600
2C	Welding (construction industry)	\$74,200	\$95,900	\$170,100	\$74,200	\$95,900	\$170,100
2D	Welding (government)	\$0	\$11,700	\$11,700	\$0	\$11,700	\$11,700
2A1	Welding (general industry - carbon steel)	\$46,000	\$161,600	\$207,600	\$46,000	\$161,600	\$207,600
2B1	Welding (maritime industry - carbon steel)	\$100	\$2,300	\$2,400	\$100	\$2,300	\$2,400
2C1	Welding (construction industry - carbon steel)	\$140,800	\$174,700	\$315,500	\$140,800	\$174,700	\$315,500
3A	Painting (general industry - aerospace)	\$300	\$33,100	\$33,400	\$300	\$33,100	\$33,400
3A1	Painting (general industry - auto repair)	\$38,900	\$107,700	\$146,600	\$38,900	\$107,700	\$146,600
3A2	Painting (general industry - coil coating)	\$300	\$7,600	\$7,900	\$300	\$7,600	\$7,900
3B	Painting (maritime industry)	\$5,400	\$7,900	\$13,300	\$5,400	\$7,900	\$13,300
3C	Painting (construction industry)	\$82,600	\$72,500	\$155,100	\$82,600	\$72,500	\$155,100
3D	Painting (government)	\$0	\$42,800	\$42,800	\$0	\$42,800	\$42,800
4	Chromate (chromite ore) production	\$0	\$900	\$900	\$0	\$900	\$900
5	Chromate Pigment Producers	\$20	\$280	\$300	\$20	\$280	\$300
6	Chromated Copper Arsenate (CCA) Producers	\$0	\$130	\$130	\$0	\$130	\$130
7	Chromium Catalyst Producers	\$0	\$1,810	\$1,810	\$0	\$1,810	\$1,810
8	Paint and Coatings Producers	\$4,550	\$6,510	\$11,060	\$4,550	\$6,510	\$11,060
9	Printing Ink Producers	\$820	\$250	\$1,070	\$820	\$250	\$1,070
10	Plastic Colorant Producers and Users	\$210	\$2,630	\$2,840	\$210	\$2,630	\$2,840
11	Plating Mixture Producers	\$70	\$440	\$510	\$70	\$440	\$510
12	Wood Preserving	\$0	\$0	\$0	\$0	\$0	\$0
13	Chromium Material Producers	\$0	\$270	\$270	\$0	\$270	\$270
14	Steel Mills (stainless)	\$600	\$45,400	\$46,000	\$600	\$45,400	\$46,000
14A	Steel Mills (carbon)	\$1,400	\$118,600	\$120,000	\$1,400	\$118,600	\$120,000
14B	reshaping (Alloy and Stainless)	\$400	\$4,200	\$4,600	\$400	\$4,200	\$4,600
15	Iron and Steel Foundries	\$78,200	\$107,500	\$185,700	\$78,200	\$107,500	\$185,700
16	Chromium Dioxide Producers	\$0	\$0	\$0	\$0	\$0	\$0
17	Chromium Dye Producers	\$40	\$540	\$580	\$40	\$540	\$580
18	Chromium Sulfate Producers	\$100	\$0	\$100	\$100	\$0	\$100

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)					
		20 ug/m <sup>3</sup>		10 ug/m <sup>3</sup>		Total	
		< 20 employees	≥ 20 employees	< 20 employees	≥ 20 employees		
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	
20	Textile Dyeing	\$4,600	\$71,100	\$75,700	\$0	\$75,700	
21	Colored Glass Producers	\$100	\$100	\$200	\$100	\$200	
21A	Fiber, Flat, and Container Glass	\$100	\$14,300	\$14,400	\$100	\$14,200	
22	Printing	\$3,800	\$14,800	\$18,600	\$3,800	\$18,600	
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	
24	Chromium Catalyst Users	\$0	\$990	\$990	\$0	\$990	
24A	Chromium Catalyst Users (Service)	\$290	\$3,050	\$3,340	\$290	\$3,340	
25	Refractory Brick Producers	\$0	\$300	\$300	\$0	\$300	
26A	Woodworking (general industry)	\$200	\$300	\$500	\$200	\$500	
26B	Woodworking (maritime industry)	\$100	\$300	\$400	\$100	\$500	
26C	Woodworking (construction industry)	\$21,600	\$22,900	\$44,500	\$21,600	\$400	
26D	Woodworking (government)	\$0	\$400	\$400	\$0	\$400	
27	Solid Waste Incineration	\$540	\$4,260	\$4,800	\$540	\$4,800	
27A	Incinerators (government)	\$0	\$130	\$130	\$0	\$130	
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	
30	Superalloy Producers and Users	\$0	\$3,510	\$3,510	\$0	\$3,510	
31B	Construction (Refractory Repair)	\$680	\$3,560	\$4,240	\$680	\$4,240	
31C	Construction (Hazardous Waste Work)	\$2,310	\$3,280	\$5,590	\$2,310	\$5,590	
31CG	Haz. Waste (government)	\$0	\$3,260	\$3,260	\$0	\$3,260	
31D	Construction (Industrial Rehabilitation)	\$1,060	\$7,120	\$8,180	\$1,060	\$8,180	
31DG	Industrial Rehab. (government)	\$0	\$0	\$0	\$0	\$0	
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	
Total (General Industry)		\$250,680	\$1,014,780	\$1,265,460	\$250,680	\$1,265,260	
Total (Maritime Industry)		\$6,600	\$54,100	\$60,700	\$6,600	\$60,700	
Total (Construction Industry)		\$323,250	\$379,960	\$703,210	\$323,250	\$703,210	
Total (Government)		\$0	\$58,290	\$58,290	\$0	\$58,290	
Total Industry		\$580,530	\$1,507,130	\$2,087,660	\$580,530	\$2,087,950	

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)						
		5 ug/m <sup>3</sup>		1 ug/m <sup>3</sup>		Total		
		< 20 employees	> 20 employees	< 20 employees	> 20 employees		< 20 employees	> 20 employees
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$4,600	\$71,100	\$75,700	\$4,600	\$71,100	\$75,700	\$75,700
21	Colored Glass Producers	\$100	\$100	\$200	\$100	\$100	\$200	\$200
21A	Fiber, Flat, and Container Glass	\$100	\$13,800	\$13,900	\$100	\$13,300	\$13,400	\$13,400
22	Printing	\$3,800	\$14,800	\$18,600	\$3,800	\$14,800	\$18,600	\$18,600
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$990	\$990	\$0	\$990	\$990	\$990
24A	Chromium Catalyst Users (Service)	\$290	\$3,050	\$3,340	\$290	\$3,050	\$3,340	\$3,340
25	Refractory Brick Producers	\$0	\$300	\$300	\$0	\$300	\$300	\$300
26A	Woodworking (general industry)	\$200	\$300	\$500	\$200	\$300	\$500	\$500
26B	Woodworking (maritime industry)	\$100	\$300	\$400	\$100	\$300	\$400	\$400
26C	Woodworking (construction industry)	\$21,600	\$22,900	\$44,500	\$21,600	\$22,900	\$44,500	\$44,500
26D	Woodworking (government)	\$0	\$400	\$400	\$0	\$400	\$400	\$400
27	Solid Waste Incineration	\$540	\$4,260	\$4,800	\$540	\$4,260	\$4,800	\$4,800
27A	Incinerators (government)	\$0	\$130	\$130	\$0	\$130	\$130	\$130
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$3,510	\$3,510	\$0	\$3,510	\$3,510	\$3,510
31B	Construction (Refractory Repair)	\$680	\$3,560	\$4,240	\$680	\$3,560	\$4,240	\$4,240
31C	Construction (Hazardous Waste Work)	\$2,310	\$3,280	\$5,590	\$2,310	\$3,280	\$5,590	\$5,590
31CG	Haz. Waste (government)	\$0	\$3,260	\$3,260	\$0	\$3,260	\$3,260	\$3,260
31D	Construction (Industrial Rehabilitation)	\$1,060	\$7,120	\$8,180	\$1,060	\$7,120	\$8,180	\$8,180
31DG	Industrial Rehab. (government)	\$0	\$490	\$490	\$0	\$490	\$490	\$490
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$250,680	\$1,014,280	\$1,264,960	\$250,640	\$1,013,770	\$1,264,410	\$1,264,410
Total (Maritime Industry)		\$6,600	\$54,100	\$60,700	\$6,600	\$54,100	\$60,700	\$60,700
Total (Construction Industry)		\$323,250	\$379,960	\$703,210	\$323,250	\$379,960	\$703,210	\$703,210
Total (Government)		\$0	\$58,780	\$58,780	\$0	\$58,780	\$58,780	\$58,780
Total Industry		\$580,530	\$1,507,120	\$2,087,650	\$580,490	\$1,506,610	\$2,087,100	\$2,087,100

Table III.41 Summary of Total Annualized Recordkeeping Cost for Each Industry by Establishment Size and PEL at a Discount Rate of 3 Percent

Section No.	Sector	Proposed Permissible Exposure Limit (PEL)				Total
		0.25 ug/m <sup>3</sup>		0.5 ug/m <sup>3</sup>		
		<20 employees	>20 employees	<20 employees	>20 employees	Total
19	Chemical Distributors	\$0	\$0	\$0	\$0	\$0
20	Textile Dyeing	\$4,600	\$71,100	\$4,600	\$71,100	\$75,700
21	Colored Glass Producers	\$100	\$100	\$100	\$100	\$200
21A	Fiber, Flat, and Container Glass	\$100	\$13,300	\$100	\$13,000	\$13,100
22	Printing	\$3,800	\$14,800	\$3,800	\$14,800	\$18,600
23	Leather Tanning	\$0	\$0	\$0	\$0	\$0
24	Chromium Catalyst Users	\$0	\$990	\$0	\$990	\$990
24A	Chromium Catalyst Users (Service)	\$290	\$3,050	\$290	\$3,050	\$3,340
25	Refractory Brick Producers	\$0	\$300	\$0	\$300	\$300
26A	Woodworking (general industry)	\$200	\$300	\$200	\$300	\$500
26B	Woodworking (maritime industry)	\$100	\$300	\$100	\$300	\$400
26C	Woodworking (construction industry)	\$21,600	\$22,900	\$21,600	\$22,900	\$44,500
26D	Woodworking (government)	\$0	\$400	\$0	\$400	\$400
27	Solid Waste Incineration	\$540	\$4,260	\$540	\$4,260	\$4,800
27A	Incinerators (government)	\$0	\$130	\$0	\$130	\$130
28	Oil and Gas Well Drilling	\$0	\$0	\$0	\$0	\$0
29	Portland Cement Producers	\$0	\$0	\$0	\$0	\$0
30	Superalloy Producers and Users	\$0	\$3,510	\$0	\$3,510	\$3,510
31B	Construction (Refractory Repair)	\$680	\$3,560	\$680	\$3,560	\$4,240
31C	Construction (Hazardous Waste Work)	\$2,310	\$3,280	\$2,310	\$3,280	\$5,590
31CG	Haz. Waste (government)	\$0	\$3,260	\$0	\$3,260	\$3,260
31D	Construction (Industrial Rehabilitation)	\$1,060	\$7,120	\$1,060	\$7,120	\$8,180
31DG	Industrial Rehab. (government)	\$0	\$490	\$0	\$490	\$490
32A	Ready-Mixed Concrete	\$0	\$0	\$0	\$0	\$0
32	Precast Concrete Products Producers	\$0	\$0	\$0	\$0	\$0
Total (General Industry)		\$250,640	\$1,013,770	\$250,640	\$1,013,470	\$1,264,110
Total (Maritime Industry)		\$6,600	\$54,100	\$6,600	\$54,100	\$60,700
Total (Construction Industry)		\$323,250	\$379,960	\$323,250	\$379,960	\$703,210
Total (Government)		\$0	\$58,780	\$0	\$58,780	\$58,780
Total Industry		\$580,490	\$1,506,610	\$580,490	\$1,506,310	\$2,086,800