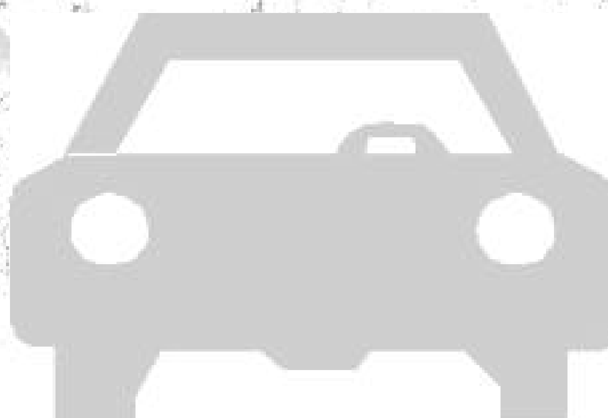
STATE OF CALIFORNIA
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
AIR RESOURCES BOARD

INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

EXECUTIVE SUMMARY/STAFF REPORT



AIRBORNE TOXIC CONTROL MEASURE FOR EMISSIONS OF HEXAVALENT CHROMIUM AND CADMIUM FROM MOTOR VEHICLE AND MOBILE EQUIPMENT COATINGS

STATIONARY SOURCE DIVISION
MEASURES ASSESSMENT BRANCH
AUGUST 2001

STATE OF CALIFORNIA
AIR RESOURCES BOARD

STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING

Public Hearing to Consider Adoption of the Proposed Airborne Toxic Control Measure for Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings

To be considered by the Air Resources Board
on September 20, 2001, at:

California Environmental Protection Agency
Headquarters Building
1001 "I" Street
Board Hearing Auditorium
Sacramento, California

STATE OF CALIFORNIA
AIR RESOURCES BOARD

EXECUTIVE SUMMARY/STAFF REPORT

Proposed Adoption of an Airborne Toxic Control Measure for Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings

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STATE OF CALIFORNIA

AIR RESOURCES BOARD

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I. INTRODUCTION

This executive summary presents the Air Resources Board (ARB/Board) staff's ***Proposed Airborne Toxic Control Measure for Emissions of Hexavalent Chromium and Cadmium from Motor Vehicle and Mobile Equipment Coatings***. Hexavalent chromium and cadmium are found in some motor vehicle and mobile equipment coatings (automotive coatings) used by both auto body repair and refinishing facilities and the do-it-yourself enthusiast. Lead is also found in these coatings because chromated products are typically formulated with lead chromate.

The proposed airborne toxic control measure (ATCM) would eliminate the use of coatings containing hexavalent chromium or cadmium in automotive refinishing and original equipment manufacturing (OEM). The proposed ATCM would not specifically eliminate the use of coatings containing lead because additional data are needed to demonstrate the feasibility of eliminating lead from all automotive coatings. If approved by the Board, the proposed ATCM will be sent to the air pollution control and air quality management districts (air districts) to be implemented and enforced. The local air districts may implement the proposed ATCM as approved by the Board, or adopt an alternative rule that is at least as stringent as the ATCM.

II. BACKGROUND

1. Why is the staff proposing an ATCM for motor vehicle and mobile equipment coatings?

The ARB identified hexavalent chromium and cadmium as toxic air contaminants (TAC) in 1986 and 1987, respectively. The ARB identifies and controls TACs under the authority of the California Toxic Air Contaminant Identification and Control Program (Air Toxics Program) established by California Assembly Bill 1807 (AB 1807) and set forth in Health and Safety Code (HSC) sections 39650 through 39675. Both hexavalent chromium and cadmium were determined to be human carcinogens without identifiable threshold exposure levels below which no significant adverse health effects are anticipated.

As part of AB 2588 implementation (*Air Toxics "Hot Spots" Information and Assessment Act,* (Connelly 1987)), the California Air Pollution Control Officers Association's (CAPCOA) Toxics Subcommittee determined that facilities using motor vehicle and mobile equipment coatings containing hexavalent chromium or cadmium can pose a significant community health risk. Consequently, the CAPCOA Toxics Subcommittee requested that ARB develop an ATCM to reduce emissions of hexavalent chromium and cadmium from coating facilities.

The proposed ATCM is expected to affect less than one percent of the total automotive coatings sold in California. However, the use of even a small volume of coatings that contain hexavalent chromium can result in significant near-source cancer risks because hexavalent chromium is an extremely toxic substance. Additionally, chromium-free and cadmium-free coatings are available and widely used in California. We estimate that 90 percent of the auto body repair and refinishing facilities have voluntarily elected to use chromium-free and cadmium-free coatings. The South Coast Air Quality Management District (SCAQMD) and the Antelope Valley Air Pollution Control District (AVAPCD) have prohibited the use of automotive coatings that contain hexavalent chromium or cadmium since 1996. Based on discussions with the air districts, no OEM facilities in California use automotive coatings containing hexavalent chromium or cadmium.

2. What does the law require ARB to do to protect public health?

HSC section 39666 requires the ARB to adopt ATCMs to reduce emissions of TACs. When adopting ATCMs for TACs without a Board-specified threshold exposure level, HSC section 39666 requires the ATCM to be designed to reduce emissions to the lowest level achievable through the application of best available control technology (BACT) or a more effective control method. The proposed ATCM is consistent with this requirement of California law. To determine BACT, we evaluated the proposed control measure and alternatives to the proposed control measure. We believe that prohibiting the use of hexavalent chromium and cadmium in coatings is technically feasible and will provide the greatest reduction in exposure at the lowest cost of any of the alternatives identified.

III. PUBLIC OUTREACH

During development of the proposed ATCM, the ARB made extensive efforts to ensure that the public participated in the rulemaking process. Our public outreach program involved interaction with:

- coatings manufacturers and their associations;
- coating facility operators and their associations;
- local air districts and air pollution control agencies in other states;
- environmental/pollution prevention and public health advocates; and
- other interested parties.

These entities participated in the development and review of the ARBs *2001 Survey of Motor Vehicle and Mobile Equipment Refinishing Coatings Containing Hexavalent Chromium and/or Cadmium and their Alternatives* (2001 survey). They also participated in conference calls, working group meetings, and a public workshop. Through these efforts, we obtained information on the use of hexavalent chromium, cadmium and lead in these coatings.

1. What actions did staff take to consult with interested parties?

As part of our outreach program, staff made extensive contacts with industry and facility representatives as well as other affected parties through meetings, telephone calls, and mail-outs.

Major Outreach Activities Included:

- formation of an *ARB/District Working Group*;
- conducting three meetings or conference calls with the *ARB/District Working Group* to discuss activities;
- formation of an *ARB/Industry Working Group*;
- conducting four meetings or conference calls with the *ARB/Industry Working Group*;
- mailing or faxing working group agendas and draft surveys;
- *mailing the 2001 survey to 58 manufacturers;*
- mailing workshop notices to over 2,500 recipients;
- conducting a public workshop;
- conducting a military installation site visit to assess potential ATCM impacts on military coating operations;
- conducting site visits to two automotive repair facilities and two community colleges with automotive refinishing operations to familiarize staff with spraying operations and facility design;
- visiting the Iowa Waste Reduction Center at the University of Northern Iowa to gain further knowledge of manual spraying operations and variables associated with spray technique and equipment; and
- preparing a fact sheet on the ATCM effort and making it available at community meetings held throughout California.

In addition to conducting a public workshop, ARB has made ATCM information available via the ARB website, and has established a list server to automatically apprise list server subscribers of changes to these web pages.

2. How does this proposed ATCM relate to ARB's goals on community health and environmental justice?

The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. It is ARB's goal to reduce or eliminate any disproportionate impacts of air pollution on low-income and minority populations so that all individuals in California can live, work, and play in a healthful environment. The proposed ACTM will reduce exposure to hexavalent chromium, cadmium, and lead in California communities with affected facilities, including those with low-income and minority populations.

3. What other steps are being taken to advance ARB's community health and environmental justice goals?

To advance ARB's goal of cleaner air for communities, we will be implementing a pollution prevention outreach pilot program for automotive refinishing facilities located in low-income, minority communities in California. Through funding provided by an United

States Environmental Protection Agency (U.S. EPA) Pollution Prevention Incentives for States grant, we will provide hands-on training and state-of-the-art equipment to automotive refinishing technicians in three low-income, minority areas identified through our Neighborhood Assessment Program. The goal of the program is to increase the transfer efficiency of coating operations and decrease air pollution, including emissions of TACs, through training on advanced spray techniques and the use of new technology.

Spray Technique Analysis and Research (STAR®) training, developed by the Iowa Waste Reduction Center (IWRC) at the University of Northern Iowa, teaches new and innovative techniques and practices to increase transfer efficiency during manual spraying operations. The ARB, in cooperation with community colleges in or near low-income, minority communities, will provide STAR® training to automotive refinishing technicians in the community. Upon completion of STAR® training, spray technicians will be issued Laser Touch™ equipment and a new Sata high-volume low-pressure (HVLP) spray gun. The Laser Touch™ is a laser-targeting device used in conjunction with HVLP spray guns to improve painter technique by helping maintain gun-to-target distance, gun angle, and targeting. The U.S. EPA's Environmental Technology Verification Program has shown that the use of the Laser Touch™ increases transfer efficiency an average of 11 percent over unassisted manual spraying. When use of the Laser Touch™ is combined with STAR® program training, the IWRC has verified that spray technicians typically improve transfer efficiency an average of 25 percent.

IV. EMISSIONS AND POTENTIAL HEALTH IMPACTS

1. How much Hexavalent Chromium, Cadmium and Lead is emitted from Coating Facilities?

Automotive coatings are used in over 6,000 facilities throughout California, as well as by do-it-yourself enthusiasts who typically paint vehicles outside of a facility. The emissions of hexavalent chromium, cadmium, and lead from the use of these coatings were estimated based on information collected from our survey of coatings manufacturers. Based on the 2001 survey results, adjusted to reflect complete market share, a total of 35,300 gallons of automotive coatings containing hexavalent chromium were sold in California in 2000. The use of these coatings resulted in approximately 270 pounds of hexavalent chromium emissions, or about 3.5 percent of the hexavalent chromium emitted from all sources annually. Of those manufacturers responding to the 2001 survey, none reported selling coatings containing cadmium, so cadmium emissions are believed to be minimal or non-existent. However, inclusion of cadmium in the proposed ATCM is a pollution prevention measure that will prevent the reintroduction of cadmium compounds into these coatings. Also, by including cadmium in the ATCM, the proposed regulation is consistent with existing rules in the SCAQMD and AVAPCD.

Although the proposed ATCM does not explicitly prohibit the use of lead in automotive coatings, adoption of this proposed ATCM would virtually eliminate lead emissions from the affected coatings. Elimination of hexavalent chromium will reduce the quantity of lead contained in these coatings because the most common hexavalent chromium compound used is lead chromate. We estimate that the proposed regulation will reduce lead emissions by about 560 pounds per year.

In addition to its use in chromated automotive coatings, lead is used in small quantities in other automotive coatings. It is staff's understanding that the use of lead in automotive coatings has been declining due to concerns with worker exposure. However, additional information is needed regarding the use of lead in automotive coatings to determine if a complete ban is feasible. Staff will collect information on the uses of lead in all automotive coatings as part of a comprehensive survey planned for 2002. The survey results will be used to evaluate the feasibility of completely banning the use of lead in automotive coatings.

2. What are the potential health impacts from exposure to hexavalent chromium emissions from coating facilities?

To assess potential health impacts, we conducted individual health risk assessments for four specific coating facilities and eight generic facilities. These specific and generic facilities represent a broad range of coating facilities, and serve as a reasonable approximation of potential health impacts from the use of chromated coatings. Our discussion of potential health impacts is limited to hexavalent chromium since manufacturers responding to our survey did not report selling any coatings containing cadmium.

The risk assessment methodologies used in assessing potential health impacts are consistent with the California Air Pollution Control Officers Association (CAPCOA) risk assessment guidelines. Additionally, the pollutant-specific health effects values have been approved by the ARB and the Office of Environmental Health Hazard Assessment (OEHHA). The air dispersion models that were used have been approved by the U.S. EPA, and are recommended by ARB for use in risk assessments.

Results of staff's analysis of the four specific coating facilities indicates a potential cancer risk ranging from approximately 1 up to 1,630 per million for near-source receptors where the maximum TAC concentrations are expected to occur. The highest estimated chronic hazard index for a specific coating facility was 5.4, however, nearly all facilities are expected to have hazard indices of less than one. Generally, hazard indices greater than one are considered to be a concern to public health. Estimates of acute health impacts are not available because an acute reference exposure level for hexavalent chromium has not yet been established.

V. SUMMARY OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

1. What does the proposed ATCM require?

The proposed ATCM prohibits the sale, offer for sale, and distribution of automotive coatings that contain hexavalent chromium or cadmium for use in California. The ATCM also prohibits the use of these coatings in California. The proposed ATCM applies to both refinish coatings, as well as coatings used in OEM coating activities (factory automotive and other vehicle and mobile equipment coating operations).

The proposed ATCM allows the sale of coatings manufactured prior to the effective date of this regulation to be sold, supplied, or offered for sale for up to six months after the effective date of the regulation. To qualify for this provision, manufacturers must clearly display on each product container or package the date, or a code indicating the date, of manufacture. The proposed ATCM allows for the use of coatings up to 12 months from the effective date if they are manufactured prior to the effective date of this regulation. The air districts must implement and enforce the ATCM. The earliest the air districts could enforce the ATCM would be when the Office of Administrative Law approves it (e.g., within 12 months of August 3, 2001).

The proposed ATCM allows manufacturers and distributors to sell coatings containing hexavalent chromium or cadmium for use outside of California. Retailers are not allowed to sell or possess coatings containing hexavalent chromium or cadmium. The regulation does not have recordkeeping provisions, but manufacturers or distributors who sell these coatings for use outside of California must demonstrate that they have taken precautions to ensure that they are not used in California.

The proposed ATCM specifies the test methods to be used to determine compliance. Staff believes including test methods improves the enforceability of the ATCM.

The proposed ATCM does not apply to the sale, supply, or distribution of motor vehicles and mobile equipment in or outside of California regardless of the coatings that have been applied.

The proposed ATCM does not provide for a de minimus level. Raw material suppliers have indicated that it is rare for hexavalent chromium to be a contaminant in materials used in the manufacture of automotive coatings. Thus, staff believes that a de minimus level is not necessary to account for contamination levels.

2. What is the basis for the proposed ATCM?

The proposed ATCM is based on our evaluation of BACT, in consideration of alternative products and processes. In evaluating BACT, we analyzed information from the 2001 survey and additional information from manufacturers. Based on this information, we determined that coatings excluding hexavalent chromium and/or cadmium are readily available and widely used.

As mentioned earlier, the SCAQMD and AVAPCD have prohibited the use of automotive coatings containing hexavalent chromium and cadmium since 1996. Consequently, coatings manufacturers are currently producing alternative coatings to comply with regulations in these air districts. Most manufacturers market both chromated and non-chromated coatings and claim that both are suitable and effective. Discussions with facility operators also indicate that alternative products are suitable and effective.

We consider the proposed ATCM to be technically feasible based on information from the 2001 survey, discussions with coating manufacturers and facility operators, and the current use of effective, alternative coatings in California.

3. What alternatives to the proposed ATCM did staff consider?

HSC section 39665 requires the ARB to consider and evaluate alternatives to the proposed ATCM. As an alternative to the proposed control measure, we considered requiring that all coatings containing hexavalent chromium or cadmium be applied inside a spray booth. The alternative was evaluated in terms of applicability, effectiveness, enforceability, and cost/resource requirements. We determined that the alternative would not be as effective as the proposed ATCM in reducing emissions of and exposure to hexavalent chromium and cadmium. Furthermore, the alternative did not meet the HSC section 39666 criterion, which requires reduction of emissions to the lowest level achievable through the application of BACT in consideration of cost, risk, and environmental impacts.

VI. POTENTIAL IMPACTS OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE: HEALTH, ECONOMIC AND ENVIRONMENTAL

1. How would the proposed ATCM reduce risk to public health?

The proposed ATCM would virtually eliminate the use of hexavalent chromium and cadmium compounds in the affected coatings. As a result, the emissions of these compounds and the subsequent health impacts would be essentially eliminated. As previously noted, while the use of lead is not specifically prohibited, we estimate that the proposed ATCM would provide an additional health benefit from reduced lead emissions.

Another benefit of the proposed ATCM would be reduced worker exposure. Worker exposure to hexavalent chromium emissions from the use of coatings would be virtually eliminated. Worker exposure to lead emissions would also be reduced.

We estimate that the overall benefits from the ATCM would be a reduction in annual average ambient hexavalent chromium levels of 3.5 percent, and as mentioned earlier, the elimination of the potential cancer risk associated with exposure to hexavalent chromium.

2. What are the expected economic impacts of the proposed ATCM on businesses?

No significant economic impacts are expected from the proposed ATCM. The proposed ATCM will primarily impact manufacturers and marketers (companies which outsource the manufacturing of their products). Based on the 2001 survey information, we estimate that automotive chromated coatings constitute less than one percent of the total automotive coatings sold in California in 2000. As a result, we do not expect a noticeable change in employment; business creation, elimination or expansion; or business competitiveness in California.

Coatings containing hexavalent chromium are manufactured by a number of companies nationwide; however, none of these companies are located in California. Since most manufacturers already produce alternative coatings that comply with the proposed ATCM, they are not expected to incur additional reformulation costs. Those companies not currently manufacturing compliant coatings are expected to be able to absorb the cost of reformulation with no adverse impacts on their profitability.

3. What is the total cost of the proposed regulation?

We used two methods to estimate the total cost of the proposed ATCM. First, we estimated the total cost by considering the differences in raw material costs for chromated vs. non-chromated coatings reported in the 2001 survey. This method results in the lower end of the estimated range of cost. We also estimated the total cost based on the retail price differences for these coatings, as reported in the 2001 survey. Because automotive coating manufacturers already sell complying products, no research and development costs are included in these cost estimates. Based on these analyses, the total cost is estimated to range from $440,000 to $2 million per year for five years.

4. Will consumers have to pay more for motor vehicle and mobile equipment coatings subject to the proposed ATCM?

Based on the 2001 survey results, the retail price of coatings can vary significantly. However, the survey indicates that some non-chromated coatings cost less than chromated coatings, and the average retail cost of non-chromated coatings is only one to six percent more than chromated coatings. Because the cost of coating materials is a small fraction of the total cost of a repair job, the overall impact on consumers is estimated to be minimal. Under a worst-case scenario, based on repainting an entire car, it is estimated that the cost to consumers will increase by $12, or less than half of one percent, per vehicle painted.

5. What are the expected environmental benefits of the proposed ATCM?

The main environmental benefit of the proposed ATCM is the elimination of about 270 pounds per year of hexavalent chromium emissions in California. The benefits will occur throughout California, with the exception of the SCAQMD and AVAPCD, which already have a prohibition on hexavalent chromium- and cadmium-containing coatings. The proposed ATCM will also decrease lead emissions by an estimated 560 pounds per year.

In addition to improved air quality, the proposed ATCM is expected to result in positive hazardous waste and wastewater environmental impacts. Elimination of hexavalent chromium and cadmium from coatings will result in lesser amounts of these metals being disposed of with solvents classified as hazardous waste. Introduction of particulates containing these TACs to the sewer system through the practice of washing down facilities to remove over spray would also be eliminated.

6. Are there any potential negative environmental impacts?

No potential negative environmental impacts are expected to occur as a result of the proposed ATCM.

VI. NEXT STEPS

If the proposed ATCM is adopted, the local districts must implement and enforce the ATCM. However, if the district wishes to adopt an alternative regulation, they have 120 days to propose a regulation that is at least as stringent as the ATCM. The alternative regulation must be adopted within six months of the adoption of the ATCM. Sources would need to be in compliance by the date the district implemented and enforced the ATCM or by a compliance date specified in the alternative regulation.

VII. RECOMMENDATION

We recommend that the Board adopt the proposed regulation contained in Appendix A. The proposed regulation would prohibit the use of hexavalent chromium and cadmium in motor vehicles and mobile equipment coatings. Consistent with the requirement to adopt BACT when suitable alternatives are available, the proposed regulation would prohibit manufacturers from selling coatings that contain hexavalent chromium or cadmium for use in California. The proposed regulation would also prohibit facility owners or operators from using products containing hexavalent chromium or cadmium. Benefits from the proposed regulation include nearly 100 percent reduction in emissions of hexavalent chromium and cadmium, and the subsequent exposure and risk from these emissions. Additional benefits include reduced lead emissions, reduced wastewater and hazardous waste contamination, and reduced workplace exposure.

I. INTRODUCTION

A. OVERVIEW

The Air Resources Board's (ARB/Board) statewide comprehensive air toxics program was established in the early 1980's. Assembly Bill (AB) 1807 (Tanner 1983), *The Toxic Air Contaminant Identification and Control Act,* created California's Air Toxic Contaminant Identification and Control Program (Air Toxics Program) to reduce the public's exposure to air toxics. AB 2588 (Connelly 1987), *Air Toxics "Hot Spots" Information and Assessment Act*, supplements the Air Toxics Program by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks.

AB 1807 mandated that ARB use certain criteria in prioritizing the identification and control of air toxics. In selecting substances for review, ARB must consider criteria relating to "the risk of harm to public health, amount or potential amount of emissions, manner of, and exposure to, usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community" [Health and Safety Code (HSC) section 39660(f)]. AB 1807 also requires the ARB to use available information gathered from the AB 2588 program in the prioritization of compounds.

Hexavalent chromium and cadmium compounds are constituents found in some motor vehicle and mobile equipment coatings (automotive coatings). In 1986 and 1987, under the Air Toxics Program, ARB identified both hexavalent chromium and cadmium as toxic air contaminants (TAC), respectively. Both compounds were determined to be human carcinogens without an identifiable threshold exposure level below which no significant adverse health effects are anticipated.

Once a compound has been identified as a TAC, the Board is required to prepare a report on the need and appropriate degree of regulation for the compound, and adopt regulations to reduce emissions of the compound. These regulations are called airborne toxic control measures (ATCM) or control measures. In this report, we use the terms ATCM, regulation, and control measure interchangeably. California law requires control measures for TACs, without Board-specified threshold exposure levels, to be based on best available control technology (BACT) or a more effective control method where cost and risk are taken into consideration.

The Initial Statement of Reasons (ISOR) for the proposed *Airborne Toxic Control Measure for Emissions of Hexavalent Chromium and Cadmium Compounds from Motor Vehicle and Mobile Equipment Coatings*, provides information on the:

- TAC identification and control process;
- report preparation process and previous identification and control activities;
- compound specific physical characteristics;
- source specific information;
- ambient concentration, exposure and health effects;
- description of typical coating operations and coatings types; and
- proposed ATCM and its health, economic, and environmental impacts.

B. PURPOSE

In February 1988, the Board adopted a hexavalent chromium control plan (control plan). The purpose of this control plan was to set forth the overall course of action for controlling sources of hexavalent chromium. While the control plan listed chromate pigment producing facilities as possible sources to control, it did not specifically consider the control of hexavalent chromium from automotive coatings. However, the California Air Pollution Control Officers Association's (CAPCOA) Toxics Committee has found, through the AB 2588 program, that facilities using automotive coatings that contain hexavalent chromium pose a community health risk. In addition to hexavalent chromium, cadmium emissions also contribute to the toxic health risk burden from automotive coating operations.

Consequently, the CAPCOA Toxics Committee requested that ARB develop an ATCM to reduce emissions of hexavalent chromium and cadmium from coating facilities. Staff has developed this proposed ATCM in conjunction with district efforts to reduce the toxic health risk burden from automotive coating operations. Both industry and district representatives have participated in the development of this regulation.

This ATCM is designed to eliminate the use of hexavalent chromium and cadmium in automotive coatings. The determination to ban hexavalent chromium and cadmium in automotive coatings is based on community health risk due to the use of automotive coatings containing hexavalent chromium and/or cadmium at automotive coating facilities. Thus, this regulation focuses on a relatively small segment of automotive coatings that contain hexavalent chromium or cadmium.

While lead is not specifically being eliminated by this measure, common forms of hexavalent chromium used in automotive coatings are lead chromate, lead chromate - molybdate, and lead chromate-molybdate-sulfate. Therefore, by eliminating the hexavalent chromium from automotive coatings, the use of lead in automotive coatings will also be reduced. This will provide an additional health benefit.

Additional information regarding the use of lead in automotive coatings is needed to evaluate whether a ban on the use of lead is feasible. Staff will collect information on the overall use of lead as part of a comprehensive survey planned for 2002 to gather VOC and ingredient information on all automotive coatings.

C. REGULATORY AUTHORITY

California's Air Toxics Program established under California law by AB 1807 (Chapter 1047, Statutes of 1983), and set forth in HSC sections 39650 through 39675, is designed to protect public health by reducing emissions of TACs. This law mandates the identification and control of air toxics in California and complements California's criteria air pollutant program. The identification phase of the Air Toxics Program requires the ARB, with the participation of other State agencies, to evaluate the health impacts of, and exposure to, substances and to identify those substances, which pose the greatest health threat as TACs. ARB's evaluation is made available to the public and is formally reviewed by the Scientific Review Panel (SRP) established under HSC section 39670. Following ARB's evaluation and the SRP's review, the Board identified hexavalent chromium as a TAC at its January 1986 Board hearing. Cadmium was identified as a TAC by the Board at its January 1987 Board hearing. In each case, the Board determined that there was not sufficient available scientific evidence to support the identification of a threshold exposure level (ARB, 1986; ARB, 1987). Following the identification of a substance as a TAC, HSC section 39665 requires the ARB, with the participation of the air pollution control and air quality management districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance. As previously mentioned, a hexavalent chromium control plan was developed in 1988.

D. REGULATORY ACTIVITIES

1. Airborne Toxic Control Measures

The ARB has developed two ATCMs to reduce emissions of hexavalent chromium and one ATCM to reduce emissions of cadmium. In 1988, the Board adopted the *Hexavalent Chromium Control Measure for Decorative and Hard Chrome Plating and Chromic Acid Anodizing Facilities.* The ATCM was revised in 1998. In 1989, the Board adopted the *Proposed Airborne Toxic Control Measure for Hexavalent Chromium For Cooling Towers*. In 1992, ARB developed the *Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting* to reduce emissions of cadmium from these sources.

2. National Emission Standards for Hazardous Air Pollutants

In the federal Clean Air Act Amendments of 1990, the United States Environmental Protection Agency (U.S. EPA) identified chromium compounds and cadmium compounds as Hazardous Air Pollutants (HAP) because they were either known to have or may have adverse effects on human health or the environment. HSC section 39658(b) requires the Board to designate federal HAPs as TACs. The Board designated these HAPs as TACs in 1993 (AB 2728, Tanner)(ARB 1993b).

3. AB 2588 "Hot Spots" Program

In May 1997, ARB provided guidelines for motor vehicle refinish facilities subject to AB 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987. The guideline document titled *"Senate Bill 1731 Risk Reduction Audits and Plans Guidelines for Automobile Refinishing Facilities"* identified ways to reduce emissions associated with toxic air pollutants that cause facilities to pose significant health risks. The report states that the best way to reduce emissions of toxic compounds, including hexavalent chromium, is to use alternative automotive coatings that do not contain compounds associated with the toxic health risk. The guidelines were developed with the participation of air pollution control and air quality management districts and the automotive coatings industry.

4. California Air District Rules

The South Coast Air Quality Management District and the Antelope Valley Air Pollution Control District have prohibited the use of automotive coatings that contain hexavalent chromium or cadmium since 1996. The Sacramento Metropolitan Air Quality Management District has also proposed revisions to their automotive refinishing rule that would ban hexavalent chromium use in automotive coatings. Ventura County, Santa Barbara County and Kern County Air Pollution Control Districts have exemptions from the requirement that automotive coatings be applied in spray booths if the automotive coatings do not contain hexavalent chromium. The San Luis Obispo County Air Pollution Control District has additional recordkeeping requirements for facilities that use automotive coatings containing hexavalent chromium. In addition, some air districts place a condition on permits for new automotive coating facilities that prohibits the use of automotive coatings that contain hexavalent chromium.

ARB staff is working with air districts to address concerns regarding the enforceability of their automotive coating rules. As part of this effort, staff plans to conduct a comprehensive survey in 2002 of all automotive coatings to assess whether additional VOC reductions are feasible. At that time, staff will also evaluate the extent to which lead is used in automotive coatings, and whether banning the use of lead is feasible.

II. PUBLIC OUTREACH

A. OUTREACH EFFORTS

The ARB has made extensive efforts to ensure public participation throughout the ATCM rulemaking process. ARB's public outreach program involved interaction with:

- coatings manufacturers and their associations;
- coating facility operators and their associations;
- California's air pollution control districts and air quality management districts;
- air pollution control agencies in other states;
- environmental/pollution prevention and public health advocates; and
- other interested parties.

These entities participated in the development and review of the ARB's *2001 Survey of Motor Vehicle and Mobile Equipment Refinishing Coatings Containing Hexavalent Chromium and/or Cadmium and their Alternatives* (2001 survey). They also participated in conference calls, working group meetings, and a public workshop. A copy of the 2001 survey is included in Appendix B. Through these efforts, ARB has obtained information on the use and emissions of hexavalent chromium and lead in automotive coatings. We have also determined that the use of cadmium in automotive coatings is already being phased-out. All parties were given opportunities to express their concerns, both in public and in private meetings.

As part of ARB's outreach program, we made extensive personal contacts with industry and facility representatives, as well as other affected parties through meetings, telephone calls, and mail-outs.

Major Outreach Activities included:

- formation of an *ARB/District Working Group* and an *ARB/Industry Working Group*;
- conducting three meetings or conference calls with the *ARB/District Working Group*;
- conducting four meetings or conference calls with the *ARB/Industry Working Group* ;
- mailing or faxing working group agendas and draft surveys to affected parties;
- mailing the 2001 survey to 58 coatings manufacturers;
- mailing workshop notices to over 2,500 recipients;
- conducting a public workshop;
- conducting a military installation site visit to assess potential ATCM impacts on military coating operations;
- conducting site visits to two automotive repair facilities and two community colleges with automotive refinishing operations to familiarize staff with spraying operations and facility design;
- visiting the Iowa Waste Reduction Center at the University of Northern Iowa to gain further knowledge of manual spraying operations and variables associated with spray technique and equipment; and
- preparing a fact sheet on the ATCM effort and making it available at community meetings held throughout California.

B. PUBLIC INVOLVEMENT

As described below, affected industries, other government agencies, and organizations interested in minimizing the use of hexavalent chromium and cadmium in automotive coatings have been actively involved in the ATCM rulemaking process. In addition to conducting a public workshop, ARB has implemented other measures to increase the general public's awareness of and participation in this process.

We have made ATCM information available via the ARB website at: (http://www.arb.ca.gov/coatings/autorefin/autorefin.htm) and have established an automotive coatings list server to automatically apprise list server subscribers of modifications to any of the automotive coatings web pages.

1. Industry Involvement

Coatings manufacturers and industry representatives have actively participated in the development of this ATCM. The industry has provided technical information, and has commented on the 2001 survey and the proposed regulatory language. Industry involvement included:

- numerous telephone conversations with staff;
- completion of the 2001 survey; and
- participation in conference calls and a workshop.

2. Government Agency Involvement

Local, state, and federal agencies with an interest in reducing emissions of hexavalent chromium and cadmium have been involved in the ATCM rulemaking process. These agencies include: California's air districts, California's Occupational Safety and Health Administration (Cal/OSHA), the Department of Toxic Substances Control (DTSC), the U.S. EPA , and the United States Department of Defense.

In addition to the *ARB/District Working Group*, we have apprised the air districts of the activities through CAPCOA's Toxics Subcommittee. We have also received information from the air districts on automotive refinishing facilities, and how they regulate the automotive refinishing industry. We have attended several CAPCOA Toxics Subcommittee meetings.

Also, staff requested information on coatings regulations in other states, contacting air pollution control agencies to obtain information on regulatory requirements for the use of hexavalent chromium and cadmium in automotive coatings.

C. DATA COLLECTION TOOLS USED TO ASSIST IN REPORT PREPARATION

Efforts to obtain data for this ATCM include requesting data from each air district in California and developing the 2001 survey.

1. District Survey

On December 18, 2000, we solicited the input and participation of each air district via a written request to all Air Pollution Control Officers. To assist in ATCM development, we requested information regarding automotive refinishing facilities and the composition of automotive coatings in use at these facilities. We also requested information on control devices, risk assessment data, and the use of hexavalent chromium- and cadmium-free automotive coatings.

2. Manufacturer Survey

In February 2001, we mailed the 2001 survey to coating manufacturers known to sell products in California. The 2001 survey included automotive coatings containing hexavalent chromium or cadmium, and existing alternatives to these automotive coatings. The 2001 survey requested formulation, sales, and cost data on automotive coatings sold in California in 2000. The 2001 survey was distributed to 58 companies and made available in both hard copy and electronic format.

III. PHYSICAL CHARACTERISTICS, SOURCES AND AMBIENT CONCENTRATIONS OF HEXAVALENT CHROMIUM AND CADMIUM COMPOUNDS

This chapter summarizes information on the physical properties, sources and emissions, ambient concentrations, atmospheric persistence, and air toxics "Hot Spots" (AB 2588) risk assessment information for hexavalent chromium and cadmium. The information is derived from ARB's 1997 reference report unless otherwise noted (ARB, 1997). This chapter also discusses the presence of these compounds in other environmental media as it was presented in the technical support document for either the proposed identification of the compound as a TAC, the Air Toxic Contaminant Identification list summaries (ARB, 1997), the *Proposed Airborne Toxic Control Measure for Hexavalent Chromium for Cooling Towers*, and/or the *Proposed Airborne Toxic Control Measure for Emission of Toxic Metals From Non-Ferrous Metal Melting* (ARB 1992).

A. HEXAVALENT CHROMIUM AND HEXAVALENT CHROMIUM COMPOUNDS

1. Physical Properties

Chromium is an odorless, steel-gray, hard metal that is lustrous and takes a high polish. It is extremely resistant to corrosive agents. Chromium can exist in water in several different states, but under strongly oxidizing conditions may be converted to the hexavalent state and occur as chromate anions. Chromium is soluble in dilute hydrochloric acid and sulfuric acid, but not nitric nor strong alkalis or alkali carbonates (ARB 1997). See Table III-1 for information on the physical properties of chromium.

Chromium metal is not found in nature, but is produced principally from the mineral chromite (chrome ore). Chromite contains chromium in the +3 oxidation state, or chromium (III). Chromium combines with various other elements to produce compounds, the most common of which contain either chromium (III), which is trivalent (the +3 oxidation state), or chromium (VI), which is hexavalent (the +6 oxidation state) (ARB, 1997). Chromium (III) compounds are sparingly soluble in water, while most chromium (VI) compounds are readily soluble in water (ARB, 1997). Chromium forms a number of compounds in other oxidation states, however, those of +2 (chromous), +3 (chromic) and +6 (chromates) are the most important (ARB, 1997).

Chromium (VI) compounds are produced industrially by heating chromium (III) compounds in the presence of mineral bases (such as soda ash) and atmospheric oxygen. Most chromium (VI) solutions are powerful oxidizing agents under acidic conditions, but much less oxidizing under basic conditions. Depending on the concentration and acidity, chromium (VI) can exist as either chromate ion (CrO_4^{-2}), or as dichromate ion ($Cr_2O_7^{-2}$) (ARB, 1997). Chromium (VI) is virtually always bound to oxygen in ions such as chromates (CrO_4^{-2}) and dichromates ($Cr_2O_7^{-2}$). Chromium (VI) ions are strong oxidizing agents and are readily reduced to chromium (III) in acid or by organic matter.

TABLE III-1. - PHYSICAL PROPERTIES OF HEXAVALENT CHROMIUM	
SYNONYMS: CHROME	
Atomic Weight:	51.966
Atomic Number:	24
Valences:	1 - 6
Boiling Point:	2642 ^oC
Melting Point:	1900 ^oC
Vapor Pressure:	1 mm Hg at 1616 ^oC
Density/Specific Gravity:	7.14
(ARB, 1997)	

Below is a summary of the properties of hexavalent chromium compounds typically found in automotive coatings. Based on the 2001 survey, the most common compound used in automotive coatings is lead chromate.

Lead Chromate(VI): Chrome yellow; Cologne yellow; King's yellow; Leipzig yellow, Paris yellow; C.I. Pigment Yellow 34; C.I. 77600. CrO_4Pb; Molecular weight 323.22. Cr 16.09%, O 19.80%, Pb 64.11%. $PbCrO_4$. Occurs in nature as the minerals *crocoite*, *phoenicochroite*. Reference: Color Index Vol. 4 (3rd edition; 1971)P 4677. Yellow or orange-yellow powder. d 6.3 Melting point 844 ^0C. It is one of the most insoluble salts (0.2 mg/1 H_2O). Insoluble in acetic acid; soluble in solutions of fixed alkali hydroxides, in dilute HNO_3. LD_{75} i.p. in guinea pigs: 156 Mg/Kg, *Handbook of Toxicology* Vol.1, W.S. Vol.1, W.S. Spector, Ed. (Saunders, Philadelphia, 1956) pp176-177. Use: as a pigment in oil and water colors, printing fabrics, decorating china and porcelain; in chemical analysis of organic substrates; in traffic paints. Note: Basic lead chromates of various shades of color from brown-yellow to red are used as pigments.

Lead Chromate (VI) Oxide: *Chromic Acid Lead-(2+) salt (1:2);* Basic lead chromate; red lead chromate; chrome red; chromium lead oxide; Persian red, Australian cinnabar. $CrPb_2O_5$; molecular weight 546.40. Cr 9.52%, Pb 75.84%, O 14.64%. $Pb_2(CrO_4)$ O. Red powder. Insoluble in water. Use: as pigment.

Calcium Chromate(VI): Calcium chrome yellow, gelbin; yellow ultramarine C.I. 77223; C.I. Pigment yellow 33. $CaCrO_4$; Molecular weight. 156.09. Ca 25.68%, Cr 33.32%, O 41.00%. Also occurs as hemihydrate, monohydrate and dehydrate. Yellow monoclinic or rhombic crystals. Sparingly soluble in water; soluble in dilute acids; practically insoluble in alcohol. Use: as a pigment, corrosion inhibitor; manufacturing of chromium; in oxidizing reactions; in battery depolarization.

Zinc Chromate(VI) Hydroxide: Zinc yellow, buttercup yellow; C.I. Pigment Yellow 36. A basic salt of somewhat variable composition. Approximately $Zn_2CrO_4(OH)_2$. Hydrate, yellow, odorless powder. Slightly soluble in water; soluble in dilute acids, including acetic acid. Use: as pigment in paints, varnishes, oil colors, linoleum, rubber, etc.

Strontium Chromate(VI): CrO_4Sr; molecular weight 203.64. Sr 43.03%, Cr 25.54%, O 31.43%. $SrCrO_4$. Yellow powder. D 3.89 Soluble in 840 parts cold water, about 5 parts boiling water; freely soluble in dilute hydrochloric, nitric, or acetic acids. Use: Corrosion inhibitor in pigments; in electrochemical process to control sulfate concentration of solutions.

Barium Chromate(VI): C.I. 77103; C.I. Pigment Yellow 31; baryta yellow, lemon yellow, permanent yellow; Steinbuhl yellow; ultramarine yellow. $BaCrO_4$; Molecular weight 253.37. Ba 54.21%, Cr 20.53%, O 25.26%. Yellow heavy monoclinic, orthorhombic crystals. *Poisonous!* D 4.50. practically insoluble in water, dilute acetic or chromic acids; dissolved or decomposed by mineral acids. Use: As a pigment, almost entirely in anticorrosion jointing pastes to prevent electro-chemical corrosion at junctions of dissimilar metals; some use in artists' colors and in coloring glass, ceramics, and porcelain. Also used in metal and primers, and pyrotechnic compositions.

Sodium Dichromate(VI): Sodium bichromate, bichromate of soda. $Na_2Cr_2O_7$; molecular weight 261.96. Cr 39.07%, Na 17.55%, O 42.75%. $Na_2Cr_2O_7$. Dihydrate, reddish to bright orange, somewhat deliquescent crystals. Crystal system: monoclinic sphenoidal. Crystal habit: Elongated prismatic. Bulk density: 96 lbs./cu.ft. Becomes anhydrous on prolonged heating at 100 ^oC. The anhydrous salt melting point 356.7 ^oC. starts to decompose at about 400 ^oC. Heat of solution - 28.2 cal/g. Very soluble in water. Solutions are acidic: pH of 1% solution: 4.0; pH of 10% solution: 3.5. Use: Oxidizing agent in manufacturing of dyes, many other synthetic organic chemicals, inks, etc.; in chrome-tanning of hides; in electric batteries; bleaching fats, oils, sponges, resins; refining petroleum; manufacturing chromic acid, other chromates and chrome pigments; in corrosion-inhibitors, corrosion inhibiting paints; in many metal treatments, electro-engraving of copper; mordant in dyeing; for hardening gelatin; for the defoliation of cotton plants and other plants and shrubs. Therapeutic category: Topical anti-infective.

2. Sources

Hexavalent chromium (chromium (VI)) is a permanent and stable inorganic pigment used for paints, rubber, and plastic products (ARB, 1997). The most commonly used form of hexavalent chromium is lead chromate. Lead chromate has historically been the pigment in the yellow paint used to mark traffic lanes. Chrome plating is another source of chromium (VI) emissions. Chromium VI emissions can also occur from firebrick lining of glass furnaces (ARB, 1997). Reported emissions of chromium (VI) from other stationary sources in California include electrical services, aircraft and parts manufacturing, and steam and air conditioning supply services (ARB, 1997).

3. Emissions

Hexavalent chromium emissions from stationary sources in California are estimated to be about 5,800 pounds per year. Total hexavalent chromium emissions in California are estimated to be about 7,600 pounds per year (ARB, 2001). Hexavalent chromium emissions from automotive coatings are estimated to be about 270 pounds per year (2001 survey).

4. Natural Occurrence

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases (ARB, 1997). Chromium (III) is a component of most soils. In areas of serpentine and peridotite rocks, chromite is the predominant chromium mineral. Deposits of five to ten percent chromite have been found in beach sands and streams in several California counties. Also, chromium has been found in non-serpentine areas of California at concentrations as high as 500 parts per million (ARB, 1997).

Chromium in soil is generally in an insoluble, biologically unavailable form, mainly as the weathered form of the parent chromite or as the chromium (III) oxide hydrate. Weathering and wind action can transport soil chromium to the atmosphere; generally, such mechanical weathering processes generate particles greater than ten micrometers in diameter, which have significant settling velocities. The extent to which natural sources of chromium contribute to measured ambient chromium levels in California is not known. Ambient chromium derived from soil is expected to exist as chromium (III) (ARB, 1997).

5. Ambient Concentrations

Chromium compounds and chromium (VI) are routinely monitored by the statewide ARB air toxics network. The monitoring results indicate that chromium (VI) concentrations have declined in recent years. The average chromium (VI) concentration has decreased by approximately 64% from 0.33 ng/m^3 in 1991 to 0.12 (ng/m^3) in 1999. The concentrations monitored in 1999, ranged from 0.2 ng/m^3 to 0.70 ng/m^3 (ARB, 2000). For chromium (VI) monitoring, the limit of detection is 0.2 ng/m^3. However, monitoring results below the limit of detection are assumed to be one-half the limit of detection or 0.1 ng/m^3.

Data on ambient concentrations of chromium (VI) indicate that chromium (VI) comprises three to eight percent of total ambient chromium concentrations. Chromium in ambient air has been reported to contain principally respirable particulates, with a mass median diameter of about 1.5 to 1.9 micrometers (ARB, 1997).

6. Indoor Sources and Concentrations

The extent of exposure to airborne chromium in the indoor environment, other than in the workplace, is not known. There are no direct consumer uses of chromium that could lead to indoor emissions of chromium compounds. Although cigarettes are known to contain chromium, the intake of chromium from smoking is not known (ARB, 1997).

In a field study conducted in Southern California, investigators collected particles (PM_{10}) inside 178 homes and analyzed the particle samples for selected elements, including chromium. Two consecutive 12-hour samples were collected inside and immediately outside of each home. Chromium was present in measurable amounts in less than 25 percent of the indoor or outdoor samples (ARB, 1997).

A study in Southern California measured chromium inside vehicles during the summer of 1987 and winter of 1988. An average chromium concentration of 12 ng/m^3 and a maximum concentration of 41 ng/m^3 were measured (ARB, 1997).

7. Atmospheric Persistence

Atmospheric reactions of chromium compounds were characterized in field reaction studies and laboratory chamber tests. These results demonstrated an average experimental half-life of 13 hours (ARB, 1997). Physical removal of chromium from the atmosphere occurs both by atmospheric fallout (dry deposition) and by washout and rainout (wet deposition). Measurements have shown that most chromium deposition occurs through wet deposition. Chromium particles of less than five micrometers (aerodynamic equivalent) diameter may remain airborne for extended periods of time, allowing long distance transport by wind currents. Because of this, meteorological conditions can play a significant role in the dispersion of chromium emitted from some sources (ARB, 1997).

B. CADMIUM AND CADMIUM COMPOUNDS

1. Physical Properties

Cadmium is a malleable, silver-white, odorless metal. Cadmium is produced as a byproduct of zinc, lead or copper ore smelting (ARB, 1997). Cadmium is insoluble in water. It is soluble in acid ammonium nitrate, but not in sulfuric acid (ARB, 1997). The most common oxidation state of cadmium is +2, although a few cadmium compounds occur in the +1 oxidation state (ARB, 1997). See Table III-2 for information on the physical properties of cadmium. Cadmium compounds range in solubility in water from quite soluble to practically insoluble (ARB, 1997). In its elemental form, cadmium is resistant to corrosion by alkalis and salt water, and retains its metallic luster in air.

TABLE III-2. - PHYSICAL PROPERTIES OF CADMIUM	
SYNONYMS: COLLOIDAL CADMIUM	
Atomic Weight:	112.41
Atomic Number:	48
Valence:	2
Boiling Point:	765 ^oC
Melting Point:	321 ^oC
Vapor Pressure:	1 mm Hg at 394 ^oC
Density/Specific Gravity:	8.65 at 25 ^oC (water = 1)
(ARB, 1997)	

Cadmium Sulfide: Capsebon. CdS; molecular weight 144.47. Cd 77.81%, S 22.19%. Occurs in nature as the mineral greenockite. Light yellow or orange-colored cubic or hexagonal crystals. The light-yellow variety is also known as Cadmium Yellow or Jaune Brilliant. Sublimes at 980 ^oC. Solubility in water (18^o) 0.13 mg/100 g. Soluble in concentrated or warm dilute mineral acids with evolution of H_2S, readily decomposed and dissolved by moderately dilute HNO_3. Use: as a pigment being fast to light and not affected by H_2S; color for soaps; coloring glass yellow; coloring textiles, paper, rubber; in printing inks, ceramic glazes, fireworks; in phosphors and fluorescent screens; in scintillation counters, semiconductors, and photoconductors. Therapeutic category: dermatological.

2. Sources

Cadmium compounds are used in the metal plating and in battery manufacturing industries. Cadmium sulfide and sulfoselenide are used in pigments. Cadmium compounds are used as stabilizing agents in many polyvinyl chloride products. Cadmium sulfide and cadmium telluride are used in the electronics industry to produce photocells and light emitting diodes. Cadmium metal alloyed with copper is used in the production of motor vehicle radiators. Cadmium sulfide is also used as a curing agent in tires (ARB, 1997). Cadmium acetate is used in ceramics, textile dyeing, printing, and electroplating. Cadmium bromide is used in photography, engraving, and lithography. Cadmium chloride is used in dyeing and printing of fabrics, in electronics component manufacture, and in photography. Cadmium oxide is used in electroplating, manufacture of cadmium electrodes, in semiconductors, and in glass and ceramic glazes (ARB, 1997). Cadmium is a component of diesel fuel, gasoline, and lubricating oil. Also, it is present in vehicle tires and consequently in the particles resulting from tire wear (ARB, 1997).

As of February 22, 1983, cadmium sebacate and cadmium succinate are no longer registered for pesticide use in California. Also, as of January 15, 1985, cadmium chloride is no longer registered for pesticide use in California (ARB, 1997).

The primary stationary sources that have reported emissions of cadmium in California are electrical services, gold and silver ore mining, and structural clay products manufacturing (ARB, 1997).

The ARB has become aware, through the 2001 survey responses and discussions with coating manufacturers, that the use of cadmium compounds in automotive coatings has been voluntarily phased out (2001 survey).

3. Emissions

Cadmium emissions from stationary sources in California are estimated to be about 3,600 pounds per year (ARB, 2001). Total cadmium emissions in California are estimated to be about 12,900 pounds per year (ARB, 2001). Based on the 2001 survey results, we expect minimal or no emissions of cadmium from automotive coatings (2001 survey). Thus, the proposed ATCM would prevent the reintroduction of cadmium compounds into automotive coatings.

4. Natural Occurrence

Coal and other fossil fuels contain cadmium and their combustion releases the element into the environment. Cadmium occurs in sulfide ore (greenockite) containing zinc sulfide and with lead and copper ores containing zinc. Cadmium has been detected in carbonaceous shales and phosphatic rock. Volcanic emissions contain cadmium-enriched aerosols (ARB, 1997).

5. Ambient Concentrations

ARB's statewide air toxics network periodically monitors cadmium and its compounds. The air toxic's network's mean concentration of cadmium, including its species from January 1996 through December 1996, is estimated to have been 0.252 ng/m^3 (ARB, 2000). The concentrations ranged from 0.025 ng/m^3 to 1.900 ng/m^3 (ARB, 2000).

When cadmium and cadmium compounds were formally identified as a TAC, ARB estimated a population-weighted annual concentration for ten million people of between 1.0 and 2.5 ng/m^3, of which one million people are exposed to an average cadmium concentration between 1.8 and 5.6 ng/m^3 (ARB, 1997).

6. Indoor Sources and Concentrations

Environmental tobacco smoke is an indoor source of cadmium (ARB, 1997). In a field study conducted in Southern California, investigators collected particles (PM_{10}) inside 178 homes and analyzed the particle samples for selected elements, including cadmium. Two consecutive 12-hour samples were collected inside and immediately outside of each home. Cadmium was present in measurable amounts in less than ten percent of the samples (ARB, 1997).

A Southern California in-vehicle study measured an average cadmium concentration of 1 ng/m^3 and a maximum concentration of 8 ng/m^3 (ARB, 1997).

7. Atmospheric Persistence

Cadmium and cadmium compounds are expected to be particle-associated in the atmosphere, and hence subject to wet and dry deposition. The average half-life and lifetime for particles and particle-associated chemicals in the atmosphere is estimated to be about 3.5 to 10 days and 5 to 15 days, respectively (ARB, 1997).

IV. SUMMARY OF MOTOR VEHICLE AND MOBILE EQUIPMENT REFINISHING OPERATIONS

This chapter provides a general overview of automotive coating operations and a brief description of coating types used in these operations.

A. OVERVIEW

Most automotive refinishing operations are conducted at body shops. The majority of body shops are small businesses operating as job shops, meaning that they paint single vehicles for individual customers.

Repair of a motor vehicle or mobile equipment surface includes vehicle preparation prior to coating application. Vehicle preparation may start with bodywork, which is the repair or replacement of metal and plastic components. Subsequent to surface repair and prior to coating application, extensive effort is put into preparing and cleaning the plastic or metal surface to be refinished to assure proper adhesion of the various automotive coatings and appearance of color uniformity. (ARB, 1996)

For many sources, coating application is conducted in spray booths, which are fire and health protective enclosures designed to provide a positive movement of air through the spray area. (Binks) Spray booths are equipped with filters or water curtains, which capture most of the solids not deposited on the vehicle and adjacent surfaces. The most commonly used type of spray booth is the filter type, where air movement causes volatile organic compounds (VOC) to be carried to the atmosphere and most solid particles to be captured in the filter system. (ARB, 1996) A spray booth allows for improved finish quality, both by providing a clean work environment, and through the removal of overspray, which prevents contamination of other work in the area. (Binks)

B. SPRAY EQUIPMENT

In January 1991, the Board issued a Determination of Reasonably Available Control Technology (RACT) and Best Available Retrofit Control Technology (BARCT) for Automotive Refinishing Operations. This guidance document specified the use of high-volume low-pressure (HVLP) spray equipment or other equipment that will achieve at least 65% transfer efficiency. (ARB, 1991)

Prior to this time, what are referred to as “conventional” guns were the most widely used type of spray gun in the motor vehicle and mobile equipment refinishing industry. Conventional spray guns transfer the atomized coating to the substrate at a high velocity, causing violent air turbulence to occur at the surface of the substrate and forcing much of the atomized coating away from the surface to be coated. Conventional spray guns are available in either siphon tube fed or gravity fed configurations. The major design difference between the gravity and siphon fed designs is the location of the paint cup. The cup is located on top of the gravity fed guns, as opposed to the siphon tube spray guns, which have the cup located below the body of the gun.

While the transfer efficiency of the gravity fed guns is slightly better than that of the siphon fed guns, both types of conventional guns have low transfer efficiency (IWRC, 1998).

Transfer efficiency is the percentage of material atomized through the gun that actually ends up as a coating on the desired surface. The transfer efficiency of any type of spray equipment is subject to change under a variety of conditions. Variables affecting transfer efficiency include:

- technician's spray technique;
- size and configuration of the object to be sprayed;
- distance of the gun from the object to be sprayed;
- size of air cap and nozzle used;
- air pressure at the tip;
- volume of material exiting the gun at the tip;
- volume of air leaving the tip;
- viscosity of the material being sprayed; and
- atmospheric conditions.

The atomization of automotive coatings by spray guns takes place in three separate stages. First, the paint is surrounded by a highly pressurized column of air. This air column causes turbulence to occur in the paint, which begins to separate the paint into small droplets. Next, the paint is forced through the fluid nozzle of the gun. Air is released through containment holes in the air cap, enhancing atomization of the coating. Finally, air is released from the horns of the air cap and comes in contact with the atomized paint. The sudden release of this high pressure air through the small openings of the nozzle breaks up the paint and propels the spray away from the gun.

HVLP spray equipment can be categorized as either turbine or non-turbine, and the non-turbine HVLP spray guns further subcategorized into gravity fed and siphon fed. HVLP turbine spray guns use columns of low-pressure air to cause turbulence within the paint as the first stage of atomization. The air used for the final step of atomization originates from high-volume turbine driven blowers. This air, transferred to the gun using large diameter air lines, is heated to assist in the atomization process. Reported transfer efficiency is very good, but the cost of HVLP turbine spray guns is high.

Non-turbine HVLP spray guns are the type most commonly used in automotive refinishing facilities that use HVLP guns. Non-turbine HVLP guns are more versatile and less expensive than their turbine counterparts, using only conventional shop compressed air for operation.

Low-pressure low-volume (LPLV) spray equipment, like non-turbine HVLP spray equipment, utilizes conventional shop air and does not require expensive turbine units. Unlike HVLP spray equipment, the first stage of atomization occurs within the LPLV spray gun. Air and paint are mixed inside an internal chamber of the air cap to further assist paint atomization. LPLV spray equipment has gained only minimal acceptance in the automotive refinishing industry. (IWRC, 1998)

C. SPRAY TECHNIQUE AND TRANSFER EFFICIENCY

In addition to the type of spray gun used, transfer efficiency depends to a large degree on the spray technician's skill and spraying techniques. In order to achieve the best finish, the technician must focus on the following variables:

- type of material to be sprayed;
- viscosity of material;
- thinner/reducer speed used;
- type of hardener or reactor used;
- addition of additives;
- booth air temperatures;
- booth air flow;
- paint gun orifice size;
- paint gun air cap style;
- paint gun adjustments (air, fluid, fan size);
- distance of the spray gun from the surface; and
- operator's spray gun speed.

Spray technicians should adjust spraying style for each specific job to compensate for the type of coating being sprayed, the atmospheric conditions, the size and shape of the object being coated and the spray equipment used. (IWRC, 1998)

D. MOTOR VEHICLE AND MOBILE EQUIPMENT COATINGS

Automotive coatings can be divided into two main categories, undercoats and topcoats. Undercoats are defined as all material applied over the substrate prior to the application of a topcoat, and topcoats are automotive coatings applied over the undercoat to impart the surface with its final color and gloss.

1. Undercoats

Undercoats may be categorized as prep coats, primer-surfacers, primer-sealers, or sealers.

a. Prep Coats

<u>Prep coats</u> are applied directly over bare metal or metal alloy, galvanized or plated metal, plastic or rubber substrates. The type of prep coat used will vary depending on the substrate and the type of coating to be applied over the prep coat. The primary function of a prep coat is to maintain a thin barrier between a metal surface and a subsequent waterborne primer to avoid pinpoint corrosion. In addition to providing corrosion resistance, the prep coat helps to promote maximum adhesion between the substrate and the subsequent coating. It is not intended for use to fill scratches. Prep coats are generally followed by a primer-surfacer.

Metal conditioners/conversion automotive coatings are acidic solution prep coats that clean the surface of the substrate, removing contaminants that would otherwise compromise the bond between the substrate and the undercoat. The metal conditioner is generally wiped on with a rag, and after two to four minutes neutralized with water, and dried. Following the metal conditioner, a conversion coating is applied to the substrate. This conversion coating, usually phosphoric acid, etches the metal to improve bonding with the primer-surfacer.

Wash-primers/vinyl wash primers were developed to eliminate one of the steps associated with metal conditioner and conversion coating systems. Wash primers contain either phosphoric acid or nickel dihydrogen phosphate, which forms an adherent phosphate coating when applied to steel and aluminum. The acid also removes rust, welding scale, and oil from the bare metal while etching the surface to insure good adhesion of the primer-surfacer. Some wash-primers are designed for use on most metal surfaces as well as plastic and rubber substrates. These wash-primers form a good bond between the topcoat and the plastic or rubber surfaces, which often pose adhesion problems.

Zinc phosphate primers deposit a phosphate coating on the surface to provide protection from moisture. A light coat of zinc phosphate is sprayed on the metal surface and allowed to dry for 30 to 60 minutes. Zinc phosphate primers, in their reduced form, have a high VOC level. In addition, they are not recommended for use as a primer under many waterborne primer-surfacers.

Self-etching primers provide corrosion resistance and promote adhesion to bare metal substrates. These are usually two-component automotive coatings with a relatively high VOC content.

Epoxy primers are two component primers, either solvent-based or waterborne, that can be used as a primer, primer-surfacer, primer-sealer, or adhesion promoter. Some of these primers contain lead and chrome, and their activators may contain isocyanates.

Adhesion promoters offer improved adhesion to rubber, plastic, and painted surfaces. They do not provide corrosion protection and should not be used over bare metal substrates. (IWRC, 1998)

b. Primer-Surfacers

Primer-surfacers are high-solids automotive coatings applied over prep coats. Primer-surfacers function to provide adhesion between the prep coat and the material to be applied over the primer-surfacers. They provide corrosion protection, act as a filling material to cover minor surface flaws, and provide a surface that can be easily sanded to a smooth surface. Many primer-surfacers still contain hexavalent chromium and lead.

Acrylic lacquer primer-surfacers dry quickly and have good filling capabilities, but these primers are not generally recommended for large jobs due to their poor durability and lack of compatibility with the majority of today's topcoat systems.

Alkyd synthetic enamel surfacer-primers have good holdout properties and corrosion resistant qualities. They produce a flexible, chip-resistant base for topcoats and are less likely than lacquer-based products to adversely affect sensitive substrates. Due to their slow dry-time, alkyd enamel primer-surfacers are not typically used for spot-repair operations, but rather for large panel surfaces and complete paint jobs.

Self-etching primers (as a primer-surfacer) are usually two-component primers that provide good corrosion resistance with fair filling qualities and relatively fast dry time.

One-component waterborne primer-surfacers possess excellent high building properties and hold-out capabilities. These primer-surfacers have a relatively slow dry time.

Epoxy primers (as a primer-surfacer) produce a tough surface which provides a durable base for topcoats, and possess excellent filling and hold-out capabilities.

Polyester primer-surfacers contain polyester resins which, when cured, form a durable surface with excellent high build qualities and minimal shrinkage. These primer-surfacers generally do not sand as easily as other primer-surfacers and have a relatively long curing time. The topcoats that can be applied to these primer-surfacers are usually limited to the newer polyurethanes.

Acrylic urethane enamel primer-surfacers were developed for the newer high-tech topcoats. They provide high build characteristics with little or no shrinkage, and a relatively long cure time. (IWRC, 1998)

c. Primer-Sealers

Primer-sealers improve adhesion of the topcoat and provide a seal between the primer and the topcoat to prevent solvent penetration. Primer-sealers differ from primer-surfacers in two basic areas. First, primer-sealers fill only very minor surface imperfections. Second, they should not be sanded prior to the application of a topcoat. Primer-sealers provide corrosion resistance, promote adhesion to bare metal substrates, seal sanded surfaces to prevent solvent penetration and bleed through, and provide a neutral-colored base for easy topcoat coverage.

Lacquer primer-sealers produce fair filling qualities with good adhesion properties, and are designed to be topcoated with lacquer topcoats. Lacquer primer-sealers are commonly used for spot repair and small paint jobs, but are not generally used for large surface coating operations.

Enamel type primer-sealers also have fair filling qualities with good adhesion and holdout properties. These primer-sealers are generally used for large panel or complete paint jobs, and only one coat is generally needed prior to application of the topcoat.

Single component waterborne primer-surfacers (as a primer-sealer) possess excellent high building qualities and work well as barrier coats with excellent holdout properties. Many can be used on flexible parts without the addition of a flex agent. Because water is the primary solvent, these products have relatively long flash and cure times.

Epoxy primers (as a primer-sealer) provide a tough durable base for the application of all topcoats, with excellent holdout capabilities.

Acrylic urethane primer-sealers impart high build characteristics with little or no shrinkage. They also have superior holdout properties which make them an excellent primer-sealer. Urethanes must usually be topcoated within 24 hours to avoid the need for sanding and recoating. (IWRC, 1998)

d. Sealers

Sealers are applied prior to the topcoat, if necessary. Sealers provide adhesion between the topcoat and the surface, provide a neutral colored base for easy coverage, seal sanded surfaces to prevent solvent penetration, and fill minor surface imperfections.

In general, sealer types include lacquer sealers, enamel sealers, and urethane sealers. These sealers are intended to be coated by lacquer, enamel, and urethane topcoats, respectively, and generally require only one coat prior to application of the topcoat. In addition to general sealers, there are specialty sealers available for use on specific problem surfaces:

Tie coat sealers are used to achieve extra adhesion between lacquer topcoats and factory enamel finishes.

Barrier coat sealers are applied over very sensitive and/or checked surfaces. These sealers prevent lifting or checking of the new topcoat.

2. Topcoats

Topcoats are applied directly over an undercoat, which may be a prep coat, primer-surfacer, primer-sealer, or sealer. Topcoats include paints and clears that determine the final color, gloss and durability of the finished area. Topcoats come in single, and two coat (basecoat/clearcoat) systems including solid colors and metallics.

Solid color topcoats are made up of solvents, binders, and opaque pigments that produce the color of the finish. Metallic finishes contain the same components as the solid color topcoats, but also contain small metallic, polychrome or mica flakes that refract light. These finishes are among the most difficult to color match. Many paint companies offer the option of high-solids colored or clear topcoats. Generally only one to three coats are needed to achieve adequate coverage using high solids paints. (IWRC, 1998)

a. Single Stage Topcoats

Acrylic lacquer topcoats are most commonly used for small spot repair operations, and produce a hard, brittle finish. Acrylic lacquer topcoats yield dull, rough finishes which must be polished to achieve a smooth, high gloss finish. Usually four to five coats of lacquer are applied to insure proper paint thickness after polishing.

Alkyd enamels dry in a two stage curing process, and are the least durable of the automotive topcoats.

Acrylic enamels are used for both spot repair and overall painting operations, and offer more durable finishes and faster drying times than the alkyd enamels.

Polyurethane enamels are a two part painting system requiring the addition of a hardener or reactor (the second component) to assure proper curing of the coating. Polyurethane topcoats have good spraying characteristics and metallic flow properties. They produce a high gloss, chemically resistant finish that will withstand UV radiation.

Acrylic urethane enamels produce an extremely durable finish. They have a relatively high VOC content, but generally only two coats of these topcoats are required to produce a quality finish. (IWRC, 1998)

b. Two Stage Topcoats

The first stage of the finish, the basecoat, contains the pigments that give the finish the desired color. In the case of metallic finishes, the basecoat also contains the "metallic" flakes. The second stage of the finish is the clearcoat, a durable finish that protects the basecoat.

The purpose of the basecoat is to achieve the desired color tint and metallic appearance. Basecoats do not contain the additives needed to withstand chemical and ultraviolet deterioration, or the chemicals necessary to achieve a high gloss surface. Basecoats are typically acrylic enamel, polyester, or urethane, and are designed to be easy spraying and quick drying to keep the base free of dirt and other contaminants. The quick-drying effect also locks the metallic flakes in position to achieve a mottle-free finish.

To protect the basecoat, a durable clearcoat finish is applied. This clear coating can often be applied over the basecoat after only 15 to 30 minutes of cure time. Clearcoats are typically acrylic urethane or polyurethane automotive coatings, although acrylic enamel and lacquer clears are also available. Clearcoats are designed to flow upon application, resulting in a smooth, glass-like finish in as few as two coats. (IWRC, 1998)

E. PAINT ADDITIVES

In addition to chemical hardeners and flex additives, there are many other paint additives available. These include flatting compounds, accelerators, retarders, color blenders and fisheye eliminators. (IWRC, 1998)

V. EMISSIONS OF HEXAVALENT CHROMIUM, CADMIUM AND LEAD FROM MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERATIONS

A. OVERVIEW

In April 2001, ARB conducted a survey of manufacturers of automotive coatings. The 2001 survey collected formulation, sales, and cost data on automotive coatings sold in California which contain hexavalent chromium and/or cadmium, as well as alternatives to the automotive coatings. A copy of the 2001 survey forms and instructions is included in Appendix B. The 2001 survey was distributed to 58 companies identified by the ARB as potential manufacturers of automotive coatings. Staff made numerous attempts to get information from non-responding companies known to manufacture automotive coatings. With the exception of one company, the companies that did not respond to the survey account for a small percentage of the total automotive coatings market.

This chapter presents estimates of the emissions of hexavalent chromium, cadmium, and lead and the total volumes of chromated automotive coatings sold in California in 2000. Emission estimates are based on the 2001 survey responses from manufacturers, adjusted to reflect complete market share. The market share adjustments are based on discussions with industry representatives (2001 survey, NPCA).

B. COATING MANUFACTURERS SURVEY FINDINGS

- 20 companies responded to the 2001 survey;
- 8 of the 20 responding companies produce automotive coatings that contain hexavalent chromium;
- Based on discussions with the National Paint and Coatings Association (NPCA), staff estimates that the 8 companies represent approximately 60 percent of the coatings market;
- 7 of the 8 companies that use hexavalent chromium in automotive coatings also manufacture alternative automotive coatings; and
- None of the manufacturers responding to the 2001 survey reported any use of cadmium in automotive coatings.

C. ANALYSIS OF SURVEY DATA

To more accurately represent the impact of the proposed ATCM, staff adjusted the 2001 survey results to account for the companies that did not respond. The numbers that staff adjusted are labeled as such. Staff assumed the companies that did not respond to the 2001 survey sold automotive coatings with the same sales-weighted average hexavalent chromium and lead content as those companies that did respond. We also assumed that the chromated and alternative coating sales were proportional to the companies' market shares.

The automotive coatings containing hexavalent chromium are grouped into three categories; primers, packaged colors, and tints. A total of 95 automotive coatings were reported to contain hexavalent chromium; 22 primers, 13 packaged colors, and 60 tints. The hexavalent chromium content in the primers ranged from 0.003% to 1.86%, with a sales-weighted average of 0.30%. The hexavalent chromium content in the packaged colors ranged from 0.39% to 2.66%, with a sales-weighted average of 1.02%. The hexavalent chromium content in the tints ranged from 1.31% to 8.67%, with a sales-weighted average of 3.68%. It should be noted that the hexavalent chromium contents reported for the primers and tints are greater than the contents in the automotive coatings as applied. This is the case, because the primers and tints are diluted with other ingredients prior to use.

Based on the adjusted survey results, a total of 35,300 gallons of automotive coatings were sold in California in 2000 that contained hexavalent chromium. Primers accounted for most of the sales (24,600 gallons), followed by tints (9,700 gallons), and packaged colors (1,000 gallons).

Manufacturers reported 37 automotive coatings as direct alternatives to automotive coatings that contain hexavalent chromium. Based on the adjusted survey results, 18,500 gallons of the alternative coatings were sold in California in 2000.

1. Emissions of Hexavalent Chromium

Based on the adjusted survey results, 4,860 pounds of hexavalent chromium were used in automotive coatings sold in California in 2000. Most of the hexavalent chromium use occurred in tints. The tints contained 4,130 pounds of hexavalent chromium, while the primers contained only 640 pounds of hexavalent chromium. The packaged colors contained the remaining 90 pounds of hexavalent chromium used.

We estimate that 270 pounds of hexavalent chromium were emitted into the atmosphere from the use of automotive coatings. To estimate the emissions, all automotive coatings were assumed to be applied with high-volume low-pressure (HVLP) spray guns. Tints and packaged colors were assumed to be applied in a spray booth. Primers were assumed to be applied outside of a spray booth (in a prep station). Based on the *CAPCOA Air Toxics "Hot Spots" Program Auto Bodyshop Industrywide Risk Assessment Guidelines* (September 1996), the fall out fraction of particulates (e.g., hexavalent chromium) in a spray booth is 80 percent. The 80 percent fall out fraction includes an estimated 65 percent transfer efficiency for the HVLP spray gun, and a 15 percent fall out from spray booth containment. Thus, only 20 percent of the hexavalent chromium emissions are vented to the spray booth filters. The spray booth was assumed to have paper filters with a 95 percent control efficiency for hexavalent chromium emissions. Based on these assumptions, the spray booth has an overall control efficiency of 99 percent for hexavalent chromium emissions. Because the primers are applied outside of a spray booth, we assumed that hexavalent chromium emissions from primer applications are controlled by 65 percent (the transfer efficiency of the HVLP spray gun).

2. Emissions of Cadmium

There were no reported sales of automotive coatings in California in 2000 that contained cadmium. This finding is consistent with the industry's assertion that the use of cadmium in automotive coatings has been declining over the last several years (2001 survey).

3. Emissions of Lead

While removal of lead is not specifically required by the proposed ATCM, the most common chromium compounds used in these automotive coatings are lead chromate, lead chromate - molybdate, and lead chromate - molybdate - sulfate. Thus, removing hexavalent chromium from automotive coatings will virtually eliminate lead emissions from the small fraction of the automotive coatings market affected by the proposed ATCM. As discussed in Chapter I, staff plans to evaluate the current use of lead in all automotive coatings and whether eliminating its use in these automotive coatings is feasible. The evaluation will be part of a comprehensive survey planned for 2002.

Based on the adjusted 2001 survey results, we estimate a total of 18,000 pounds of lead were used in chromated automotive coatings sold in California in 2000. We estimate that 560 pounds of lead were emitted into the atmosphere from the use of these automotive coatings. This estimate is based on the same assumptions that were used to calculate the hexavalent chromium emissions (described above).

VI. POTENTIAL HEALTH IMPACTS OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

This chapter presents an overview of the health risk assessment process, the potential health impacts from exposure to hexavalent chromium from coating activities, and information on alternative pigments. Also, addressed are the benefits of the proposed ATCM in terms of statewide emissions and potential health impacts, and a general discussion of workplace exposure.

A. AN OVERVIEW OF HEALTH RISK ASSESSMENT

A health risk assessment (HRA) is an evaluation or report that a risk assessor develops to describe the potential a person or population may have of developing adverse health effects from exposure to a facility's emissions. Some health effects that are evaluated include cancer, developmental effects, or respiratory illness. The pathways that are included in a HRA depend on the toxic air pollutants that a person (receptor) may be exposed to, and can include breathing, the ingestion of soil, water, crops, fish, meat, milk, and eggs, and dermal exposure. According to the CAPCOA Auto Bodyshop Industrywide Risk Assessment Guidelines, 97 to 99 percent of the total potential cancer risk associated with exposure to hexavalent chromium is due to exposure via inhalation. Therefore, for this HRA, we evaluated the impacts of hexavalent chromium via the breathing or inhalation pathway only. The health impacts of cadmium were not evaluated because, based upon the 2001 survey results, cadmium is no longer used in automotive coatings. However, general information on cadmium's health effects is presented.

Generally, to develop a HRA, the risk assessor would consider information developed under the following four steps:

Step 1 - Hazard Identification

The risk assessor determines if a hazard exists, and if so, identifies the pollutant(s) and the type of effect, such as cancer or respiratory effects. Hexavalent chromium and cadmium have been formally identified by the Board as TACs without threshold exposure levels below which adverse health effects are not anticipated.

Step 2 - Dose-Response Assessment

The risk assessor characterizes the relationship between a person's exposure to a pollutant and the incidence or occurrence of an adverse health effect. A dose-response assessment is requested by ARB from the Office of Environmental Health Hazard Assessment (OEHHA). OEHHA supplies the dose-response relationships in the form of cancer potency factors or unit risk factors (URF) for carcinogenic effects and reference exposure levels (REL) for non-carcinogenic effects.

The URFs and RELs that are used in California can be found in one of three references: (1) The *California Air Pollution Control Officer's Association (CAPCOA) Air Toxics "Hot Spots" Program Risk Assessment Guidelines, October 1993*; (2) The *OEHHA Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part I, The Determination of Acute RELs for Airborne Toxicants, March 1999*; and (3) The *OEHHA Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors, April 1999* (ARB, 2000a)

Step 3 - Exposure Assessment

The risk assessor estimates the extent of public exposure by looking at who is likely to be exposed, how exposure will occur (e.g., inhalation and ingestion), and the magnitude of exposure. For coating activities, the persons that are most likely to be exposed include nearby residents or off-site workers located near the facility. On-site workers could be impacted by the emissions; however, they are not included in this HRA because Cal/OSHA has jurisdiction over on-site workers. The magnitude of exposure was assessed through the following process. Emissions were quantified using emission factors from the *CAPCOA Auto Bodyshop Industrywide Risk Assessment Guidelines*, the 2001 survey, and input from industry representatives. Information such as physical dimensions of the source and receptor locations was obtained from air districts for facilities using chromated automotive coatings. Air dispersion modeling was used to provide downwind ground-level concentrations of the TAC.

Step 4 - Risk Characterization

The risk assessor combines modeled concentrations, which are determined through exposure assessment, with the URFs (for cancer risk) and RELs (for non-cancer effects) to quantify the potential cancer risk and non-cancer health impacts.

An URF is defined as the estimated upper-confidence limit (usually 95 percent) probability of a person contracting cancer as a result of constant exposure to a concentration of 1ug/m^3 over a 70-year lifetime. Conversely, using the URF for hexavalent chromium as an example, which was 1.5 E-1 $(ug/m^3)^{-1}$, the potential excess cancer risk for a person continuously exposed over a 70-year lifetime to 1 ug/m^3 of hexavalent chromium was estimated to be no greater than 150,000 chances in one million.

Hexavalent chromium is a very potent carcinogen in comparison to other common carcinogens. Unit risk factors for several common carcinogens including hexavalent chromium are listed in Table VI-1.

TABLE VI-1. - UNIT RISK FACTORS FOR COMMON CARCINOGENS	
COMPOUND	**UNIT RISK FACTOR $(ug/m^3)^{-1}$**
Dioxins	38
Chromium VI	0.15
Nickel	4.2E-3
1,3-Butadiene	3.3E-3
Ethylene Oxide	8.8E-5
Vinyl Chloride	7.8E-5
Ethylene Dibromide	7.1E-5
Carbon Tetrachloride	4.2E-5
Benzene	2.9E-5
Ethylene Dichloride	2.2E-5
Inorganic Lead	1.2E-5
Perchloroethylene	5.9E-6
Formaldehyde	6.0E-6
Chloroform	5.3E-6
Acetaldehyde	2.7E-6
Trichloroethylene	2.0E-6
Cadmium	4.2E-3
Methylene Chloride	1.0E-6
Diesel Exhaust	3.0E-4
Inorganic Arsenic	3.3E-3

A REL is used as an indicator of potential non-cancer adverse health effects, and a REL is defined as a concentration level at or below which no adverse health effects are anticipated. RELs are designed to protect the most sensitive persons in the population by including safety factors in their development, and can be created for both acute and chronic exposures. An acute exposure is defined as one or a series of short-term exposures generally lasting less than 24 hours. Consistent with risk assessment guidelines, one hour exposure is used to determine acute non-cancer impacts (CAPCOA 1993). Chronic exposure is defined as long-term exposure usually lasting from one year to a lifetime.

B. THE TOOLS USED FOR THIS RISK ASSESSMENT

The tools and information that are used to estimate the potential health impacts from a facility include an air dispersion model and pollutant-specific health effects values. Information required for the air dispersion model includes emission estimates, physical descriptions of the source, and emission release parameters. A combination of the output from the air dispersion model, and the pollutant-specific health values provide the estimate of the off-site potential cancer and non-cancer health impacts from the emission of a TAC. For this assessment, we estimated the potential health impacts from hexavalent chromium emitted during the coating of motor vehicles and mobile equipment. A brief description of the air dispersion modeling and pollutant-specific health effects values is provided below.

1. Air Dispersion Modeling

Air dispersion models are used to estimate the downwind, ground-level concentrations of a pollutant after it is emitted from a facility. The downwind concentration is a function of the quantity of emissions, release parameters at the source, and appropriate meteorological conditions.

2. Pollutant-Specific Health Effects Values

Dose-response or pollutant-specific health effects values are developed to characterize the relationship between a person's exposure to a pollutant and the incidence or occurrence of an adverse health effect. A URF or cancer potency factor is used when estimating potential cancer risks and RELs are used to assess potential non-cancer health impacts.

Exposure to hexavalent chromium and cadmium may result in both cancer and non-cancer health effects. The inhalation URFs and non-cancer chronic RELs that are used for this HRA are listed in Table VI-2. Non-cancer acute health effects have not been established for hexavalent chromium and cadmium. No RELs exist for acute health effects for these two TACs. Also included in Table VI-2 are the non-cancer chronic toxicological endpoints for hexavalent chromium and cadmium. Table VI-2 reflects the current OEHHA-adopted health effects values for these compounds.

TABLE VI-2. - POLLUTANT-SPECIFIC HEALTH EFFECTS VALUES USED FOR DETERMINING POTENTIAL HEALTH IMPACTS

COMPOUND	CANCER UNIT RISK FACTOR $(ug/m^3)^{-1}$	NON-CANCER REFERENCE EXPOSURE LEVELS (ug/m^3)		TOXICOLOGICAL ENDPOINTS	
		ACUTE	CHRONIC	Acute	Chronic
Hexavalent chromium	0.15	N/A	0.0020	N/A	Kidney and respiratory system
Cadmium*	0.0042	N/A	3.5	N/A	kidney; alimentary system and respiratory system

* While no cadmium use was reported in the survey, the information on cadmium is presented for completeness.

C. FACTORS THAT AFFECT THE OUTCOME OF A HEALTH RISK ASSESSMENT

Factors that affect the potential health impacts from facilities using automotive coatings that contain hexavalent chromium and/or cadmium compounds include:

- the concentration of hexavalent chromium and/or cadmium in the product(s) used;
- the facility operating schedule;
- product use;
- the physical dimensions of the facility; and
- local meteorology.

The combination of these factors will ultimately determine the potential health impact. Due to the variability of these factors, the potential health impacts can also vary. For example, if only the chromium content was to increase, and all other factors were held constant, the resulting potential health impacts would also increase.

D. SUMMARY OF THE POTENTIAL HEALTH IMPACTS OF HEXAVALENT CHROMIUM EMISSIONS FROM MOTOR VEHICLE AND MOBILE EQUIPMENT COATING FACILITIES

Since the 2001 survey results indicate that cadmium is not used in automotive coatings, the HRA discussion is limited to the potential health impacts of exposure to hexavalent chromium. This section presents analyses of the potential health impacts from facilities using automotive coatings that contain hexavalent chromium. The analyses include the results from four site-specific HRAs. For these facilities, the individual carcinogenic and chronic non-carcinogenic impacts at near-source locations were estimated. In addition, modeling was performed to estimate ground level concentrations of hexavalent chromium from generic facilities. Based on the modeling results of eight representative generic facilities, we estimated the volume of automotive coatings use that would result in cancer risks of 1, 10 and 100 in a million.

1. Actual Facility Risk Assessment

a. Air Dispersion Modeling Results

In this evaluation, we modeled average ambient concentrations for four facilities using the U.S. EPA, Industrial Source Complex Short Term (Version 00259) air dispersion model (ISCST3 model). The ISCST3 model estimates concentrations at specific locations around each facility, directly caused by each facility's emissions. The ISCST3 model is a Gaussian plume regulatory model. The ISCST3 model assumes that emissions are inert, and do not undergo chemical reactions between the source and receptor. In addition, the modeling options selected for this evaluation are based on the assumption that emissions do not fall-out or deposit on the ground or other surfaces. A list of these facilities is shown in Table VI-3.

TABLE VI-3. - FACILITY PARAMETERS							
FACILITY	STACK HEIGHT (M)	STACK DIAMETER (M)	STACK GAS TEMP. (°K)	STACK GAS VELOCITY (M/SEC)	OPERATION SCHEDULE	EMISSIONS (G/S)	EMISSIONS (LBS/YR)
F1	8.534	0.6096	294.1	22.64	M-F 8-12pm, 1-5pm	6.93e-04	11.4
F2	6.25	0.61	293	15.09	M-F 8-12pm, 1-5pm	9.00e-05	1.5
F3	1.828	0.762	295.22	10.34	M-F 8-12pm, 1-5pm	4.71e-07	7.8e-3
F4	3.96	0.6858	293	17.9	Mon-Sun 24 hr/dy	6.13e-08	4.2e-3

Glossary of Acronyms for Table VI-3: (M)=Meters (°K)=Degrees Kelvin (M/SEC)=Meters per second (G/S)=grams per second (LBS/YR) = Pounds per year.

Three different receptor networks were used for each of the facilities. The coarse grid covers a 30 kilometer (km) modeling domain centered over the source with 1 km grid cell spacing. The fine grid covers a 3 km modeling domain centered over the source with a 100 meter (m) grid cell spacing. The very fine grid covers a 300 m modeling domain centered over the source with a 10 m grid cell spacing. The very fine grid is used to locate the maximum impacted receptor. The coarse grid is used to estimate the population burden with a census tract overlay. The fine grid is used to evenly distribute the concentration gradient for receptors near the source in the course grid receptor field for the purpose of calculating the population burden.

Meteorological data from Stockton and Fresno are used for this simulation. Five years of hourly surface observations from Fresno for a period of 1960 – 1964 for source F2, and one year of 1976 data for Stockton for sources F1, F3, and F4 are input directly into the ISCST3 model. These data are the most recent preprocessed meteorological data that are readily available for use in the ISCST3 model. Holzworth seasonal averages are used for the upper air data.

b. Potential Health Impacts

Table VI-4 summarizes the maximum potential cancer and non-cancer health impacts at each of the four specific facilities. The receptor distance coordinates represent near source locations, where the maximum concentrations of chromium (VI) and maximum health impacts are expected to occur. Overall, Table VI-4 shows potential carcinogenic risks ranging from less than 1 to over 1,600 excess cancers per million. There are no acute health impacts since the acute REL value for chromium (VI) has not been established. Generally, hazard indices less than 1.0 are not considered to be a concern to public health. Facility F4 has the highest chronic hazard index of 5.4.

TABLE VI-4. - SUMMARY OF THE POTENTIAL HEALTH IMPACTS FROM THE SPECIFIC FACILITIES

FACILITY	MAX ANNUAL AVERAGE CONCENTRATION (UG/M*3)	POTENTIAL CANCER RISK (CHANCES PER MILLION)	ACUTE HAZARD INDEX	CHRONIC HAZARD INDEX
F1	0.01086472	1,630	N/A	5.4
F2	0.00118486	178	N/A	0.59
F3	0.00008326	12	N/A	0.042
F4	0.00000462	1	N/A	0.0023

Glossary of Acronyms for Table VI-4 - UG/M*3= Micrograms per Cubic Meter

2. Generic Facility Risk Assessment

a. Air Dispersion Modeling

We also performed a sensitivity test for a generic auto body shop facility using varying stack parameters. We used the ISCST3 model and meteorological data for Oakland for these simulations. We used five years of hourly surface observations for a period of 1960 – 1964. Two separate values for a stack height were used: 25 feet (ft) and 30 ft. Exit velocities also varied from 30 feet per second (ft/s) to 75 ft/s. We also modeled an emission source as a point and a volume source. A unit emission rate of one gram per second was used in this simulation. We used varying building configurations: 20 ft by 20 ft, 20 ft by 75 ft, and 75 ft by 75 ft, and a building height of 20 ft for all cases. The results indicate that different configurations of building dimensions do not make a significant difference in model results. The results of the sensitivity study are shown in Table VI-5.

TABLE VI-5. - SENSITIVITY STUDY FOR GENERIC AUTOBODY SOURCE CONFIGURATIONS			
TEST NO.	**MAX. X/Q ([mg/m^3]/[g/s])**	**SOURCE-RECEPTOR DISTANCE (M)**	**SOURCE CONDITIONS**
1	39.4	32	H=25 ft, Ex.vel.=30 fps, Stk.dia.=2.5 ft
2	21.5	41	H=25 ft, Ex.vel.=75 fps, Stk.dia.=2.0ft
3	27.3	41	H=30 ft, Ex.vel.=30 fps, Stk.dia.=2.5 ft
4	15.7	52	H=30 ft, Ex.vel.=75 fps, Stk.dia.=2.0 ft
5	32.6	41	H=30 ft, Ex.vel.=0
6	49.3	32	H=25 ft, Ex.vel.=0
7	208.9	22	Volume src.: H=5 ft, Sy=0.71, Sz=0.71
8	212.2	22	Volume src.: H=5 ft, Sy=0.35, Sz=0.71

Glossary of Acronyms for Table VI-5**:** μg/m^3 =Micrograms per cubic meter; g/s=Grams per second; H=Height of building in feet; ft=feet; Ex. vel.=exit velocity; fps=feet per second, src=source; Stk. dia.=Stack Diameter; Sy= X/Q= ground level concentration per unit of emissions rate; Sy: initial dispersion in the horizontal direction (Sy = Length/4.3); Sz: initial dispersion in vertical direction (Sz = Height/2.15).

b. Health Impacts from Generic Facilities

Based on eight generic facility scenarios, staff calculated the gallons of annual throughput of chrome-containing automotive coatings that would give rise to one in a million, ten in a million and 100 in a million excess cancer risks. The throughput calculation was done to demonstrate the minimum usage of chromated automotive coatings that would result in these cancer risks. Table VI-6 presents these results. For the emission rate calculation, we assumed the density of automotive coatings to be the sales weighted average density based on the manufacturer survey. In addition, staff used topcoat sales-weighted average for stack emissions, tests numbers 1-6. The primer sales-weighted average density was used to calculate generic fugitive emissions, tests numbers seven and eight.

TABLE VI-6. – ESTIMATED ANNUAL VOLUMES OF AUTOMOTIVE COATINGS BASED ON CANCER RISK							
		1 CANCER/ MILLION		10 CANCERS/ MILLION		100 CANCERS/ MILLION	
GENERIC FACILITY	**Max X/Q ([ug/m*3]/ [g/s])**	**Emission rate (g/s)**	**Vol. Of coating used (gal/yr)**	**Emission rate (g/s)**	**Vol. of coating used (gal/yr)**	**Emission rate (g/s)**	**Vol. Of coating used (gal/yr)**
1	39.4	1.69E-07	4.386	1.69E-06	43.86	1.69E-05	438.6
2	21.5	3.10E-07	8.038	3.10E-06	80.38	3.10E-05	803.8
3	27.3	2.44E-07	6.331	2.44E-06	63.31	2.44E-05	633.1
4	15.7	4.25E-07	11.008	4.25E-06	110.08	4.25E-05	1100.8
5	32.6	2.04E-07	5.301	2.04E-06	53.01	2.04E-05	530.1
6	49.3	1.35E-07	3.506	1.35E-06	35.06	1.35E-05	350.6
7	208.9	3.19E-08	0.092	3.19E-07	0.92	3.19E-06	9.2
8	212.2	3.14E-08	0.090	3.14E-07	0.90	3.14E-06	9.0

Glossary of Acronyms for Table VI-5: Max X/Q=Maximum ground level concentration per unit of emissions rate; Fg/m^3 =Micrograms per cubic meter; g/s= grams per second; gal/yr=gallons per year; and vol=volume.

E. MULTI-PATHWAY HEALTH RISK ASSESSMENT

In evaluating the potential health effects of a pollutant, it is important to identify the different routes by which an individual could be exposed to the pollutant. The appropriate pathways to include in a HRA are dependent on the specific toxic air pollutant that a person (receptor) is exposed to, and can include inhalation, dermal exposure, and the ingestion of soil, water, crops, fish, meat, milk, and eggs. We evaluated other pathways of exposure, but found that the inhalation pathway accounts for 97 to 99 percent of the risk associated with exposure to hexavalent chromium. Therefore, for this HRA, we focused solely upon the impacts of exposure to hexavalent chromium via the inhalation pathway.

Multiple exposure pathway (multi-pathway) assessments are most significant for, and thus traditionally used for lipophilic (fat loving), semivolatile, or low volatility compounds such as dioxins, polycyclic organic compounds (PAHs), or polychlorinated biphenyls (PCBs) (CAPCOA, 1993).

F. STATEWIDE EMISSION AND RISK REDUCTION BENEFITS OF THE AIRBORNE TOXIC CONTROL MEASURE

As reported by the coating manufacturers in the 2001 survey, cadmium is not currently used in coating products. Consequently, the risk reduction estimates only address hexavalent chromium emissions.

The proposed ATCM would reduce emissions of hexavalent chromium from coating facilities by nearly 100 percent. Thus, the potential cancer risk associated with these emissions will also be virtually eliminated. Staff estimates that 270 pounds per year of hexavalent chromium emissions would be reduced as a result of the proposed ATCM. An additional benefit of the proposed ATCM is a reduction of the emissions of lead. This is the case because hexavalent chromium is typically found in the form of lead chromate in automotive coatings. We estimate that lead emissions would be reduced by 560 pounds per year.

Based on generic facility analyses, we estimate that less than a gallon of a chromated primer, used annually, could contribute to over 10 cancer cases per million due to fugitive emissions of hexavalent chromium. Because of mixed zoning, residences and other businesses are often located near automotive coating facilities. As illustrated by the modeling of the generic facilities, it requires relatively small volumes of chromated automotive coatings to cause near-source potential cancer risks that are relatively high. Hence, the proposed ATCM would eliminate a significant near-source cancer risk from facilities that currently use chromated automotive coatings.

In addition to the risk reduction benefits for potential receptors, we expect a reduction in overall ambient levels of hexavalent chromium. By reducing ambient levels of hexavalent chromium, overall statewide risk reduction benefits will be achieved.

To estimate the total statewide emissions of hexavalent chromium staff compiled data from ARB's 1996 Emission Inventory. Based on the inventory, approximately 7,600 pounds per year of hexavalent chromium are emitted from all sources. Assuming that hexavalent chromium emissions are directly proportional to ambient levels, then it would be expected that ambient concentrations of hexavalent chromium would be reduced by approximately 3.5 percent (the percent reduction in total emissions) upon full implementation of the proposed ATCM. This would result in twelve potential lifetime cancer cases avoided statewide.

G. POTENTIAL ADVERSE HEALTH EFFECTS FROM THE COMPOUNDS USED AS REPLACEMENTS FOR HEXAVALENT CHROMIUM

We evaluated the potential adverse health impacts from chemical constituents used to replace hexavalent chromium. To perform this evaluation, staff reviewed Material Safety Data Sheets (MSDS) to obtain information regarding the safety concerns of alternative ingredients reported in the 2001 survey. MSDS information was obtained by calling the manufacturers or distributors directly, or if available, from a manufacturer's web site. In addition, the list of hazardous chemicals under Proposition 65 has been reviewed to identify any alternative ingredient that might cause cancer or reproductive toxicity.

Based upon staff's review of available information, no adverse health impacts from compounds identified as alternatives to hexavalent chromium are expected. MSDS information indicates that the majority of organic pigments found in chrome-free alternative products are not considered hazardous as defined under OSHA's Hazard Communication Standard (29 CFR 1910.1200). Although known published data are limited for acute/chronic toxicity and mutagenicity of organic pigments, they are considered non-toxic, based upon industry-wide experience over many years of manufacturing.

H. WORKPLACE EXPOSURE

Hexavalent chromium and cadmium are human carcinogens. As such, the California Department of Industrial Relations, Division of Occupational Safety and Health Administration (Cal/OSHA) regulates these compounds in the workplace environment. To protect worker safety, Cal/OSHA has established permissible exposure limits (PEL) for these compounds. The PEL is the maximum, eight-hour, time-weighted average concentration for occupational exposure and is 0.01 mg/ m^3 for hexavalent chromium, and 0.005 mg/ m^3 for cadmium. Since the proposed ATCM will remove these compounds from automotive coating products, worker exposure to hexavalent chromium and cadmium from the use of these products will be virtually eliminated.

VII. PROPOSED AIRBORNE TOXIC CONTROL MEASURE AND ALTERNATIVES

This chapter describes and provides the basis for the proposed ATCM, including a discussion of alternatives to the proposed control measure.

A. SUMMARY OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

The proposed ATCM would virtually eliminate hexavalent chromium and cadmium emissions from the use of automotive coatings in automotive refinishing operations and original equipment manufacturing. Eliminating emissions of these compounds would be accomplished by prohibiting the sale and use of automotive coatings that contain them.

The proposed ATCM specifically prohibits the introduction of hexavalent chromium or cadmium as a pigment or agent that imparts any properties to the coating. The proposed regulation does not allow for a de minimus level of these compounds. A de minimus level would be a maximum concentration of hexavalent chromium or cadmium that would be allowed in automotive coatings. We are not including a de minimus level for several reasons. First, hexavalent chromium is an extremely toxic compound. Even at low levels, it could pose potential health risks to the public, as well as coating facility employees.

Raw material suppliers have indicated that it is rare for hexavalent chromium to be a contaminant in materials used in the manufacture of automotive coatings. Thus, staff believes that a de minimus level is not necessary to account for contamination levels.

Because hexavalent chromium is added to some automotive coatings at low levels to impart properties, incorporation of a de minimus level would potentially allow some coating manufacturers to add hexavalent chromium up to the de minimus level. Exclusion of a de minimus level will ensure that coating manufacturers minimize hexavalent chromium concentrations in automotive coatings.

A final reason for exclusion of a de minimus level is to maintain consistency with existing rules. SCAQMD Rule 1151 and AVAPCD Rule 1151, which already prohibit the use of hexavalent chromium or cadmium in automotive coatings, do not contain de minimus levels. Including de minimus levels in the proposed ATCM would make it less stringent than these existing district rules.

The proposed ATCM also contains a sell-through provision. This provision allows automotive coating manufacturers to sell automotive coatings manufactured before the effective date of the proposed regulation for a period of up to six months after the effective date. End users of these products are allowed to use products subject to the proposed ATCM up to 12 months after the effective date. Generally, the ATCM becomes legally effective upon approval by the Office of Administrative Law. However, because air districts must implement and enforce the ATCM no later than 120 days from the date the regulation becomes effective, the sell-through and use provisions will begin when districts begin implementation.

The ATCM also requires manufacturers to code-date products that are subject to the regulation. The code-dating provision requires each product container to clearly display the day, month, and year of manufacture.

The regulation allows manufacturers and distributors to sell automotive coatings containing hexavalent chromium or cadmium for use outside of California. Retailers are not allowed to sell or possess automotive coatings containing hexavalent chromium or cadmium. The regulation does not have recordkeeping provisions, but manufacturers or distributors who sell these automotive coatings for use outside of California must demonstrate that they have taken precautions to ensure that they are not used in California.

Although it appears, based on the 2001 survey, that cadmium is no longer used, cadmium has been used in automotive coatings in the past. Therefore, staff is adding the prohibition on the use of cadmium to prevent the reintroduction of cadmium in the future. In addition, the prohibition on cadmium is consistent with other district rules, such as SCAQMD Rule 1151, which prohibits the use of automotive coatings that contain hexavalent chromium or cadmium.

Testing may be necessary to determine compliance with the proposed ATCM. The proposed test methods are: *American Society for Testing and Materials (ASTM) Method D3335-85a (1999), Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in paint by Atomic Absorption Spectroscopy; and EPA method 7196A* (which may be used with *EPA method 3060A, Alkaline Digestion for Hexavalent Chromium*). Alternative methods that are shown to accurately determine the concentration of hexavalent chromium or cadmium compounds in a coating product or its emissions may be used upon written approval of the Air Pollution Control Officer.

B. BASIS FOR THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

HSC section 39665(b) requires ARB to address the availability, suitability, and relative efficacy of substitute products of a less hazardous nature. To evaluate the technical feasibility and availability of substitute products, we had discussions with automotive refinishing coating manufacturers and end users. We also looked at the current market share of substitute products as reported in the 2001 survey.

HSC section 39666 requires that any control measure for a TAC without a Board-specified threshold exposure level be designed to reduce emissions to the lowest level achievable through the application of best available control technology (BACT) or a more effective control method, if needed. To determine BACT, we evaluated the proposed control measure, as well as alternatives to the control measure. We concluded that prohibiting the addition of hexavalent chromium and cadmium to automotive coatings is BACT.

C. ALTERNATIVES TO THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

This section discusses the alternatives evaluated and provides the reasons they were considered to be less effective than the proposed regulation. For each of the alternatives evaluated, other than the “No Action” alternative, staff addressed four issues:

1) applicability;
2) effectiveness;
3) enforceability; and
4) cost/resource requirements.

As an alternative to the proposed ATCM, other than taking no action, we evaluated establishing workplace practices (requiring that all hexavalent chromium or cadmium containing automotive coatings be applied inside a spray booth). We evaluated each of the alternatives and determined that they would not be as effective at reducing emissions of hexavalent chromium or cadmium from coating activities as the proposed control measure. We also determined that the alternatives did not meet the objective of HSC section 39666 to reduce emissions to the lowest level achievable through the application of BACT or a more effective control method in consideration of cost, risk, and environmental impacts. (ARB, 2001)

1. No Action

This alternative would not address the public health risk posed by hexavalent chromium emissions from auto refinishing facilities and original equipment manufacturing. Since hexavalent chromium is a potent human carcinogen, this alternative would not be protective of public health.

2. Spray Booth Requirement

This alternative would require automotive coatings that contain hexavalent chromium or cadmium to be applied inside a paint spray booth.

a. Applicability

This alternative would be applicable to facility owners and operators who use automotive coatings containing hexavalent chromium or cadmium.

b. Effectiveness

This alternative would not be as effective as the proposed ATCM. A properly operated and maintained spray booth would capture approximately 90-95 percent of the paint overspray (CAPCOA, 1996). Since the proposed ATCM would virtually eliminate hexavalent chromium emissions, it is more effective then a spray booth requirement. In light of the availability of alternative products that contain no hexavalent chromium or cadmium compounds, a measure that reduced 95 percent of the emissions would not be considered BACT.

c. Enforceability

A spray booth requirement would necessitate the addition of booth operating parameters to the regulation. For example, operators could be required to check and record pressure drop across the filter, filter replacement schedules, and quantify the paint usage inside the spray booth. Air district inspectors could examine maintenance records, as well as pressure gauges to determine compliance with the regulation. However, even with recordkeeping requirements, district inspectors would not be sure that all automotive coatings containing hexavalent chromium or cadmium were always sprayed inside a paint spray booth. Thus, the proposed ATCM is more enforceable than the spray booth alternative.

d. Cost and Resource Requirements

While most facilities have a paint spray booth, at least some of the application of primers is done outside a paint spray booth (in a prep station). Because a significant portion of the hexavalent chromium-containing automotive coatings are primers, this option would be more burdensome to the body shop operator than the proposed control measure. In order to continue to use automotive coatings containing hexavalent chromium or cadmium, facilities would have to purchase spray booths, if they did not own a spray booth. Even if a facility owned a spray booth, many facilities would have to purchase an additional spray booth in order to maintain the same volume of refinishing jobs. A new downdraft spray booth can cost $60,000, plus installation costs (Science Applications International Corporation, 1997). The trend in the marketplace has been to decrease the volume of automotive coatings that contain hexavalent chromium or cadmium. Most manufacturers offer both primers and tints that do not contain hexavalent chromium or cadmium, making the use of alternative automotive coatings a simple option.

As enforcement would be conducted predominantly by the air districts, the burden of enforcement costs would fall on the air districts. However, most air districts already inspect motor vehicle and mobile equipment coating facilities in connection with their auto refinishing rules. Cost estimates for district inspectors to enforce the proposed ATCM are addressed in Chapter VIII.

VIII. ECONOMIC IMPACTS OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

A. SUMMARY OF THE ECONOMIC IMPACTS

Overall, the proposed ATCM banning the sale of chromated and cadmium containing automotive coatings in California is not expected to have a noticeable cost impact on manufacturers and marketers of automotive coatings. Of the eight manufacturers and marketers of affected automotive coatings that responded to the 2001 survey, seven currently sell alternative automotive coatings that meet the requirements of the proposed ATCM. Therefore, these manufacturers are not expected to incur additional costs for reformulation. Since the other manufacturer sells a negligible quantity of chromated automotive coatings in California, its loss would have no noticeable impact on the company. Also, chromated automotive coatings accounted for a negligible share of these companies' total sales. The largest five manufacturers of chromated automotive coatings are also among the largest paint and automotive coatings companies worldwide, with estimated sales of over $16 billion in 1999.

Staff estimates that responses to the survey account for approximately 60 percent of the total automotive coatings sold. Staff adjusted the cost estimate to account for the estimated 40 percent that did not respond to the 2001 survey. We used two methods to estimate the total cost of the proposed ATCM. First, we estimated the total cost by considering the differences in raw material costs for chromated vs. non-chromated automotive coatings reported in the 2001 survey. We also estimated the total cost based on the retail price differences for automotive coatings, as reported in the 2001 survey. Based on these analyses, the total cost is estimated to range from $440,000 to $2 million per year for five years.

As the main users of chromated coating products, a typical automotive body paint shop is expected to experience an annual increase of about $555 to $5,550 in material costs due to slightly higher prices for alternative coatings. These shops are expected to fully recover their cost increase by passing it on to their customers. The cost of a complete paint job is expected to rise by about $12, or less than half of one percent of the estimated total cost of $3,000. A cost increase of this magnitude is not expected to change demand for these shops. As a result, ARB expects the proposed ATCM to have no significant impact on employment; business creation, elimination or expansion; and business competitiveness in California. ARB staff also expects no significant adverse fiscal impacts on any local or State agencies.

B. LEGAL REQUIREMENTS

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulation. The assessment shall include a consideration of the impact of the proposed regulation on California's jobs, business expansion, elimination or creation, and the ability of California businesses to compete with businesses in other states.

Also, State agencies are required to estimate the cost or savings to any state or local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate shall include any non-discretionary cost or savings to local agencies and the cost or savings in federal funding to the State.

Health and Safety Code section 57005 requires ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding ten million dollars in any single year.

C. AFFECTED BUSINESSES

Any business that manufactures or markets automotive coatings for use in California would potentially be affected by the proposed ATCM. Also potentially affected are businesses that supply resins, exempt solvents, other ingredients, or equipment to these manufacturers or marketers, or use automotive coatings. The focus of this analysis, however, will be on manufacturers or marketers because these businesses would be directly affected by the proposed ATCM. ARB also considered the impact of the proposed ATCM on automotive coatings facilities (automotive body shops) because they are the main users of the affected automotive coatings.

Chromated coating products sold in California are manufactured or marketed by eight companies, of which none is based in California according to the survey. Five of these companies are among the largest paint and automotive coatings manufacturers worldwide. These companies generated over $16 billion in worldwide sales in 1999. The other three companies are relatively small manufacturers and distributors of paints and automotive coatings. Table VIII-1 provides a global ranking of the major paint and automotive coatings companies affected by the proposed ATCM.

TABLE VIII-1. RANKING OF MAJOR FIRMS IN PAINT AND AUTOMOTIVE COATINGS INDUSTRY

COMPANY	1999 SALES (billions)	GLOBAL RANKING
Sherwin-Williams	$4.99	1
Akzo Nobel	$4.98	2
Dupont	$3.30	5
BASF Corporation	$1.88	7
Valspar	$1.29	14

Source: Coatings World, July/August 2000

The coating companies marketed an estimated total of 95 chromated coating products and 37 non-chromated coating products in California in 2000. Although no California-based company manufactures chromated coating products, one California company manufactures four non-chromated coating products as shown in Table VIII-2.

TABLE VIII-2. - NUMBER OF CHROMATED AND NON-CHROMATED COATINGS MARKETED IN CALIFORNIA						
PRODUCT TYPE	**CALIFORNIA FIRMS**		**NON-CALIFORNIA FIRMS**		**TOTAL**	
Chromated Products	0	0%	95	100%	95	100%
Non-chromated Products	4	17%	33	83%	37	100%
Total Products	4		128		132	
Firms	1		8		9	

All affected products are classified under Standard Industrial Classification (SIC) Code 2851 or new North American Industry Classification System (NAICS) 325510. A list of these categories is provided in Table VIII-3. Based on information provided by affected companies, the bulk of automotive coatings sold in California are currently in compliance with the proposed ATCM. The percentage of compliant coatings for individual companies range from 88 % to over 99%.

TABLE VIII-3. - AFFECTED COATING CATEGORIES	
CATEGORY	**PERCENT OF COMPLIANT COATINGS SOLD IN CALIFORNIA**
Tint	92 to 99
Primer	88 to 99
Packaged Color	93

D. POTENTIAL IMPACT ON MANUFACTURERS

The proposed ATCM to ban the sale of chromated and cadmium containing coating products in California would have a minimal impact on affected manufacturers. This is because chromated coating products generated less than $2 million in California sales in 2000 for eight manufacturers, according to the survey. Five of these manufacturers are among the world's largest paint and coating manufacturers, with an estimated sales of over $16 billion in 1999. These companies accounted for the vast majority of the chromated coating sales in California reported in the 2001 survey, the other three companies accounted for a small fraction of the sales. Since chromated coating products account for a small portion of their sales, ARB expects the proposed ATCM to have no noticeable impact on these manufacturers. Also, all of these manufacturers, except one small company, currently supply the California market with non-chromated coating products. Thus, these manufacturers are not expected to incur additional costs for reformulation of chromated automotive coatings. A ban on the sale of chromated coating products would actually increase demand for alternative coating products. This would potentially offset the impact of the ban.

The small manufacturer that reported it has no alternative coating product on the market supplies a negligible quantity of chromated automotive coatings in California. The loss of this sale is not expected to impose a noticeable hardship on the company. One California-based company may actually benefit from the proposed ATCM because it currently sells non-chromated coating products. This company may experience an increase in demand for its products when a ban is imposed on the sale of chromated coating products in California.

E. POTENTIAL IMPACT ON SUPPLIERS

Suppliers who supply resins, solvents, other chemicals, or equipment for use in the production of alternative automotive coatings would potentially benefit from the proposed ATCM as they experience an increase in demand for their products. In contrast, those suppliers who supply hexavalent chromium compounds for existing chromated automotive coatings may experience a decline in demand for their products.

The proposed ATCM is unlikely to have an adverse impact on distributors (jobbers) and retailers of automotive coatings as alternative automotive coatings are currently available for chromated automotive coatings at approximately equivalent prices. The proposed ATCM may also require the distributors and retailers to ensure that chromated automotive coatings are not sold past the “sell-through period.” Staff believes a six-month sell-through period should provide ample time to allow for the sale of chromated coating products manufactured prior to the effective date of the regulation.

F. POTENTIAL IMPACT ON AUTOMOTIVE BODY PAINT SHOPS

Automotive body paint shops are major users of automotive refinish coatings. These facilities accounted for about 95 percent of the 37.5 million gallons of the nationwide automotive coatings use in 1994. The remaining five percent was used by do-it-yourself consumers according to the 1999 "Paint & Coatings 2000: Review and Forecast" study. Among automotive body shops, independent shops accounted for 40 percent of the use, fleet paint shops for 25 percent, and dealer body shops and chain shops for 15 percent each.

The California Bureau of Automotive Repair estimates that there are approximately 3,600 automotive body shops outside of the South Coast Air Quality Management District (SCAQMD). Of these shops, staff believes that approximately ten percent, or about 360 shops, are likely to currently use chromated automotive coatings. Assuming that manufacturers pass on the entire compliance costs to these shops, staff estimates a typical shop would experience an average annual increase of $5,550 in the costs of coating materials. In the less likely case that all 3,600 shops were to use chromated automotive coatings, the annual increase would be about $550. Automotive body shops are expected to recover the entire cost of compliance because these shops operate locally, which isolates them from the national competition.

G. POTENTIAL IMPACT ON CONSUMERS

The potential impact of the proposed ATCM on consumers depends upon how the price and performance attributes of non-chromated coating products compares to that of chromated products. Based on the information collected from the 2001 survey, staff estimates that the average market prices for non-chromated automotive coatings materials are about one to six percent higher than the average market prices for chromated automotive coatings materials (2001 survey). The cost of painting an entire vehicle can range from a few hundred dollars to $3,000

(Autobody Assoc., 2001). Staff used the upper end of this range to present a worst-case estimate of the cost to consumers. Assuming about 20 percent of the total cost is due to the coating materials, the proposed ATCM would increase the consumer's cost for a complete paint job by about $12. This cost estimate is very conservative because most consumers do not need a complete paint job. Thus, a cost increase of this magnitude is not expected to have a noticeable impact on consumers.

The proposed ATCM is unlikely to alter the performance attributes of coating products. This is because there are currently non-chromated automotive coatings in the market that have acceptable performance attributes. Indeed, some non-chromated automotive coatings account for significant shares of the coatings market.

H. POTENTIAL IMPACT ON EMPLOYMENT

As stated above, the survey results indicate that five global companies manufacture a significant portion of the chromated automotive coatings sold in California. The remaining chromated automotive coatings are manufactured by non-California companies. Over 90 percent of the automotive coatings currently sold by these companies in California meet the requirements of the proposed ATCM. Thus, ARB does not expect a ban on the sales of chromated automotive coatings to have a noticeable impact on employment in California.

A slight increase in the price of non-chromated automotive coatings that may occur as a result of a ban on the sale of chromated automotive coatings would potentially affect employment in some small auto body paint shops. According to the 1997 Economic Census, there were 3,554 paint or body repair shops in California, employing 26,102 persons. The paint or body repair shops (NAICS 811121/SIC 7532) are defined as establishments engaged in repairing or customizing automotive vehicles, such as passenger cars, trucks, and vans, and all trailer bodies and interiors; and/or painting automotive vehicles and trailer bodies. Assuming that employment is uniformly distributed among all establishments, staff estimates each establishment employed, on average, seven persons. The number of automotive body shops reported by the U.S. Census Bureau is significantly below the number of shops reported by the California Bureau of Automotive Repair. The discrepancy is likely due to the fact that the U.S. Census Bureau's numbers include independent and chain automotive body shops but do not include fleet body shops and automotive dealer body shops. Based on the number of automotive body shops reported by the California Bureau of Automotive Repair, we estimated that about 360 shops currently use chromated automotive coatings. Given staff's estimate of seven employees per shop, approximately 2,600 employees would potentially be affected by the proposed ATCM. Since automotive body shops are expected to pass on the cost increase to customers, we do not expect a significant change in employment as a result of a ban on the use of chromated coating products in California.

I. POTENTIAL IMPACT ON BUSINESS CREATION, ELIMINATION OR EXPANSION

The proposed ATCM would have no noticeable impact on the status of California businesses. The reformulation costs of the proposed ATCM are expected to be minor for all coating manufacturers. This is because five large global companies supply the bulk of chromated automotive coatings sold in California and the sale of these automotive coatings account for a negligible share of their total sales. All but one of the affected manufacturers currently sell alternative coating products and have no need to develop new coating formulations. In fact, non-chromated automotive coatings account for over 90 percent of the automotive coatings currently sold in California. Thus, a ban on the sale of chromated automotive coatings would have no noticeable impact on chromated coating manufacturers. In addition, the loss of sales associated with a ban is likely to be offset with an increase in the sale of alternative coating products. The only affected California manufacturer may actually experience an increase in demand for its alternative coating products as a result of the proposed ban. This manufacturer does not sell any chromated coating products.

The proposed ATCM would have no significant impact on automotive body shops. The shops are expected to pass on any increase in material costs to their customers in terms of higher prices for their products. As stated above, staff expects the cost of a complete paint job to rise by about $12 if all the costs are passed on to the customers. A price increase of this magnitude is unlikely to change demand significantly for these shops.

J. POTENTIAL IMPACT ON BUSINESS COMPETITIVENESS

The proposed ATCM would have no significant impact on the ability of California businesses to compete with businesses in other states. Since the proposed ATCM would apply to all businesses that manufacture or market automotive coatings for sale in California, regardless of their location, the ARB staff's proposal should not present any economic disadvantages specific to California businesses. Of a total of eight companies involved in manufacturing or marketing of chromated automotive coatings, none was located in California. However, one California manufacturer supplies only alternative products. This manufacturer may actually benefit from the proposed ban.

The proposed ATCM is not expected to have an adverse impact on the competitive position of automotive body shops, as these shops are locally based businesses that compete within a region. Most of these shops are isolated from out-of-state competition. However, a few of these shops located in the border areas may face competition from similar shops located nearby in other states. Staff doesn't expect these cross-border transactions to be significant.

K. COSTS TO PUBLIC AGENCIES

Given that the air districts will have primary responsibility for implementing and enforcing this ATCM, we evaluated the potential cost to the air districts. We also evaluated the cost to State agencies. This section gives the conclusions we reached and the basis for those conclusions.

The proposed ATCM should have minimal economic impacts on air districts. HSC section 39666 requires that after the adoption of the proposed ATCM by the Board, the air districts must implement and enforce the ATCM or adopt an equally effective or more stringent regulation.

Beginning in 2002, the air districts will be responsible for enforcing the requirements of the ATCM. The air districts responsibilities under the proposed regulation can be fully financed from the fee provisions authorized by HSC sections 42311 and 40510. No reimbursement is required by this proposed ATCM pursuant to section 6 of Article XIII B of the California Constitution. This is because the air districts have the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service within the meaning of section 17556 of the Government Code.

The proposed ATCM will not affect any State agency or program other than the ARB. Although the air districts will have primary responsibility for enforcing this ATCM, ARB may, at the request of the air districts, provide technical expertise, laboratory analyses, legal support, or other enforcement support. We do not foresee this being a regular event, and estimate that such costs should not exceed $25,000 in any given calendar year. All costs from this rulemaking action would be negligible and absorbable within the existing ARB budget.

L. COST OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

Based on information provided in the responses to the 2001 survey, and discussions with industry representatives, staff estimated the total cost of the proposed regulation. We extrapolated the survey results to account for the estimated 40 percent of the market that did not respond to the 2001 survey. Staff also assumed that the market share not represented by the 2001 survey has the same sales-weighted average hexavalent chromium concentration and cost as the fraction represented by the 2001 survey.

First, we estimated the total cost by considering the differences in raw material costs for chromated vs. non-chromated automotive coatings reported in the 2001 survey. We also estimated the total cost based on the retail price differences for automotive coatings, as reported in the 2001 survey. Based on these analyses, the total cost is estimated to range from $440,000 to $2 million per year for five years. Appendix E presents a detailed discussion of the cost analysis methodology.

The sales-weighted-average cost increase of automotive coatings was estimated to be 1.2 percent ($0.92 per gallon) for primers and 5.8 percent ($5.93 per gallon) for tints. A typical coating facility (automotive body shop) using chromated automotive coatings could have an increase of $555 to $5,550 per year. We estimated that the cost of a coating job may increase by up to $12 or less than half of one percent.

IX. ENVIRONMENTAL IMPACTS OF THE PROPOSED AIRBORNE TOXIC CONTROL MEASURE

The intent of the proposed ATCM is to protect the public health by reducing the public's exposure to potentially harmful emissions of TACs. An additional consideration is the impact that the proposed ATCM may have on the environment. Based on available information, the ARB has determined that no significant adverse environmental impacts should occur as a result of adopting this ATCM. This chapter describes the potential impacts that the proposed ATCM may have on wastewater treatment, hazardous waste disposal, and air quality.

A. LEGAL REQUIREMENTS APPLICABLE TO THE ANALYSIS

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed regulations. Since ARB's program involving the adoption of regulations has been certified by the Secretary of Resources (see Public Resources Code section 21080.5), the CEQA environmental analysis requirements may be included in the ISOR for a rulemaking in lieu of preparing an environmental impact report or negative declaration. In addition, we will respond in writing to all significant environmental issues raised by the public during the public review period or at the Board hearing. The responses will be contained in the Final Statement of Reasons for the ATCM.

Public Resources Code section 21159 requires that the environmental impact analysis conducted by ARB include the following:

- an analysis of the reasonably foreseeable environmental impacts of the methods of compliance;
- an analysis of reasonably foreseeable feasible mitigation measures; and
- an analysis of reasonably foreseeable alternative means of compliance with the ATCM.

Regarding reasonably foreseeable mitigation measures, CEQA requires an agency to identify and adopt feasible mitigation measures that would minimize any significant adverse environmental impacts described in the environmental analysis.

B. ANALYSIS OF REASONABLY FORESEEABLE ENVIRONMENTAL IMPACTS OF THE METHODS OF COMPLIANCE

1. Potential Wastewater Impacts

Wastewater is regulated in California by the Water Resources Control Board. In California, wastewater containing hazardous substances is not allowed to be disposed of in the sewer system. Discharge of wastewater from automotive coatings facilities to a sanitary sewer can result in metals such as hexavalent chromium and cadmium accumulating in sewage treatment sludge, preventing its beneficial use. Some contaminants "pass through" and are discharged to lakes, rivers, bays, and oceans.

Although the practice is illegal, facility operators may introduce hazardous substances to the sewer system by washing down areas containing over spray and allowing that water to enter the sewer system.

The removal of hexavalent chromium, cadmium, and the associated lead from automotive coatings should reduce the amount of these metals deposited into storm drains and the wastewater treatment plants.

Most waste paint is a result of over spray and is collected primarily on the paint booth exhaust filter or in floor sweepings. However, coating facilities may also generate paint-contaminated disposable rags, masking tape and paper, disposable mixing cups and sticks, and disposable paint strainers. The dry paint related wastes are typically landfilled, but are potentially hazardous if they contain hexavalent chromium or cadmium. If wastes containing these metals are landfilled, hazardous materials may leach out of the waste into the groundwater. The removal of hexavalent chromium and cadmium from automotive coatings will minimize the possibility of waste materials containing the metals being disposed of in sanitary landfills and leaching into groundwater.

2. Potential Hazardous Waste Impacts

Hazardous waste is regulated in California by federal and State laws. In California, all hazardous waste must be disposed of at a facility that is registered with the DTSC. Under these programs, automotive coatings may be classified as hazardous waste, if they contain substances listed as toxic, such as hexavalent chromium and cadmium.

It is difficult to determine the amount of liquid waste paint generated from automotive coatings since the waste paint is almost always mixed with waste paint thinner. Waste paint thinner is generated when paint guns and other paint equipment are cleaned. The waste paint thinner is usually collected in a 55-gallon drum and is mixed with waste paint. In almost all cases, waste coatings in liquid form must be managed as a hazardous waste. The removal of hexavalent chromium and cadmium from automotive coatings is not expected to result in non-hazardous liquid waste coatings. Solvent-based automotive coatings waste will still be classified as hazardous due to ignitability characteristics.

Coating facilities that have filter-type paint booths also generate paint booth exhaust filters. Paint booth exhaust filters are changed every few weeks to a few months depending on the amount of painting being done.

Waste paint booth filters need to be tested for ignitability and toxicity characteristics. The "*Toxicity Characteristic Leaching Procedure*" (TCLP) is used to determine if the filters contain toxic metals. Hexavalent chromium and cadmium are among the compounds for which testing is required. It is rare that a paint booth filter will test as a hazardous waste assuming that only typical automotive coatings have been used. Waste filters are typically thrown into the trash for disposal at the local sanitary landfill.

While this ATCM will not significantly decrease the quantity of paint booth filters that are disposed of as hazardous waste, it is expected to minimize the quantity of paint booth filters containing hexavalent chromium and cadmium being disposed of at sanitary landfills.

3. Potential Air Quality Impacts

There are two basic kinds of air emissions from activities conducted at automotive coating facilities; VOCs and particulates (solids). Particulates make up the solid part of paint that contains the binder, pigments, and other additives. The TACs, hexavalent chromium and cadmium, are found in the particulate emissions from these operations.

To control particulates, painting should be performed inside a paint booth equipped with paint arrestors (filters) and a ventilation system sufficient to draw the air from the booth through the filters. Most automotive coating facilities exhaust work area and paint booth air to the outside. This not only includes shop floor air but also the air exhausted from the paint booths and solvent usage areas. Paint booth air emissions controls are limited to collection of paint particulates. Generally, no control of VOCs from the air exhausted from the paint booth is required or practiced.

Analysis of data provided by manufacturers identifying alternative coating formulations in ARB's 2001 survey, indicates that the sales-weighted average VOC content of the alternative automotive coatings is lower than the VOC content of automotive coatings containing hexavalent chromium. Therefore, it is expected that the ATCM will result in a decrease in VOC emissions.

The California Department of Industrial Relations, Division of Occupational Safety and Health Administration (Cal/OSHA) regulates the concentration of many TACs in the workplace environment. To protect worker safety, Cal/OSHA has established a permissible exposure limit (PEL) for many of these compounds (the PEL is the maximum, eight-hour, time-weighted average concentration for occupational exposure). The effect of the proposed ATCM is a reduction in TAC emissions. Therefore, an increase in workplace exposure from TAC emissions is not expected.

C. REASONABLY FORESEEABLE FEASIBLE MITIGATION MEASURES

As previously discussed, ARB is required to do an analysis of reasonably foreseeable feasible mitigation measures. We have concluded that no significant adverse environmental impacts should occur from implementation of the proposed ATCM. As a result, no mitigation measures would be necessary.

D. REASONABLY FORESEEABLE ALTERNATIVE MEANS OF COMPLIANCE WITH THE ATCM

The ARB is required to do an analysis of reasonably foreseeable alternative means of compliance with the ATCM. Alternatives to the proposed ATCM are discussed in Chapter VII. We have concluded that removing hexavalent chromium and cadmium from automotive coatings is appropriate and necessary because of the potential increased risk from exposure to these TACs. Additionally, less hazardous alternatives are readily available.

E. COMMUNITY HEALTH AND ENVIRONMENTAL JUSTICE

The ARB is committed to evaluating community impacts of proposed regulations, including environmental justice concerns. ARB's goal is to reduce or eliminate any disproportionate impacts of air pollution on low-income and minority populations so that all individuals in California can live, work, and play in a healthful environment. The proposed ATCM is not expected to result in significant negative impacts in any community. The result of the proposed ACTM will be reduced exposure to hexavalent chromium, cadmium, and lead for all California communities, including those with large populations of low-income and minority residents.

As part of our Community Health and Environmental Justice Programs, we have begun a new effort to assess and reduce the localized impacts of pollution from multiple sources. The cumulative, multi-pollutant focus of this important program compels us to take a more comprehensive, integrated approach to defining the ARB’s overall control strategy. The Neighborhood Assessment Program (NAP), a key component of our Community Health Program, calls for the development of cumulative risk assessment tools to determine health impacts in California communities, including those comprised of low-income, minority residents.

Many communities in California are composed of a mix of residential, commercial, and industrial sites. During and after World War II, these areas experienced tremendous development due to rapid population growth and capital investment in military and industrial complexes. This rapid growth and development did not allow for proper residential planning, therefore, residential areas and industrial zones may be integrated. As a result, parts of these communities exhibit an unhealthy mixture of homes, schools, and environmentally hazardous facilities. Homes within these neighborhoods may be in close proximity to multiple sources of toxic air contaminants, such as businesses, industries, storage facilities, and freeways. Automotive refinish facilities, whose operations may produce TACs, are often among those types of small businesses located in low-income, minority communities. The higher than average incidence of asthma and other respiratory illnesses in children living in these communities may be related to poor air quality. (EPA News Release, 11/13/2000)

State law (HSC section 39669.5) requires OEHHA to develop a list of up to five TACs that may cause infants and children to be especially susceptible to illness. The scientific basis of the listing is to be reviewed by the Scientific Review Panel (SRP) on TACs.

At its June 15, 2001, meeting the SRP provisionally accepted the revised report and data presented by OEHHA staff and accepted a modified proposal to list five contaminants that may disproportionately impact infants and children. Lead, which is found in automotive coatings, is among the five toxic air contaminants identified by OEHHA.

Among the goals of the NAP are heightening community awareness of the links between environmental pollution and health problems, and identifying opportunities for pollution prevention. We have identified pollution prevention outreach to automotive refinishing facilities as an excellent opportunity to provide positive air quality impacts at the community level.

F. AUTOMOTIVE REFINISHING POLLUTION PREVENTION OUTREACH IN ENVIRONMENTAL JUSTICE COMMUNITIES

To advance ARB's goal of cleaner air for communities, we will be conducting pollution prevention outreach to automotive refinishing facilities located in low-income, minority communities in California. Through training of advanced spray techniques and use of new technology, transfer efficiency will be increased and pollution generated within the communities will be decreased. We have identified seven permitted automotive refinishing facilities operating in the San Diego community of Barrio Logan, and they will be the focus of our initial automotive refinishing pollution prevention outreach efforts.

ARB has been approved to receive U.S. EPA Pollution Prevention Incentives for States grant funds that will allow staff to provide hands-on training and state-of-the-art equipment to automotive refinishing technicians in Barrio Logan and two other low-income, minority areas identified through NAP. The funds will be used to incorporate Spray Technique Analysis and Research (STAR®) training and Laser Touch™ technology into ARB's automotive refinishing pollution prevention outreach pilot program.

Operator training and performance play a significant role in the transfer efficiency achieved during spray coating operations. STAR® training, developed by the Iowa Waste Reduction Center (IWRC) at the University of Northern Iowa, teaches spray technicians new and innovative techniques and practices to increase transfer efficiency. Community colleges in or near identified low-income, minority neighborhoods will be equipped and trained to provide STAR® training to automotive spray technicians within the community. Upon completion of STAR® training, spray technicians will be issued Laser Touch™ equipment. The Laser Touch™ is a laser-targeting device, used in conjunction with high-volume low-pressure (HVLP) spray guns, that improves painter technique by helping maintain consistent gun-to-target distance, gun angle, and targeting. The U.S. EPA’s Environmental Technology Verification Program has shown that use of the Laser Touch™ increases transfer efficiency an average of 11 percent over unassisted manual spraying. When use of the Laser Touch™ is combined with STAR® program training, the IWRC has verified that spray technicians typically improve transfer efficiency an average of 25 percent.

Pre-and post-training data will be collected to quantify emission reductions and gauge the success of ARB's pilot outreach program. Air quality monitoring data and other facility information is currently being collected in several low-income, minority California communities and data will be analyzed to determine which two additional communities will be targeted for outreach.

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