



Industry Guide

Painting

The term painting is commonly used to describe the process of providing a surface coating to materials using paints, varnishes, lacquers, or enamels. The painting industry employs more than half a million workers in the U.S. with nearly half of those employed in automobile body repair shops.⁽¹⁾ Over the last twenty years, there have been major changes in painting materials in response to environmental concerns. Traditional solvent-based industrial coatings are slowly being replaced with water-based paints and powder paint systems. Nevertheless, workers have a potential for exposure to health hazards including:

Chemical agents

— such as solvents; formaldehyde; lead, cadmium, and chromium compounds; and isocyanates

This publication is designed to assist health and safety professionals in choosing the appropriate equipment and methodology to assess the major chemical agents found in painting operations. Users are strongly encouraged to reference Material Safety Data Sheets (MSDS) to determine the potential hazards for the specific paint being used.

Solvents

Solvent-based paints use a variety of complex solvent systems including aromatic hydrocarbons, aliphatic hydrocarbons, alcohols, ketones, glycols, and glycol ether/esters. Toxic effects of these compounds vary, with some acting as irritants or causing narcosis and others having more serious, long-term effects.

Consult the appropriate MSDS to determine the solvents contained in the paint being used. Reference the following SKC publications:

Chemical Fact Files®

Hydrocarbons, Aromatic

by NIOSH Method 1501
SKC Publication 1453

Hydrocarbons, Halogenated

by NIOSH 1003
SKC Publication 1454

Formaldehyde

Biocides that are added to water-based paints to prevent fungal growth can result in exposure to formaldehyde.⁽¹⁾ Exposure to formaldehyde can cause irritation of the eyes, nose, and throat. The National Institute for Occupational Safety and Health (NIOSH) recommends that formaldehyde be handled in the workplace as a potential carcinogen.

The U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) for formaldehyde are 0.75 ppm as an eight-hour time-weighted average (TWA) and 2 ppm as a Short-Term Exposure Limit (STEL).

For details on sampling formaldehyde, reference the following SKC publications:

Chemical Fact Files

Formaldehyde

by OSHA 52
SKC Publication 1020

Formaldehyde

by NIOSH 2541
SKC Publication 1015

Formaldehyde

by EPA TO-11A
SKC Publication 1082

Lead, Cadmium, and Chromium Compounds

Pigments based on lead, cadmium, and chromium compounds can present a serious health concern when spray painting or when preparing a surface by sanding or abrasive blasting prior to repainting.⁽¹⁾ Overexposure to lead can create a fragility of the red blood cells causing them to be destroyed more rapidly in the body. This can lead to anemia and other damaging effects on organs and tissues. Some lead compounds are carcinogens of the lungs and kidneys. Cadmium compounds affect the respiratory tract and kidneys and are suspect human carcinogens. Hexavalent chromium compounds found in some industrial paints are human carcinogens.⁽²⁾

The OSHA standards for these compounds are as follows:

- Inorganic Lead and Compounds—
0.05 mg/m³ TWA
- Cadmium and compounds —
5 µg/m³ TWA
- Chromium and Insoluble Compounds —
1 mg/m³ TWA
- Chromic Acid and Chromates (as CrO₃)/
Hexavalent Chromium
0.5 µg/m³ TWA

Isocyanates

Urethane paint systems utilize two components that when mixed together result in the formation of a chemically resistant coating. Mixing some formulations of this type of paint can result in worker exposure to isocyanates and subsequent respiratory sensitization.

The OSHA PEL for toluene 2,4-diisocyanate is 0.02 ppm as a Ceiling.

Consult the appropriate MSDS to determine the compounds that may be present in the specific paint being used. For details on lead, cadmium, and chromium according to government methods, reference the following SKC publications:

Chemical Fact Files

Metal and Metalloid Particulates (Lead, Cadmium, and Chromium Compounds)

By OSHA ID 121
SKC Publication 1177

Metal and Metalloid Particulates (Lead, Cadmium, and Chromium Compounds)

By OSHA ID 125G
SKC Publication 1371

Elements (Lead, Cadmium, and Chromium Compounds)

By NIOSH 7300
SKC Publication 1455

Cadmium

By OSHA ID 189
SKC Publication 1456

Cadmium and Compounds

By NIOSH 7048
SKC Publication 1467

Chromic Acid and Chromates (Hexavalent Chromium)

By OSHA ID 215 (V.2)
SKC Publication 1439

Chromium Hexavalent (Chromic Acid and Chromates)

By NIOSH 7600 and 7604
SKC Publication 1032

Chromium and Compounds

By NIOSH 7024
SKC Publication 1457

Chromium, Metal, and Insoluble Compounds

By OSHA ID 121
SKC Publication 1043

Hexavalent Chromium

By OSHA W4001
Contact SKC for wipe sampling equipment.

For information on sampling isocyanates, reference the following SKC publications:

Chemical Fact Files

Diisocyanates

By OSHA 42
SKC Publication 1458

Isocyanates

By NIOSH 5521
SKC Publication 1459

Isocyanates

By NIOSH 5522
SKC Publication 1460

References

- (1) William A. Burgess, *Recognition of Health Hazards in Industry: A Review of Materials and Processes*, 2nd Ed., John Wiley & Sons, New York, 1995, pp 303-317
- (2) N. Irving Sax and Richard J. Lewis, Sr., *Hazardous Chemicals Desk Reference*, Van Nostrand Reinhold, New York, 1987, p 660w

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