



Chromate primer paints

Engineering Sheet No 32

Introduction

Because of their special properties various chromate pigments are often used in anti-corrosive primer paints. They include: basic zinc chromate/ alkali chromate; basic potassium zinc chromate; basic zinc chromate (zinc tetroxy chromate); strontium chromate; calcium chromate; lead chromate.

The zinc chromates listed above are the pigments most commonly used in primer paints. However, many variants exist and may be used for special effects. These variants are likely to present health hazards similar to those listed below. The advice given below on the hazards and precautions to be taken will therefore, also be relevant to them.

Although primarily used in wet paints, chromate pigments may also be used in powder coating applications.

The use of calcium chromate in paints is now rare and it may only be available as an imported material.

Lead chromates are primarily used in topcoat paints, but they may also be added to primer paints to provide colouring. In addition to the guidance on chromium VI set out below, these paints are also subject to the requirements of the Control of Lead at Work Regulations 1998.¹

Hazards

The adverse effects on health associated with exposure to chromium and its inorganic compounds vary according to valency state and water solubility, but it is the compounds of hexavalent chromium (chromium VI) which are of most concern. All chromates, dichromates and polychromates fall into this category.

There are few data on the actual effects of exposure to chromium VI in primer paints. The health hazards listed below are those associated with chromium VI compounds, rather than fully established hazards associated with primer paints. They relate to inhalation of dust, mist and spray, or contact with the skin and eyes. The actual risks arising from use of primer paints containing chromium VI may not be as high as that indicated by the hazards below. Employers should have regard to them when carrying out assessments, to ensure that all hazards have been considered.

Respiratory effects: There is an increased risk of lung cancer from exposure to chromium VI compounds. Under the Chemicals (Hazard Information and Packaging for Supply) (Amendment) Regulations 1997 (CHIP) all the main

chromate pigments used in paints have now been classified as carcinogenic to a varying degree (see table below).

Other effects associated with the inhalation of dust, mist or spray from chromate compounds are: (a) chemical irritation of the bronchial tubes (bronchospasm); (b) the development of occupational asthma through respiratory sensitisation; and (c) ulceration of the mucous membranes of the nose which may progress to perforation of the nasal septum.

Skin: The effects of chromate compounds on the skin include: (a) primary irritant reactions which may progress to ulceration. This is particularly the case where skin cuts and abrasions already exist; (b) allergic contact dermatitis. The skin may be red and inflamed and have an identical appearance to eczema.

Eyes: Direct contact and contamination of the eyes can result in irritation, and possibly ulceration of the cornea.

Some key hazard features following recent classification under CHIP of the main chromate pigments used in primer paints are given in the following table.

Zinc chromates inc. zinc potassium chromate	Carc.Cat 1 R45	Xn; R22	R43
Strontium chromate	Carc.Cat 2 R45	Xn; R22	—
Calcium chromate	Carc.Cat 2 R45	Xn; R22	—
Lead chromate	Carc.Cat 3 R40	Repr.Cat1R61 Repr.Cat3R62	R33
Other Cr VI compounds - except barium chromate and those specified elsewhere in the Approved Supply List	Carc.Cat 2 R49	—	R43

KEY: Carc.- Carcinogen; Cat.- Category; Xn - Harmful; Repr.- toxic for reproduction; R22 - Harmful if swallowed; R33 - danger of cumulative effects; R40 - possible risk of irreversible effects; R43 - may cause sensitisation by skin contact; R45 - may cause cancer; R49 - may cause cancer by inhalation; R61 - may cause harm to the unborn child; R62 - possible risk of impaired fertility

Who is at risk?

As well as those directly handling and applying the paints, anyone in the vicinity is at risk of exposure. They may inhale dust, mist or spray given off during application, and/or come into direct skin or eye contact with the paints.

Those at risk of exposure also include people working on articles previously coated with such paints, eg rubbing down or sanding painted articles, or doing 'hot work' on them such as cutting, welding and brazing.

People maintaining or cleaning plant and equipment which used to apply or contain such paints may be at risk.

Occupational Exposure Limits

Chromium VI compounds have a maximum exposure limit (MEL) of 0.05 mg/m³ 8-hour time weighted average (TWA), as chromium.

MELs have a legal status explained in the COSHH *General ACOP*² and EH40 *Occupational Exposure Limits*.³ For a substance which has been assigned a MEL, exposure must be reduced to the lowest level that is reasonably practicable, and in any case below the MEL.

With lead chromate, provided the lead in air standard (0.15 mg/m³ 8-hour TWA) is met, the MEL for chromium VI compounds will not be exceeded, but exposure must still be reduced so far as is reasonably practicable.

Prevention and control of exposure

Under COSHH employers and the self-employed must: (a) carry out a proper assessment of the health risks arising from the handling and application of chromate primer paints and/or treatment of articles coated with such paints, together with the precautions necessary to prevent or adequately control them. This may require air sampling and biological monitoring. Remember to include all people who may be exposed; (b) prevent exposure to the chromate primer paints or, where this cannot reasonably be done, adequately control the exposure.

Since all the main chromate pigments used in chromate primer paints, except lead chromate, are now classified under CHIP as Category 1 or 2 carcinogens, any assessment relating to them must also take account of: (a) the *COSHH Carcinogens ACOP*; ¹ (b) COSHH regulation 7(3) which requires employers to take specific measures to control exposure; and (c) COSHH regulation 7(9) which requires in the event of a control measure failure that only specified people, adequately equipped, are allowed into the affected areas and everyone who may be affected told of the failure.

Prevention of exposure: This should always be considered first. It may be possible to substitute the chromate-based primer with another less hazardous paint able to achieve the performance specifications required. Chromate-based paint should only be used if a suitable alternative is not reasonably practicable, based on proper risk assessment and the technical requirements of the job. Further guidance on these issues is given in Reference 4.

Control of exposure: Where chromate primer paints are to be used, exposure must be adequately controlled by a suitable combination of engineering and process control measures, along with the use of personal protective equipment (PPE), as appropriate.

The provision of adequate control depends on: (a) keeping personal exposures as low as is reasonably practicable and at least below the MEL, through good engineering controls and systems of work; (b) the proper use of suitable PPE to avoid skin or eye contact and, where necessary, prevent inhalation of dust, mist or spray; (c) high standards of housekeeping to prevent or minimise contamination; and (d) good personal hygiene standards. Skin cuts and abrasions, in particular, should be protected from contamination.

Engineering control systems may comprise total enclosure of the process or use of local exhaust ventilation systems. Small items may therefore be sprayed in small extracted enclosures with a small aperture for the spray gun, with larger items in suitably designed spray booths to minimise exposure to the hazardous spray. Extraction should always be designed to take spray away from the worker's breathing zone.

Further specific measures which may be required under regulation 7(3) of COSHH include:

- (a) minimising the number of persons exposed and periods of exposure;
- (b) prohibiting smoking, eating and drinking in contaminated areas;
- (c) regularly cleaning work surfaces by a suitable safe method, to minimise contamination;
- (d) the provision of suitable washing and changing facilities near at hand;
- (e) demarcating potentially contaminated areas and displaying suitable warning signs;
- (f) safe storage, handling and disposal of chromate primer paints;
- (g) use of closed and clearly labelled containers.

The *COSHH General ACOP*¹ and *COSHH Carcinogens ACOP*² give further advice on the measures to be taken.

Respiratory protective equipment

Where control measures such as enclosure and exhaust ventilation are not practicable, or are not sufficient to control exposure, respiratory protective equipment (RPE) should be worn. RPE may particularly be required for exposures of short duration where permanent

installation of other control measures is not reasonably practicable.

RPE is essential for all spraying of chromate paints, unless the spraying operation is enclosed within very well designed extracted spray booths. It may also be necessary for certain cleaning or maintenance work. RPE must be suitable for the circumstances in which it is to be used. This means that it must provide adequate protection, must fit the wearer, must be used in accordance with the manufacturer's instructions and be 'CE' marked.

RPE for use when spraying chromate paints should usually comprise a correctly fitted full-face mask (to BS EN136) attached to compressed airline breathing apparatus. Breathing apparatus should be either light duty (to prEN 12419), heavy duty (to BS EN139) or self-contained (to BS EN137). Full face masks are recommended because they give a better face seal (hence better protection), provide wide and unobstructed vision, and protect the eyes and face from splash or spray. Guidance on these issues is given in Reference 5.

Other personal protective equipment (PPE) including suitable protective clothing, gloves, footwear and eye protection should always be worn where there is any risk of skin contact through handling, application, leaks, spillage or splashing etc of the chromate primer paints.

When sanding, rubbing down, or undertaking 'hot work' on articles coated with chromate paints careful consideration should be given to methods which will minimise and adequately control exposure to any dust or fume generated. Wet sanding methods and/or local extract ventilation along with suitable PPE should be used.

Proper attention should also be given to the recommendations and conditions of use provided on the paint manufacturer's or supplier's CHIP labels and in safety data sheets and other technical information.

Maintenance of control measures

All control measures should be maintained in efficient working order and good repair at all times. Under COSHH, extract ventilation systems in particular must be examined and tested by a competent person at least once in every 14 months, and appropriate records kept. It is recommended that all engineering control measures in use also receive frequent visual inspections at least weekly.

Preventative maintenance procedures should indicate which engineering control measures require servicing, the nature of the work to be carried out, by whom, and how any defects found will be put right.

PPE should also be properly maintained, replaced as necessary, cleaned and suitably stored when not in use.

RPE should be regularly maintained in accordance with the manufacturer's instructions to ensure that it remains effective. Maintenance includes replacing filters, cleaning, disinfection, examination, repair, testing and record keeping.

Monitoring exposure

Where exposure to chromate primer paints can occur, monitoring may be required to ensure the effectiveness of control measures and ensure that exposure levels are being kept below the MEL and as low as is reasonably practicable. Remember, though, that air sampling will not indicate risks associated with any possible skin and eye contact. Biological monitoring may also be appropriate to help establish the full extent of exposure by all routes. While biological monitoring can be used to ascertain the body burden of a particular chemical, it should not be used as the sole means of assessing the level of risk.

Further guidance is given in the *COSHH General ACOP*,² and references 6 and 7.

The recommended method for measurement of chromate primer paints as chromium VI compounds is contained in Reference 8.

Health surveillance

The need for health surveillance and its extent should be determined as part of the COSHH assessment and may to be required where employees are exposed to chromate primer paints.

Where health surveillance is necessary it should be carried out under the direction of a suitably qualified health professional, eg occupational health doctor or nurse.

Further information is given in the *COSHH General ACOP*,² *COSHH Carcinogens ACOP*,² and Reference 9.

The surveillance may include initial health assessment with specific reference to any skin conditions and any nasal or respiratory symptoms along with periodic health assessment, lung function test and biological monitoring involving assessment of chromium in urine, as appropriate.

Regular skin inspection of hands and forearms should be carried out by an occupational health professional or, where appropriate, by a suitably trained responsible person. An effective system should be provided for reporting to a responsible person any skin complaint, nasal or respiratory symptoms, or other effects which may be attributable to exposure to chromate pigments.

Medical opinion should be sought where ill-health effects are identified, so that prompt remedial action can be taken.

Further information is contained in References 10, 11 and 12.

In addition to the above, suitable health records for exposure to chromate pigments as a carcinogen will need to be kept. See Appendix to the *COSHH General ACOP²* and the *COSHH Carcinogens ACOP²* for details.

Information, instruction and training

Employers must provide their employees and any others at risk with such information, instruction and training as is sufficient for them to know: (a) the risks to health arising from exposure to chromate primer paints; typical symptoms of exposure; and (b) the precautions which must be taken. This includes, in particular, details of how control measures are to be used, reporting defects and the proper use and maintenance of RPE.

Results of any monitoring of exposure, and information on the collective results and conclusions of any health surveillance carried out should also be provided.

References (HSE Books)

- 1 *The control of lead at work: Approved Code of Practice, Regulations and Guidance COP2* ISBN 0 7176 1506 5
- 2 *General COSHH ACOP and Carcinogens ACOP and Biological agents ACOP. Control of Substances Hazardous to Health Regulations 1999 L5* ISBN 0 7176 1670 3
- 3 *EH40: Occupational Exposure Limits 1999* (revised annually) ISBN 0 7176 1660 6
- 4 *Seven steps to successful substitution of hazardous substances HSG110* ISBN 0 7176 0695 3
- 5 *The selection, use and maintenance of respiratory protective equipment: a practical guide HSG53* ISBN 0 7176 1537 5
- 6 *Monitoring strategies for toxic substances HSG173* ISBN 0 7176 1411 5
- 7 *Biological monitoring in the workplace: a guide to its practical application to chemical exposure HSG167* ISBN 0 7176 1279 1
- 8 *Total hexavalent chromium compounds in air-colorimetric* ISBN 0 11 885920 X (out of print and therefore not available through HSE Books; photocopy available from the British Library).

9 *Health surveillance under COSHH: guidance for employers* ISBN 0 7176 0491 8

10 *Health surveillance of occupational skin disease* ISBN 0 7176 1545 6

11 *Medical aspects of occupational asthma* ISBN 0 7176 1547 2

12 *Preventing asthma at work: how to control respiratory sensitisers L55* ISBN 0 7176 0661 9

Further information (HSE Books)

Chromium and its inorganic compounds: health hazards and precautionary measures EH2(rev) ISBN 0 7176 1502 2

Chromium and you MSA16 1991 HSE leaflet

An introduction to local exhaust ventilation HSG37 ISBN 0 7176 1001 2

Maintenance, examination and testing of local exhaust ventilation HSG54 ISBN 0 7176 1485 9

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