MSD 003 Procedure Manual

Chromium VI Exposure Control Procedure

Revision Status					
Rev	Issue Date	Reason for Issue	Prepared	Checked	Approved
A	02-03-2026	Issued for Comments	R. Versluis	D. Wijngaard	W. Van Lingen
1	15/04/2026	Issued for Implementation	R. Versluis	D. Wijngaard	W. van Lingen

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Revision Log

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1	**15/04/26**			Issued for Implementation

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1. Purpose and Scope

Chromium VI (Cr(VI)) is a hazardous substance that may negatively affect human health and the environment. Exposure to Cr(VI) may cause skin irritation, respiratory illness, lung damage, and cancer. Cr(VI) has historically been used in paints and protective coatings due to its corrosion-resistant properties.

During decommissioning, maintenance, and related offshore activities on existing structures, coatings containing Cr(VI) may be present. Activities such as cutting, grinding, welding, or surface preparation on these coated surfaces may release hazardous particles into the work environment.

This procedure describes the minimum requirements and safe working practices for personnel and subcontractors working under the operational control of Koole Offshore Operations (KOO) where Chromium VI (Cr(VI) may be present.

The objective of this procedure is to:

- prevent or minimise exposure to Chromium VI
- define required control measures
- ensure personnel are aware of the associated hazards and exposure risks
- reduce exposure to as low as reasonably practicable (ALARP)

This procedure applies to all offshore and onshore activities performed under the operational control of KOO where Cr(VI) contamination is known or suspected.

2. Definitions and Abbreviations

Abbreviation / Term	Description
Cr(VI)	Chromium VI (Hexavalent Chromium)
P3 Filter	Respiratory filter that protects against mechanically and thermally generated particles. The filtration efficiency of a P3 filter is at least 99.95%
ALARP	As Low As Reasonably Practicable

3. Roles and Responsibilities

3.1. Management

Management shall:

- ensure adequate resources, equipment, and PPE are available
- support implementation of this procedure
- ensure exposure risks are managed within operational activities

3.2. QHSE Manager

The QHSE Manager shall:

- maintain this procedure
- monitor applicable legislation and industry guidance
- support exposure risk management and control measures
- review lessons learned, incidents, and improvement actions related to Chromium VI exposure

3.3. OIM / Site Manager

The OIM or Site Manager shall:

- ensure this procedure is implemented at the worksite
- ensure contaminated areas are identified where reasonably practicable
- verify that appropriate controls are implemented before work starts
- ensure personnel are informed of applicable exposure risks

3.4. Supervisors

Supervisors shall:

- ensure Chromium VI risks are addressed in risk assessments, toolbox talks, and Permit to Work activities
- verify that personnel use the required control measures and PPE
- stop work if exposure risks are uncontrolled or conditions change

3.5. Personnel

Personnel shall:

- comply with this procedure and applicable control measures
- correctly use and maintain required PPE
- report damaged PPE, unsafe conditions, or suspected exposure
- stop work and inform supervision if conditions are unclear or uncontrolled

3.6. Contractors

Contractors shall:

- comply with the requirements of this procedure
- ensure their personnel are informed of Chromium VI exposure risks
- provide suitable task-specific equipment and PPE where required

4. Procedure Requirements

4.1. General Information on Chromium VI

4.1.1 Chromium VI

Chromium is a metal that exists in different oxidation states, including Chromium III and Chromium VI, also known as trivalent and hexavalent chromium respectively.

Chromium VI does not occur in its pure form and is always present as part of a chemical compound. After binding with oxygen, Chromium VI is commonly present as chromate or dichromate compounds. These compounds are typically combined with other elements such as zinc or sodium.

Chromium VI compounds are widely known for their corrosion-resistant properties and have historically been used in paints, coatings, preservatives, and industrial applications. Different Chromium VI compounds may vary in colour, composition, particle size, and solubility.

4.2. Sources of Chromium VI

Chromium VI has historically been used in protective coatings due to its corrosion-resistant properties and may be present on both metal and wooden surfaces.

Although Cr(VI) is often associated with yellow-coloured coatings, it may also be present in coatings of other colours. Visual identification alone is therefore not considered reliable.

Exposure to Chromium VI in the workplace may occur during activities including, but not limited to:

- spraying coatings containing Chromium VI
- sanding coated surfaces
- grinding coated surfaces
- welding coated surfaces
- cutting or sawing coated materials
- welding stainless steel
- working with treated wood
- working with cement-containing materials

Personnel shall recognise that activities disturbing coated or contaminated surfaces may release hazardous particles, including where contamination is not immediately visible.

Where uncertainty exists regarding the presence of Chromium VI, the material shall be treated as potentially contaminated until confirmed otherwise.

4.3. Hazards and Health Effects

When coatings containing Chromium VI are intact and undisturbed, the Chromium VI is normally bound within the coating. However, activities such as sanding, grinding, cutting, welding, or cleaning may release hazardous particles into the work environment.

Once released, Chromium VI may enter the body through:

- inhalation
- ingestion
- skin contact

The route and duration of exposure may influence the severity of the health effects.

4.3.1 Inhalation Exposure

Chromium VI compounds are non-volatile and do not normally occur as gases or vapours. Exposure through inhalation occurs primarily through airborne dust, fumes, or aerosols generated during work activities.

Examples include:

- dust generated during sanding or grinding
- fumes generated during hot work activities
- aerosols generated during spraying activities

Smaller airborne particles may penetrate deeper into the respiratory system and increase the potential for harm.

4.3.2 Ingestion Exposure

Chromium VI particles may enter the body through ingestion of contaminated dust or residues. This may occur indirectly when contaminated hands, gloves, clothing, food, drinks, or cigarettes come into contact with the mouth.

Good personal hygiene and decontamination practices are therefore essential to reduce exposure risks.

4.3.3 Health Effects

Occupational exposure to Chromium VI may result in serious and irreversible health effects.

Documented health effects include:

- lung cancer
- cancer of the nose and nasal cavities
- nasal septum damage or perforation
- chronic lung diseases, including COPD and pulmonary fibrosis
- irritant-induced asthma
- allergic asthma
- allergic rhinitis
- allergic contact dermatitis

Chromium VI exposure is also suspected to be associated with:

- stomach cancer
- laryngeal cancer

Personnel shall report any suspected exposure symptoms, damaged protective equipment, or uncontrolled release of contaminated particles immediately to their supervisor.

4.4. Hazard Identification and Material Surveys

A third party may conduct hazardous material surveys, sampling activities, or coating analyses on the installation or worksite. The results of these surveys shall be made available at the work location or onboard the installation.

Prior to the start of work, and following any make-safe or preparation activities, the HSE Coordinator or designated responsible person shall identify and clearly mark locations where Chromium VI (Cr(VI) has been confirmed or is suspected to be present, based on available survey reports or sampling results.

Marked locations may be identified using paint markings, warning signs, labels, barricading, or other suitable identification methods. Existing project-specific marking systems, including “Cr6” spray markings, shall be communicated to personnel during toolbox talks or work preparation activities.

No work shall be carried out on identified or suspected contaminated areas unless:

- this procedure is applied
- the required control measures are implemented
- the associated risks are addressed in the relevant TRA/JSA and Permit to Work (PTW), where applicable

Prior to commencing work, supervisors shall ensure that:

- personnel understand the identified hazards
- control measures are communicated
- required PPE and exposure controls are available and suitable for the task

Personnel shall recognise that disturbance of contaminated coatings, dust, or residues may result in exposure to hazardous particles, including where contamination is not immediately visible.

4.5. Control Measures

The primary objective when working with Chromium VI (Cr(VI)) is to prevent contaminated particles from entering the body through inhalation, ingestion, or skin contact.

Control measures shall follow the hierarchy of controls where reasonably practicable. This includes:

- minimising disturbance of contaminated coatings
- limiting the spread of contaminated particles
- restricting access to affected areas
- applying suitable ventilation, wet methods, or extraction where possible
- using appropriate personal protective equipment (PPE)

The following control measures and PPE requirements shall be applied by all personnel and subcontractors working under the operational control of KOO when performing work on structures or materials that may contain Chromium VI.

At the start of the project, task, or campaign, personnel shall receive an induction or toolbox talk addressing:

- Chromium VI hazards
- exposure routes
- required control measures
- PPE requirements
- decontamination requirements
- waste handling arrangements

Personnel shall recognise that activities such as cutting, grinding, welding, cleaning, or surface preparation may generate hazardous particles that are not always visible.

Respiratory equipment and reusable PPE shall be cleaned in designated work areas and shall not be taken into accommodation areas unless properly decontaminated.

Contaminated gloves, disposable PPE, and cleaning materials shall be treated as contaminated waste and disposed of in accordance with applicable waste management requirements.

4.5.1 Hot Cutting / Flame Torch Cutting

General Control Measures

The following requirements shall apply during hot cutting or flame torch cutting activities on contaminated or potentially contaminated surfaces:

- eating, drinking, and smoking are prohibited within contaminated work areas
- hands and exposed skin shall be washed before eating, drinking, smoking, or using sanitary facilities
- personnel shall shower after completion of the work using designated facilities
- work areas, tools, and equipment shall be cleaned after completion of each task
- contaminated gloves and PPE shall remain within the designated work area
- a demarcated restricted area of minimum 5 metres shall be established around the worksite, unless the risk assessment requires a larger area
- wind direction, ventilation, adjacent work activities, and work levels shall be considered when establishing barriers and exclusion zones

- personnel shall use designated decontamination or cleaning stations before entering accommodation or clean areas
- respiratory protection shall remain in place during decontamination activities where exposure may still occur

Where reasonably practicable, wet methods, local extraction, or alternative cleaning methods shall be considered to minimise airborne contamination.

PPE Requirements

The following minimum PPE shall be used unless the risk assessment specifies additional controls:

- disposable coveralls suitable for contaminated work activities
- hair covering where contamination of hair is possible
- full face respiratory protection fitted with suitable P3 filters
- suitable protective gloves for hot work activities
- hearing protection where required
- safety footwear and standard PPE as required by the worksite

P3 filters shall be inspected before use and replaced in accordance with manufacturer recommendations or earlier if damaged, contaminated, or breathing resistance increases.

Disposable PPE contaminated with Chromium VI shall be disposed of as hazardous or chemical waste.

4.5.2 Welding on Coated Surfaces

General Control Measures

The following requirements apply when welding on coated or potentially contaminated surfaces:

- eating, drinking, and smoking are prohibited within contaminated work areas
- hands and exposed skin shall be washed before eating, drinking, smoking, or using sanitary facilities
- personnel shall shower after completion of the work
- work areas and tools shall be cleaned after completion of each task
- a demarcated restricted area of minimum 5 metres shall be established around the worksite unless otherwise defined by the risk assessment
- personnel shall use designated decontamination or cleaning stations before entering accommodation or clean areas
- welding fumes and airborne contamination shall be minimised where reasonably practicable through ventilation or extraction methods

Personnel shall stop work and inform supervision if dust, fumes, or contamination cannot be adequately controlled.

PPE Requirements

The following minimum PPE shall be used:

- disposable coveralls suitable for contaminated work activities
- hair covering where required
- full face respiratory protection fitted with suitable P3 filters
- suitable welding gloves
- hearing protection where required

- standard welding PPE appropriate for the task

Contaminated disposable PPE shall be disposed of as hazardous or chemical waste after use.

4.5.3 Cleaning of Work Areas and Equipment

General Control Measures

Cleaning activities shall be planned and controlled to minimise the spread of contaminated particles.

The following requirements apply:

- eating, drinking, and smoking are prohibited within contaminated work areas
- hands and exposed skin shall be washed before eating, drinking, smoking, or using sanitary facilities
- personnel shall shower after completion of the work
- designated decontamination or cleaning stations shall be used before entering accommodation or clean areas
- respiratory protection shall remain in place during cleaning or decontamination activities where exposure may occur
- demarcated areas shall be established taking into account wind direction, work at different levels, ventilation, and adjacent activities
- contaminated surfaces shall be dampened or controlled using suitable cleaning methods before removal of barriers where reasonably practicable

The use of compressed air for cleaning contaminated surfaces shall be minimised or avoided unless specifically risk assessed and approved.

Where reasonably practicable, industrial vacuum cleaning systems equipped with suitable filtration shall be used.

PPE Requirements

The following minimum PPE shall be used during cleaning and decontamination activities:

- disposable coveralls suitable for contaminated work activities
- hair covering where contamination is possible
- full face respiratory protection fitted with suitable P3 filters
- suitable protective gloves
- hearing protection where required

Contaminated PPE, disposable materials, and cleaning residues shall be disposed of as hazardous or chemical waste in accordance with waste management requirements.

5. Monitoring and Review

This procedure shall be reviewed at planned intervals, or earlier where required due to:

- changes in legislation or industry guidance
- operational changes
- changes in work methods or equipment
- incident investigations

- exposure monitoring results
- lessons learned
- audit findings
- client requirements

The purpose of the review is to verify that:

- control measures remain effective
- exposure risks are adequately managed
- working practices remain aligned with current operational activities
- personnel can reasonably comply with the defined requirements
- lessons learned and improvement opportunities are incorporated

Monitoring activities may include:

- workplace inspections
- audits
- task observations
- review of incident and near miss reports
- review of exposure monitoring data
- verification of PPE usage and decontamination practices

Personnel are encouraged to report practical improvement opportunities, ineffective controls, or operational concerns related to Chromium VI exposure management.

5.1. Continuous Improvement Actions

The following improvement actions have been identified and shall be periodically reviewed as part of the continuous improvement process:

- assess the feasibility of using industrial vacuum systems as an alternative to compressed air cleaning methods
- evaluate the current use of compressed air cleaning and identify safer alternatives where reasonably practicable
- further define and distinguish control measures for hot cutting, grinding, and cold cutting activities
- review available vacuum cleaning and extraction technologies suitable for offshore operations
- evaluate opportunities to further reduce airborne particle generation during contaminated work activities
- review lessons learned from operational activities involving Chromium VI exposure risks

6. References

6.1. Applicable Legislation and Guidelines

The following legislation, regulations, and guidance documents are applicable to work activities involving Chromium VI (Cr(VI)):

- Directive (EU) 2017/2398 amending Directive 2004/37/EC on the protection of workers from risks related to exposure to carcinogens or mutagens at work
- Dutch Ministry of Social Affairs and Employment (SZW) policy regarding safe working with carcinogenic substances
- Dutch “Beheersregime Chroom-6”

- Applicable Belgian occupational exposure legislation
- Applicable offshore client requirements and project-specific specifications

In Belgium, the Occupational Exposure Limit (OEL) for Chromium VI is 0.005 mg/m^3 in accordance with applicable European legislation.

In the Netherlands, the Occupational Exposure Limit for Chromium VI is 1 µg/m^3, with an additional target risk level of 0.01 µg/m^3.

Koole Offshore Operations (KOO) applies the principle that exposure to Chromium VI shall be reduced to as low as reasonably practicable (ALARP), taking into account:

- applicable legal requirements
- client requirements
- operational conditions
- available control measures
- current industry best practices

Where different legislative or project requirements apply, the most stringent requirement shall be followed.

6.2. Internal References

Reference	Description
Ref. [1]	TRA Cutting and Welding (updated for Cr(VI))
Ref. [2]	Hoondert Study