

# Summary of representative risk management measures (RMMs) and operational conditions (OCs)

Public version

<b>Name of applicants:</b>	CrO <sub>3</sub> 4UK Group:  Aalberts Integrated Piping Systems Ltd Borough Ltd Quality Plated Products Ltd Samuel Heath and Sons plc
<b>Submitted by:</b>	CrO <sub>3</sub> 4UK Group
<b>Prepared by:</b>	CrO <sub>3</sub> 4UK Group Technology Sciences Group Consulting Ltd (TSG Consulting) Risk & Policy Analysts Ltd (RPA)
<b>Date:</b>	30th June 2022
<b>Substance:</b>	Chromium trioxide (EC no. 215-607-8, CAS no. 1333-82-0)
<b>Use titles:</b>	Use 1: Industrial use of chromium trioxide for the etch pre-treatment step for functional chromium plating with decorative character for automotive, sanitary, heating and other applications  Use 2: Industrial use of chromium trioxide for functional chromium plating with decorative character for automotive, sanitary, heating and other applications
<b>Use numbers:</b>	1 & 2

## ES1: Industrial use of chromium trioxide in the chrome plating of plastic and metal articles

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
ECS 1	ERC 6b	<p>█ tonnes CrO<sub>3</sub>/year or █ tonnes Cr(VI)/year.</p> <p>Company 1: █ tonnes Cr(VI)/year</p> <p>Company 2: █ tonnes Cr(VI)/year</p> <p>Company 3: █ tonnes Cr(VI)/year</p> <p>Company 4: █ tonnes Cr(VI)/year</p>	<p><b>Air:</b></p> <p>Mist suppressant.</p> <p>LEV with air passing to atmosphere via a scrubber (Companies 1 and 3).</p> <p><b>Wastewater:</b></p> <p>By design, no release of Cr(VI) to surface water.</p> <p>On-site wastewater treatment facility which reduces Cr(VI) to Cr(III).</p> <p>pH &amp; dosing alarms.</p> <p><b>Waste:</b></p> <p>Solid waste is collected and disposed of by a certified waste handler.</p>	<p><b>Wastewater:</b></p> <p>Regular sampling of wastewater from the final discharge point.</p> <p>Employee training.</p> <p>Procedures.</p>	Not applicable	Not applicable	<p><b>Wastewater:</b></p> <p>The on-site waste water treatment facility reduces Cr(VI) to Cr(III) via a series of reactions, such that residual concentrations of Cr(VI) in effluent may be considered negligible.</p> <p>Probes control the automated dosing of sulphuric acid and sodium metabisulphite into the chromium reduction tank to ensure complete reduction.</p>	<p><b>Water: 0%</b></p> <p>Complete reduction of Cr(VI) to Cr(III) at onsite WWTP.</p> <p><b>Air:</b></p> <p>Company 1: 0.19%</p> <p>Company 2: No data available</p> <p>Company 3: 0.06%</p> <p>Company 4: 0%</p> <p>The conc. of Cr(VI) from the stack was measured &amp; equates to an annual release of 0.7 kg total Cr(VI)/year for Company 1 and 3 respectively. Company 4 does not release Cr(VI) into the air.</p> <p><b>Soil: 0%</b></p> <p>Cr(VI) in wastewater is reduced to Cr(III), all solid and liquid waste is collected and waste is disposed as hazardous waste by an external waste management company.</p>	Section 9.1.3.1 & 9.2.1

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
WCS 1	<b>PROC 1</b> Receipt of raw materials	-	<p>The containers containing chromium trioxide are sealed and arrive on shrink wrapped pallets upon receipt.</p> <p>There is no handling of the containers by workers. The containers are transferred using a forklift truck / pump truck.</p> <p>Natural / general ventilation.</p>	<p>Duration of task is limited: less than 30 minutes.</p> <p>The frequency of deliveries depends on each company: between 2 weeks to 6 times a year with 100-900 kg per delivery.</p> <p>The containers are only received by authorised personnel.</p> <p>Employee training.</p> <p>Procedures.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.2
WCS 2	<b>PROC 1</b> Storage of raw materials	-	<p>All containers are sealed.</p> <p>All containers are stored in a dedicated storage area.</p> <p>General ventilation.</p>	<p>Access to the chemical stores at all sites is restricted to trained personnel only using either by (i) a key/padlocked door or cage or (ii) a cordoned off area.</p> <p>Limited exposure time of up to 15 minutes.</p> <p>Employee training.</p> <p>Procedures.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.3
WCS 3a	<b>PROC 8b</b> Weighing of chromium trioxide and	-	All companies perform the top up while the plating line is not in operation.	Frequency and duration differ between companies.	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.4

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
	replenishing of tank		<p>LEV (lip extraction) is used at Company 1, Company 2 and Company 3.</p> <p>A mist suppressant is used to limit emissions from the plating tank.</p> <p>CrO<sub>3</sub> supplied as flake, limiting dust formation and exposure when compared to powder.</p> <p>Croffles are also used at Company 4.</p>	<p><b>Company 1:</b> Once a week, 15 minutes duration.</p> <p><b>Company 2:</b> Four times a week (3 times for etch tank and once for chrome tank) 5 minutes duration.</p> <p><b>Company 3:</b> Once per shift, 5 minutes duration</p> <p><b>Company 4:</b> every 2 weeks, 30 minutes duration.</p> <p>Weighing only occurs at Company 4. Company 1, 2 and 3 decant a full metal container into the plating tanks at once.</p> <p>Restricted access areas.</p> <p>Performed only by authorised, dedicated personnel.</p> <p>Employee training.</p> <p>Procedures, including requirement to ensure slow and steady addition to the plating bath to minimise dust formation.</p>					
WCS 3b	<b>PROC 8b</b> Addition of liquid to plating tank	-	All companies perform the top up while the plating line is not in operation.	The addition of liquids including water or the mist suppressant to the plating/etching tank occur every shift for all four companies.	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.4

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
			<p>LEV (lip extraction) is used at Company 1, Company 2 and Company 3.</p> <p>A mist suppressant is used to limit emissions from the plating tank.</p> <p>Croffles are also used at Company 4.</p>	<p>Duration is approximately 5 minutes.</p> <p>Performed only by authorised, dedicated personnel.</p> <p>Employee training.</p> <p>Procedures.</p>					
WCS 4	<b>PROC 9</b> Sampling of plating tanks	-	<p>LEV (lip extraction) is used at Company 1, Company 2 and Company 3.</p> <p>A mist suppressant is used to limit emissions from the plating tank.</p> <p>Croffles are also used at Company 4.</p>	<p>Frequency and duration differ between companies.</p> <p><b>Company 1:</b> Once a week, 15 minutes duration.</p> <p><b>Company 2:</b> Four times a week (3 times for etch tank and once for chrome tank) 5 minutes duration.</p> <p><b>Company 3:</b> Once per shift, 5 minutes duration</p> <p><b>Company 4:</b> every month, 15 minutes duration.</p> <p>Performed only by authorised, dedicated personnel.</p> <p>Employee training.</p> <p>Procedures.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.5

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
WCS 5	<b>PROC 3</b> Operation of plating line (automated)	-	<p>Automated rather than manual plating process (except where manual plating line at Company 4 is being used).</p> <p>LEV (lip extraction) is used at Company 1, Company 2 and Company 3.</p> <p>A mist suppressant is used to limit emissions from the plating tank.</p> <p>Croffles are also used at Company 4.</p>	<p>Limited exposure:</p> <p>At Companies 1,2 and 4, the technicians walk the plating line once per hour to perform brief checks.</p> <p>At Company 3, computers are used to monitor the plating line. Admittance to the line only occurs for sampling/top up.</p> <p>All four companies restrict the area to plating shop personnel only by using a chain or key/padlock door.</p> <p>All tanks are clearly labelled on the side noting the hazards of chromium trioxide.</p> <p>Company 3 only operates their automated line twice a week. All other companies operate their automated line daily.</p> <p>Employee training.</p> <p>Procedures.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.6
WCS 6	<b>PROC 3</b> Operation of plating line (manual)	-	<p>General ventilation.</p> <p>A mist suppressant and croffles are used to limit emissions.</p>	<p>Manual line is operated daily by Company 4 only.</p> <p>Only authorised personnel are allowed in the plating shop and all</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.7

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
				tanks are clearly labelled on the side noting the hazards of chromium trioxide.  Employee training.  Procedures.					
WCS 7	<b>PROC 15</b>  Laboratory analysis	-	General ventilation.	An onsite laboratory is used for Company 1,2 and 3. Analysis is conducted on an open bench.  <15 minutes exposure  The frequency varies per company. Ranges from daily to weekly.  Performed only by authorised, dedicated personnel.  Company 4 use an external laboratory for analysis.  Employee training.  Procedures.	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.8
WCS 8	<b>PROC 4</b>  Loading / unloading of parts	-	No direct exposure to Cr(VI).  Indirect exposure is also unlikely as all parts have been through an extensive post treatment process	Performed only by authorised, dedicated personnel.  Employee training.  Procedures.	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.9

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
			<p>involving various washing steps and a drying step.</p> <p>Separation Company 1 and Company 3 manually load / unload the parts onto the jigs in a separate building. Company 2 and 4 also perform jigging / unjigging in a separate area away from the line.</p> <p>General ventilation.</p>						
WCS 9	<b>PROC 28</b> Maintenance	-	<p>Maintenance activities occur when the plating baths are switched off.</p> <p>When emptying and cleaning tanks, the task is mainly automated and the tanks emptied and rinsed via sealed pipes to the wastewater treatment process.</p>	<p>Infrequent exposure for many maintenance activities.</p> <p>Performed only by authorised, dedicated personnel.</p> <p>Employee training.</p> <p>Procedures.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.10
WCS 10a	<b>PROC 8b</b> Treatment of wastewater and maintenance	-	<p>The wastewater treatment process is almost entirely enclosed.</p> <p>Wastewater treatment plant is fully automated and results in almost all</p>	<p>Sampling is limited to 5-15 minutes exposure time depending on the company involved.</p> <p>The frequency varies from daily to weekly.</p>	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.11

ECS and WCS	Task (ERC/spERC or PROC)	Annual amount per site	Technical RMMs	Organisational RMMs	PPE	Other conditions	Effectiveness of wastewater and waste air treatment (for ERC)	Release factors: water, air and soil (for ERC)	Detailed info. in CSR (section)
			Cr(VI) being reduced to Cr(III). The collection of wastewater samples occurs outside at discharge point.	Performed only by authorised, dedicated personnel. Employee training. Procedures.					
WCS 10b	<b>PROC 8b</b> Maintenance (cleaning of the filter press)	-	Residual concentrations of hexavalent chromium in the sludge, if any, are negligible. General ventilation. The filter is removed and collected in sealed filter bags ready for disposal by a specialist waste carrier.	The collection of the sludge varies between 4 times a day for Company 2 to twice weekly for Company 1 and once per day for Company 3. Performed only by authorised, dedicated personnel. Company 4 use an external contractor to clean the filter press. Employee training. Procedures.	See PPE table below	Not applicable	Not applicable	Not applicable	9.2.11

**Abbreviations:** RMM=Risk Management Measures, OC=Operational Conditions, ES=Exposure Scenario, WCS=Worker contributing scenario, ECS=Environmental Contributing Scenario, ERC=Environmental Release Category (or spERC if available), PROC= Process category, LEV=Local Exhaust Ventilation, PPE=Personal Protective Equipment

In addition to standard work clothing, the following PPE is worn for each WCS.

	WCS 1, 2, 5, 6, 7, 8, 9, 10	WCS 3a, 4	WCS 3b	WCS 4
Safety boots	✓	✓	✓	✓
Safety glasses	✓	✓	✓	✓
RPE	Not required	Full or half face mask with P3 filter (at least APF = 20)	Not required	Only at company 2 and 3, APF = 40 full face shields
PVC gloves	✓	✓	✓	✓
Overalls/Laboratory coat	✓	✓	✓	✓