[MATERIAL SAFETY DATA SHEET (MSDS)]

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

AUTHORIZED BY MDL FOR INTERNAL USE ONLY. FOR EXTERNAL USE, SEE SECTION 16.

FIRST COLOR CO.,LTD..
1236-1, JEUNGWANG-DONG, SHIHUNG,
KYOUNGGI-DO, KOREA

EMERGENCY TELEPHONE NUMBER:
TEL : 82-31-432-6977
FAX : 82-31-432-6329

SUBSTANCE: CHROME VERMILION

TRADE NAMES/SYNONYMS : FIRST RED 700

C.I. PIGMENT RED 104

CHEMICAL FAMILY: inorganic, salt

CREATION DATE: Sep 27 1991
REVISION DATE: Jun 17 2007

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: CHROME VERMILION
CAS NUMBER: 12656-85-8
EC NUMBER (EINECS): 235-759-9
EC INDEX NUMBER: 082-010-00-5
PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=0 REACTIVITY=0

EC CLASSIFICATION (ASSIGNED):

Carcinogen Category 3
Reproductive Toxin Category 1
Reproductive Toxin Category 3

R 33-40-61-62

EC Classification may be inconsistent with independently-researched data.

EMERGENCY OVERVIEW:
COLOR: orange or red
PHYSICAL FORM: powder
MAJOR HEALTH HAZARDS: allergic reactions, birth defects, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, allergic reactions, reproductive effects, metallic taste, vomiting, digestive disorders, loss of voice, chest pain, difficulty breathing, headache, dizziness, disorientation, tingling sensation, lung congestion, kidney damage, nerve damage, paralysis, reproductive effects, effects on the brain, convulsions
LONG TERM EXPOSURE: lack of sense of smell, lack of sense of smell and taste, black lines on the gums, tooth decay, asthma, visual disturbances, impotence, sterility, lung damage, liver damage, reproductive effects, coma, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, allergic reactions, nausea, vomiting, kidney damage, coma
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, eye damage
LONG TERM EXPOSURE: tearing, red bands around the cornea
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation, allergic reactions, vomiting, digestive disorders, dizziness, kidney damage, liver damage, nerve damage, reproductive effects, convulsions, coma
LONG TERM EXPOSURE: same as effects reported in long term inhalation

CARCINOGEN STATUS:
OSHA: N
NTP: Y
IARC: Y

SECTION 4 FIRST AID MEASURES

INHALATION: When safe to enter area, remove from exposure. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Keep warm and at rest. Get medical attention immediately.

SKIN CONTACT: Remove contaminated clothing, jewelry, and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention, if needed.

EYE CONTACT: Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

ANTIDOTE: dimercaprol, intramuscular. dextrose/water, intravenous; mannitol solution, intravenous; dimercaprol, intramuscular; calcium disodium edetate/procaine, intramuscular; penicillamine, oral.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage. Consider oxygen.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk.

Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

SECTION 6 ACCIDENTAL RELEASE MEASURES

WATER RELEASE:

Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash). Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:

Do not touch spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container. Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

CHROME VERMILION:

If any employee is exposed to lead for more than 8 hours per day, use the following formula for the maximum permissible limit (in ug(Pb/m3): 400 divided by hours worked in the day. If any employee is exposed to lead for more than 8 hours per day, use the following formula for the maximum permissible limit (in ug(Pb/m3): 400 divided by hours worked in the day.

LEAD CHROMATE:
50 ug(Pb)/m3 OSHA TWA 8 hour(s)
30 ug(Pb)/m3 OSHA action level 8 hour(s)
0.1 mg(CRO3)/m3 OSHA ceiling
0.05 mg(Pb)/m3 ACGIH TWA
0.012 mg(Cr)/m3 ACGIH TWA
0.10 mg(Pb)/m3 NIOSH recommended TWA
0.001 mg(Cr(VI))/m3 NIOSH recommended TWA
AGS MAK 4 times/shift

MEASUREMENT METHOD: Particulate filter; Nitric acid/Hydrogen peroxide; Atomic absorption spectrometry; NIOSH III # 7082, Lead Compounds

MEASUREMENT METHOD: Particulate filter; Reagent; Visible spectrophotometry; NIOSH III # 7600, Hexavalent Chromium

LEAD, INORGANIC FUMES AND DUST (as Pb):
50 ug/m3 OSHA TWA 8 hour(s)
30 ug/m3 OSHA action level 8 hour(s)
0.05 mg/m3 ACGIH TWA
0.10 mg/m3 NIOSH recommended TWA 10 hour(s)

MEASUREMENT METHOD: Particulate filter; Nitric acid/Hydrogen peroxide; Atomic absorption spectrometry; NIOSH III # 7082, also # 7105

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves. OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1025.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
Measurement Element:

Chromium (Cr)

At any detectable concentration -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Escape -

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

Lead (Pb)

0.5 mg/m3

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

2.5 mg/m3

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

50 mg/m3

Any powered, air-purifying respirator with a high-efficiency particulate filter.

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

100 mg/m3

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: solid

COLOR: orange or red

PHYSICAL FORM: powder

ODOR: Not available

BOILING POINT: Not applicable

MELTING POINT: Not available

VAPOR PRESSURE: Not applicable

VAPOR DENSITY: Not applicable

SPECIFIC GRAVITY: Not available
WATER SOLUBILITY: Not available
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not applicable
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition.
Avoid generating dust. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, oxidizing materials, halogens, peroxides, metals,
combustible materials, metal carbide, acids

CHROMIUM:
ALKALI CARBONATES: Attacked.
ALKALIES (CAUSTIC): Attacked.
AMMONIUM NITRATE (FUSED): Violent or explosive reaction.
BROMINE PENTAFLUORIDE: Violent reaction and possible ignition.
HYDROGEN PEROXIDE: Violent decomposition reaction.
LITHIUM (MOLTEN): Vigorous reaction at elevated temperatures.
NITROGEN OXIDE: Incandescent reaction.
OXIDIZERS (STRONG): Fire and explosion hazard.
POTASSIUM CHLORATE (FUSED): Vigorous incandescent reaction.
SULPHUR DIOXIDE: Incandescent reaction.

LEAD:
AMMONIUM NITRATE: Violent or explosive reaction.
CHLORINE TRIFLUORIDE: Violent reaction.
DISODIUM ACETYLIDE: Trituration in mortar may be violent and liberate
carbon.
HYDROGEN PEROXIDE (52% OR GREATER): Violent decomposition.
HYDROGEN PEROXIDE (60% SOLUTION) + TRIOXANE: Spontaneously detonable.
METALS (ACTIVE): Incompatible.
NITRIC ACID: Lead-containing rubber may ignite.
OXIDIZERS (STRONG): Incompatible.

SODIUM AZIDE: Forms lead azide and copper azide in copper pipe.
SODIUM CARBIDE: Vigorous reaction.
SULFURIC ACID (HOT): Reacts.
ZIRCONIUM-LEAD ALLOYS: Ignition on impact.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of lead, chromium compounds

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

CHROME VERMILION:
TOXICITY DATA:
11250 mg/kg/90 day(s) continuous oral-dog TDLo
CARCINOGEN STATUS: NTP: Known Human Carcinogen; IARC: Human Inadequate Evidence, Animal Sufficient Evidence, Group 2B (Lead and inorganic lead compounds), Human Sufficient Evidence, Animal Sufficient Evidence, Group 1 (Hexavalent chromium compounds); ACGIH: A2 -Suspected Human Carcinogen; TRGS 905: K 3
An excess risk for lung and sinonasal cancer has been reported in workers in the chromate production, chromate pigment production and chromium plating industries. Lead chromate and derived pigments have been tested by intrabronchial implantation in rats without producing a significant increase in the incidence of tumors. Lead chromate and derived pigments have also been tested in rats by subcutaneous and intramuscular injection, producing malignant tumors at the site of injection and, in one study, renal carcinomas. A study by intrapleural administration to rats could not be evaluated. No increase in tumor incidence was observed when lead chromate was administered intramuscularly to mice.
Renal tumors were produced in animals by lead acetate, subacetate and phosphate given orally, subcutaneously or intraperitoneally. No evalution could be made of the carcinogenicity of other lead compounds.
TARGET ORGANS: immune system (sensitizer), nervous system, kidneys, teratogen
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, heart or cardiovascular disorders, liver disorders, respiratory disorders, skin disorders and allergies
ADDITIONAL DATA: May be excreted in breast milk.
Cross sensitization reactions may occur between hexavalent and trivalent chromium compounds.

HEALTH EFFECTS:

INHALATION:

CHROME VERMILION: See information on hexavalent chromium and lead compounds.

ACUTE EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: May cause irritation and tracheobronchitis characterized by cough, sore throat, chest pain, lightheadedness, headache, sinusitis, laryngitis, sneezing, rhinorrhea, wheezing, dyspnea, pulmonary edema, anorexia, fever, and generalized bronchospasm have also been reported. Tracheobronchial irritation and edema may persist after other symptoms subside. Sensitization reactions may occur in previously exposed persons.

LEAD COMPOUNDS: Absorption of large amounts of lead may cause a metallic taste, thirst, a burning sensation in the mouth and throat, salivation, abdominal pain with severe colic, vomiting, diarrhea of black or bloody stools, constipation, fatigue, sleep disturbances, dullness, restlessness, irritability, memory loss, loss of concentration, delirium, oliguria often with hematuria and albuminuria, encephalopathy with visual failure, paresthesias, muscle pain and weakness, convulsions, and paralysis. Death may result from cardiorespiratory arrest or shock. Survivors of acute exposure may experience the onset of chronic intoxication. Liver effects may include enlargement and tenderness, and jaundice. The fatal dose of absorbed lead is approximately 0.5 grams. Pathological findings include gastrointestinal inflammation and renal tubular degeneration.

CHRONIC EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: Repeated exposure has produced inflammation, bleeding, painless, slow to heal ulcerations and perforation of the nasal septum with a foul discharge. These effects have occurred in workers at concentrations ranging from 0.06-0.72 mg/m3 and varying lengths of exposure. Congestion, hyperemia, rhinitis, pharyngitis, tracheitis, lung inflammation, emphysema, bronchitis, bronchopneumonia, and polyps and hoarseness of the larynx and polyps or cysts of the sinuses have also been reported. X-rays revealed enlargement of the hilar region and lymph nodes, increase in peribronchial and perivascular lung markings and adhesions of the diaphragm. Nodular and non-nodular pneumoconiosis, dental erosion, and cutaneous and dental discoloration, perforated ear drum, loss of sense of smell and taste, and blood changes including leucocytosis or leucopenia

may occur. Workers with a high degree of exposure showed a pattern of nephrotoxicity, as evidenced by increases in the indices for renal tubular damage. Gastrointestinal disturbances including spasms, gastritis and ulcers of the stomach and intestines, and hepatitis with or without jaundice may occur. Severe liver damage and central nervous system involvement have been reported in workers. Also, disturbance of short-term memory and attention span were reported. Sensitization reactions may occur resulting in bronchial asthmatic attacks which may have a lag time of 4-8 hours between exposure and the attack. Keratosis of the lips, gingiva and palate have been reported after years of exposure. An excess risk for lung and sinonasal cancer been reported in workers in the chromate production, chromate pigment production and chromium plating industries. An increase in chromosomal aberrations in peripheral blood lymphocytes (3.6-9.4% cells with aberrations compared with 1.9% in unexposed controls) has been reported in workers. Immune depression was noted in rats exposed to 0.2 mg/m3 continuously for 90 days; the immune system was stimulated @ <0.1 mg/m3. Adverse effects on the macrophages were reported in rabbits exposed for 4-6 weeks. Diffuse thickening of the alveolar walls and proliferation of cells along the blood vessels and bronchi were reported in animals exposed to an atmosphere comparable to that of a chromate plant.

LEAD COMPOUNDS: Prolonged or repeated exposure to low levels of lead may result in an accumulation in body tissues and exert adverse effects on the blood, nervous systems, heart, endocrine and immune systems, kidneys, and reproduction. Early stages of lead poisoning, "plumbism", may be evidenced by anorexia, weight loss, constipation, apathy or irritability, occasional vomiting, fatigue, headache, weakness, metallic taste in the mouth, gingival lead line in persons with poor dental hygiene, and anemia. Loss of recently developed motor skills is generally observed only in children. More advanced stages of poisoning may be characterized by intermittent vomiting, irritability and nervousness, myalgia of the arms, legs, joints and abdomen, paralysis of the extensor muscles of the arms and legs with wrist and/or foot drop. Severe "plumbism" may result in persistent vomiting, ataxia, periods of stupor or lethargy, encephalopathy with visual disturbances which may progress to optic neuritis and atrophy, hypertension, papilledema, cranial nerve paralysis, delirium, convulsions, and coma. Neurologic sequelae may include mental retardation, seizures, cerebral palsy, and dystonia musculorum deformans. Irreversible kidney damage has been associated with industrial exposure. Reproductive effects have been exhibited in both males and females. Paternal effects may

include decreased sex drive, impotence, sterility and adverse effects on the sperm which may increase the risk of birth defects. Maternal effects may include miscarriage and stillbirths in exposed women or women whose husbands were exposed, abortion, sterility or decreased fertility, and abnormal menstrual cycles. Lead crosses the placenta and may affect the fetus causing birth defects, mental retardation, behavioral disorders, and death during the first year of childhood. Animal studies indicate that reproductive effects may be additive if both parents are exposed to lead.

SKIN CONTACT:

CHROME VERMILION: See information on hexavalent chromium and lead compounds.

ACUTE EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: May cause irritation and corrosion. Application to broken skin has produced local necrosis, nausea, vomiting, shock, coma, kidney necrosis, and death. Sensitization reactions may occur in previously exposed persons.

LEAD COMPOUNDS: Contact with lead powders or dust may be irritating. Lead is not absorbed through the skin, but may be transferred to the mouth inadvertently by cigarettes, chewing tobacco, food, or make-up.

CHRONIC EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: Prolonged or repeated exposure may cause irritative dermatitis, sensitization dermatitis, and chrome ulcers. Sunlight sensitivity has also been reported. Dermatitis may appear as erythema, scattered papules, eczema or dyshidriotic pompholyx; it occurs most commonly on the hands, wrists, and forearms, but frequently on the eyelids, neck, or any other part of the body in contact with the mist or solution. It is very persistent and may fail to improve even many years after cessation of exposure. Repeated attacks of sensitization reactions may be of increasing severity. Ulceration occurs anywhere on the body where the skin is broken. Kidney damage in workers has been reported from absorption through damaged skin.

LEAD COMPOUNDS: Prolonged or repeated exposure to the powder or dust may result in dermatitis. Systemic toxicity may develop if lead is transferred to the mouth by cigarettes, chewing tobacco, food, or make-up.

EYE CONTACT:

CHROME VERMILION: See information on hexavalent chromium and lead compounds.

ACUTE EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: May cause generalized irritation of the conjunctiva. Dichromates may cause corneal injury causing swelling of the corneal stroma.

LEAD COMPOUNDS: Lead dust or powders may be irritating. Metallic lead particles may cause an inflammatory foreign body reaction and injury is generally thought to be mechanical and not toxic.

CHRONIC EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: Repeated and prolonged contact may produce conjunctivitis, lacrimation, and dark red bands around the cornea.

LEAD COMPOUNDS: Prolonged exposure may cause conjunctivitis.

INGESTION:

CHROME VERMILION: See information on hexavalent chromium and lead compounds.

ACUTE EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: May cause acute fulminating gastroenteritis with nausea, vomiting, thirst, vertigo, oliguria, anuria, cholera-like stools, muscle cramps, convulsions, and coma. Early deaths may result from blood loss into the gastrointestinal tract and at other sites, causing cardiovascular shock. Survival of the initial phase may be followed by renal and hepatic necrosis and failure which may be fatal. Fatal cases have been reported in which the person showed symptoms which mimicked hepatic coma; convulsions occurred during the final stages. The approximate lethal dose is 1.0-16.0 grams. Chromate dermatitis may be aggravated by ingestion of chromates.

LEAD COMPOUNDS: Absorption of large amounts of lead from the intestinal tract may cause all the same effects as detailed in acute inhalation. The fatal dose of absorbed lead is approximately 0.5 grams.

CHRONIC EXPOSURE:

HEXAVALENT CHROMIUM COMPOUNDS: Five cases of stomach cancer have been reported, apparently from swallowing of chromate dust or from excessive mouth breathing. Administration in drinking water @ 0.45-25 ppm/1 year was

nontoxic to rats. Prolonged administration to rats produced hypoactivity, which indicates chromium may affect the central nervous system.

LEAD COMPOUNDS: Prolonged or repeated exposure to low levels of lead may result in an accumulation in body tissues and adverse effects on the kidneys, heart and blood and on the nervous, reproductive, endocrine and immune systems as detailed in chronic inhalation.

SECTION 12 ECOLOGICAL INFORMATION

Not available

SECTION 13 DISPOSAL CONSIDERATIONS

Hazardous Waste Number(s): D008. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 5.0 mg/L. Hazardous Waste Number(s): D007. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 5.0 mg/L. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

No classification assigned.

LAND TRANSPORT ADR/RID: No classification assigned.

AIR TRANSPORT IATA/ICAO: No classification assigned.

MARITIME TRANSPORT IMDG: No classification assigned.

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:

TSCA INVENTORY STATUS: Y

TSCA 12(b) EXPORT NOTIFICATION: Y

HEXAVALENT CHROMIUM CHEMICALS

SECTION 6

CERCLA SECTION 103 (40CFR302.4): N

SARA SECTION 302 (40CFR355.30): N

SARA SECTION 304 (40CFR355.40): N

SARA SECTION 313 (40CFR372.65): Y

LEAD COMPOUNDS

Chromium Compounds

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40CFR370.21):

ACUTE: Y

CHRONIC: Y

FIRE: N

REACTIVE: N

SUDDEN RELEASE: N

OSHA PROCESS SAFETY (29CFR1910.119): N

STATE REGULATIONS:

California Proposition 65: Y

Known to the state of California to cause the following:

LEAD COMPOUNDS

Cancer (Oct 01, 1992)

Hexavalent Chromium Compounds

Cancer (Feb 27, 1987)

EUROPEAN REGULATIONS:

EC NUMBER (EINECS): 235-759-9

EC RISK AND SAFETY PHRASES:

R 33	Danger of cumulative effects.
R 40	Possible risks of irreversible effects.
R 61	May cause harm to unborn child.
R 62	Possible risk of impaired fertility.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53	Avoid exposure - obtain special instructions before use.

GERMAN REGULATIONS:

WATER HAZARD CLASS (WGK): 1 (Self Classification by Manufacturers and Distributors)

SECTION 16 OTHER INFORMATION
