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| <b>Section-1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION<br/>AND OF THE COMPANY/UNDERTAKING</b> |
|---|

**1.1 Identification of the substance/preparation:****Commercial name:** BENZENE**Chemical name:** BENZENE C<sub>6</sub>H<sub>6</sub>**Synonyms:** Benzene, Benzol, Phenyl hydride, carbon oil.**1.2 Use of the substance /preparation:**

Solvent & raw material in the synthesis of styrene, phenol (phenolic resins), cyclohexane (nylon), aniline, maleic anhydride (polyester resins), alkyl benzenes (detergents), chlorobenzenes, and other products used in the production of drugs, dyes, pesticides, polymers, resins.

**1.3 MANUFACTURER & SUPPLIER: Reliance Industries Limited****Emergency Coordination Centre contact details:**

|  |            |   |
|--|------------|---|
| Hazira Mfg. Division<br>Village Mora,<br>Dist Surat, Gujarat, India                              | SSM Office | +91 2612835050/+912612835056                                  |
| Jamnagar Mfg. Division<br>Village Meghpar / Padana,<br>Taluka Lalpur,<br>Dist. Jamnagar, Gujarat | SSM Office | + 91 288 6612400<br>Mobile 9998007989<br>+ 91 288 6611190/1/6 |
| Vadodara Mfg. Division<br>PO Petrochemicals,<br>Dist: Vadodara, Gujrat, India                    | SSM Office | +91 265-6696525/+91 265-6693869                               |

SSM: Site Shift Manager

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| <b>Section 2 – HAZARD IDENTIFICATION</b> |
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**Hazard Category:**

| Health  | Environmental                     | Physical                     |
|---|-----------------------------------|------------------------------|
| Aspiration toxicity: Category 1<br>Eye irritation: Category 2<br>Skin irritation: Category 2<br>Carcinogenicity – Category 1A<br>Mutagenicity – Category 1B<br>Specific Target Organ Toxicity (RE): 1 | Aquatic Toxicity –<br>Category- 1 | Flammable<br>– Category<br>2 |

NA: Not available, RE: Repeated Exposure

Data reference: <http://ecb.jrc.ec.europa.eu/esis/>, Data reference: Official Journal of the European Union regarding EU GHS

## GHS Category table for reference:

| Study/hazard statement                                      | Category 1   | Category 2  | Category 3  | Category 4   | Category 5   |
|---|--|---|---|--|--|
| Acute Oral LD50   | ≤ 5 mg/kg<br>Fatal if swallowed  | > 5 ≤ 50 mg/kg<br>Fatal if swallowed  | > 50 ≤ 300 mg/kg<br>Toxic if swallowed  | > 300 ≤ 2000 mg/kg<br>Harmful if swallowed                                     | > 2000 ≤ 5000 mg/kg<br>May be harmful if swallowed         |
| Acute Dermal LD50   | ≤ 50 mg/kg<br>Fatal in contact with skin   | > 50 ≤ 200 mg/kg<br>Fatal in contact with skin  | > 200 ≤ 1000 mg/kg<br>Toxic in contact with skin                              | > 1000 ≤ 2000 mg/kg<br>Harmful in contact with skin                            | > 2000 ≤ 5000 mg/kg<br>May be harmful in contact with skin |
| Acute Inhalation<br>Dust LC50<br>Gases LC50<br>Vapours LC50 | ≤ 0.05 mg/L<br>≤ 100 ppm/V<br>≤ 0.5 mg/L<br>Fatal if inhaled   | > 0.05 ≤ 0.5 mg/L<br>> 100 ≤ 500 ppm/V<br>> 0.5 ≤ 2.0 mg/L<br>Fatal if inhaled                          | > 0.5 ≤ 1.0 mg/L<br>> 500 ≤ 2500 ppm/V<br>> 2.0 ≤ 10 mg/L<br>Toxic if inhaled | > 1.0 ≤ 5 mg/L<br>> 2500 ≤ 20000 ppm/V<br>> 10 ≤ 20 mg/L<br>Harmful if inhaled | See footnote below this table                              |
| Flammable liquids   | Flash point < 23 degrees C and initial boiling point ≤ 35 degrees C. Extremely flammable liquid and vapour | Flash point < 23 degrees C and initial boiling point > 35 degrees C. Highly flammable liquid and vapour | Flash point ≥ 23 degrees C ≤ 60 degrees C. Flammable liquid and vapour        | Flash point > 60 degrees C ≤ 93 degrees C. Combustible liquid                  | Not Applicable   |

Note: Gases concentration are expressed in parts per million per volume (ppmV).

NOTE 1: Category 5 is for mixtures which are of relatively low acute toxicity but which under certain circumstances may pose a hazard to vulnerable populations. These mixtures are anticipated to have an oral or dermal LD50 value in the range of 2000-5000 mg/kg bodyweight or equivalent dose for other routes of exposure. In light of animal welfare considerations, testing in animals in Category 5 ranges is discouraged and should only be considered when there is a strong likelihood that results of such testing would have a direct relevance for protecting human health.

NOTE 2: These values are designed to be used in the calculation of the ATE for classification of a mixture based on its ingredients and do not represent test results. The values are conservatively set at the lower end of the range of Categories 1 and 2, and at a point approximately 1/10th from the lower end of the range for Categories 3 – 5.

## GHS Category table for reference: Continued

| Study/hazard statement               | Category 1   | Category 2   | Category 3  |
|--------------------------------------|--|--|---|
| Eye Irritation                       | Effects on the cornea, iris or conjunctiva that are not expected to reverse or that have not fully reversed within 21 days.<br>Causes severe eye damage.   | 2A: Effects on the cornea, iris or conjunctiva that fully reverse within 21 days.<br>Causes severe eye irritation.<br>2B: Effects on the cornea, iris or conjunctiva that fully reverse within 7 days.<br>Causes eye irritation.   | Not applicable  |
| Skin Irritation                      | Destruction of skin tissue, with sub categorization based on exposure of up to 3 minutes (A), 1 hour (B), or 4 hours (C).<br>Causes severe skin burns and eye damage.  | Mean value of ≥ 2.3 > 4.0 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed); inflammation that persists to end of the (normally 14-day) observation period.<br>Causes skin irritation.        | Mean value of ≥ 1.5 < 2.3 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed).<br>Causes mild skin irritation. |
| Environment: Acute Toxicity Category | 96 hr LC50 (fish) ≤ 1 mg/L 48 hr EC50 (crustacea) ≤ 1 mg/L, 72/96 hr ErC50 (aquatic plants) ≤ 1 mg/L<br>Very toxic to aquatic life   | 96 hr LC50 (fish) > 1 ≤ 10 mg/L 48 hr EC50 (crustacea) > 1 ≤ 10 mg/L 72/96 hr ErC50 (aquatic plants) > 1 ≤ 10 mg/L<br>Toxic to aquatic life  | 96 hr LC50 (fish) > 10 ≤ 100 mg/L 48 hr EC50 (crustacea) > 10 ≤ 100 mg/L 72/96 hr ErC50 (aquatic plants) > 10 ≤ 100 mg/L<br>Harmful to aquatic life   |
| Flammable Aerosol                    | Extremely flammable aerosol  | Flammable aerosol  | Not Applicable  |
| Flammable solids                     | Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire and (b) burning time < 45 seconds or burning rate > 2.2 mm/second<br>Using the burning rate test, metal powders that have burning time ≤ 5 minutes<br>Flammable solid | Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire for at least 4 minutes and (b) burning time < 45 seconds or burning rate > 2.2 mm/second<br>Using the burning rate test, metal powders that have burning time > 5 ≤ 10 minutes<br>Flammable solid | Not Applicable  |
| Flammable gases                      | Gases, which at 20 degrees C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit.<br>Extremely flammable gas    | Gases, other than those of category 1, which, at 20 degrees C and a standard pressure of 101.3 kPa, have a flammable range while mixed in air.<br>Flammable gas  | Not Applicable  |

**GHS Label: GHS02: Flame, GHS08: Carcinogen.****Signal Word: Danger.****Details of statements:**

|                                    |  |
|------------------------------------|--|
| Hazard Statements                  | <p>H225: Highly flammable liquid and vapour.</p> <p>H350: May cause cancer</p> <p>H340: May cause genetic defects</p> <p>H372: Causes damage to organs</p> <p>H304: May be fatal if swallowed and enters airways.</p> <p>H319: Causes serious eye irritation.</p> <p>H315: Causes skin irritation.</p>   |
| Precautionary Statement Prevention | <p>P 102: Keep out of reach of children.</p> <p>P 103: Read label before use.</p> <p>P201: Obtain special instructions before use.</p> <p>P202: Do not handle until all safety precautions have been read and understood.</p> <p>P210: Keep away from heat/sparks/open flames/hot surfaces* No smoking.</p> <p>P 233: Keep container tightly closed.</p> <p>P 240: Ground/bond container and receiving equipment.</p> <p>P 241: Use explosion-proof electrical/ventilating/lighting/ equipment.</p> <p>P 242: Use only non-sparking tools.</p> <p>P 243: Take precautionary measures against static discharge.</p> <p>P 260: Do not breathe dust/fume/gas/mist/vapours/spray*.</p> <p>P 264: Wash thoroughly after handling.</p> <p>P 270: Do not eat, drink or smoke when using this product.</p> <p>P 280: Wear protective gloves/protective clothing/eye protection/face protection*.</p> <p>P281: Use personal protective equipment as required.</p>   |
| Precautionary Statement Response   | <p>P 101: If medical advice is needed, have product container or label at hand.</p> <p>P 301: IF SWALLOWED:</p> <p>P 302: IF ON SKIN:</p> <p>P 303: IF ON SKIN (or hair):</p> <p>P 305: IF IN EYES:</p> <p>P308: IF ON CLOTHING:</p> <p>P 310: Immediately call a POISON CENTER or doctor/physician.</p> <p>P313: Get medical advice/attention.</p> <p>P 314: Get medical advice/attention if you feel unwell.</p> <p>P 321: Specific treatment (see on this label).*</p> <p>P 331: Do NOT induce vomiting.</p> <p>P 332: If skin irritation occurs:</p> <p>P 337: If eye irritation persists:</p> <p>P 338: Remove contact lenses, if present and easy to do. Continue rinsing.</p> <p>P 351: Rinse cautiously with water for several minutes.</p> <p>P 352: Wash with plenty of soap and water.</p> <p>P 353: Rinse skin with water/shower.</p> <p>P 361: Remove/Take off immediately all contaminated clothing.</p> <p>P 362: Take off contaminated clothing and wash before re-use.</p> <p>P 370: In case of fire:</p> <p>P 378: Use for extinction.</p> |
| Precautionary Statement Storage    | <p>P235 Keep cool.</p> <p>P403: Store in a well-ventilated place.</p> <p>P405: Store locked up.</p>  |
| Precautionary Statement Disposal   | Follow local regulation  |

Data reference: [Official Journal of the European Union regarding EU GHS](#)

**Hazard ratings:**

| NFPA HAZARD CODES      | RATINGS SYSTEM      |
|------------------------|---------------------|
| <b>HEALTH:</b> 1       | 0 = No Hazard       |
| <b>FLAMMABILITY:</b> 3 | 1 = Slight Hazard   |
| <b>INSTABILITY:</b> 0  | 2 = Moderate Hazard |
|                        | 3 = Serious Hazard  |
|                        | 4 = Severe Hazard   |

**Route of entry:**

| Skin Contact | Skin Absorption | Eye Contact | Inhalation | Ingestion |
|--------------|-----------------|-------------|------------|-----------|
| Yes          | Yes             | Yes         | Yes        | Yes       |

**2.1 Health hazards:**

| Source          | NTP listed?                          | IARC cancer review group? | OSHA Regulated?                                 |
|-----------------|--------------------------------------|---------------------------|---|
| Carcinogenicity | Chemical is known to be carcinogenic | Carcinogenic to humans    | Chemical appears at 29 CFR part 1910 subpart Z. |

DATA REFERENCE: Toxic release inventory (TRI) basis of Occupational Safety and Health Administration (OSHA) carcinogen, National Toxicological program (NTP), International Agency for Research on Cancer (IARC), <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

**Inhalation:** Severely irritating if inhaled and acute exposure may be fatal.

**Ingestion:** May be fatal if swallowed.

**Skin contact:** May be fatal if absorbed. Highly irritating to skin. May cause allergic skin reaction.

**Eye contact:** Highly corrosive to eyes.

**Chronic exposure:** Weakness, coughing, labored breathing, headache Confusion nausea/vomiting convulsions heart rate and pulse variations coma respiratory failure

**Aggravations to pre existing conditions:** Those with history of lung diseases, or skin problems may be more susceptible to the effects of this substance.

**2.2 Information pertaining to particular dangers for human:**

Toxic substance with carcinogenic and mutagenic effects. Acute intoxication leads to central nervous system attenuation and narcotic effects occur. After swallowing possibility of aspiration (passage into the lung) and danger of chemical pneumonia (pulmonary edema). Product irritates eyes and skin. High vapour concentrations irritate respiratory system and eyes and may lead to fast coma and death. Liquid is absorbed through skin and may develop allergic eruption. Chronic effects cause bone marrow damage, haemopoiesis disorder and may develop leukemia.

**2.3 Information pertaining to particular dangers for the environment:**

Possible adverse effects on aquatic organisms.

**2.4 Other adverse effects:**

Highly flammable and easily ignitable substance. Danger of ignition at normal temperature. Readily evaporates and vapours form with air toxic and explosive mixtures heavier than air. Mixtures keep above ground and after ignition they spread fast into far distances. Ignition possible when exposed to hot surfaces, sparks, naked flames and by electrostatic discharges too. The substance is practically insoluble in water, floats on the water level and forms toxic and explosive mixtures above the water level. Risk of explosion if emptied into drains or released into wastewater. Attacks rubber and plastics.

**Target Organs:** Eyes, skin, respiratory system, blood, central nervous system, bone marrow

### Section 3 – COMPOSITION & INFORMATION ON INGREDIENTS

| Ingredients / Hazardous | CAS No.  | EINECS No. | Percentage |
|-------------------------|----------|------------|------------|
| Benzene/Yes             | 71-43-2  | 200-753-7  | >99.90 %   |
| Toluene / Yes           | 108-88-3 | 203-625-9  | <0.03%     |

Data reference: <http://ecb.jrc.ec.europa.eu/esis/>

### Section 4 – FIRST AID MEASURES

#### 4.1 General advice

**IMMEDIATE MEDICAL ATTENTION IS REQUIRED AFTER INHALATION OR AFTER SWALLOWING.**

In case of health troubles or doubts, seek medical advice immediately and show this (Material)Safety Data Sheet.

Ensure activity of vitally important functions until the arrival of the doctor (artificial respiration, inhalation of oxygen, heart massage). If patient is unconscious, or in case of danger of blackout, transport patient in a stabilized position. In case of first degree burns (painful redness), and second degree burns (painful blisters), cool the affected area with cold running water for a long time. In case of third degree burns (redness, cracking pale skin, usually without pain), do not cool affected skin, dress the area with sterile dry gauze only.

#### 4.2 Inhalation

Remove patient to fresh air, keep him warm and in order to rest quietly. Avoid walking. Seek medical advice.

**SYMPTOMS AND EFFECTS:** irritation, headache, dizziness, weakness, stupefaction, irritant coughing, convulsions, unconsciousness, possible respiratory inhibition or arrest.

#### 4.3 Skin contact

Immediately take off all contaminated clothing and footwear. Flush effected area with copious quantities of water. Seek medical advice.

**SYMPTOMS AND EFFECTS:** mild irritation, degreasing, absorption, blistering.

#### 4.4 Eye contact

Immediately flush eyes with clean lukewarm water and continue flushing for at least 15 minutes – keep the eyelids widely apart and flush thoroughly with mild water stream from the inner to the outer. Seek medical advice.

**SYMPTOMS AND EFFECTS:** severe irritation, cornea damage.

#### Swallowing

If patient is conscious and without convulsion, immediately try to induce vomiting. Never give anything by mouth to an unconscious person, just put patient into a stabilized position. Seek medical advice immediately.

**SYMPTOMS AND EFFECTS:** nausea, vomiting, convulsions, irregular heartbeat.

## Section 5 – FIRE FIGHTING MEASURES

### 5.1 Suitable extinguishing media

Foam, Dry chemical powder, CO<sub>2</sub>.

Cool containers which are not on fire with water spray.

### 5.2 Extinguishing media to be avoided

Water.

### 5.3 Caution about specific danger in case of fire and fire-fighting procedures

Danger of violent reaction or explosion. Vapours may travel considerable far distances and cause subsequent ignition. Vapours are heavier than air, may cumulate along the ground and in enclosed spaces – danger of explosion. Do not empty into drains. When burning, it emits carbon monoxide, carbon dioxide and irritant fumes. Containers with the substance exposed to excessive heat may explode.

### 5.4 Special protective equipment for fire-fighters

Wear full protective fire-resistant clothing and self-contained breathing apparatus.

## Section 6 – ACCIDENTAL RELEASE MEASURES

### 6.1 Person-related safety precautions

Isolate hazard area. Evacuate all unauthorized personnel not participating in rescue operations from the area. Avoid entry into danger area. Remove all possible sources of ignition. Stop traffic and switch off the motors of the engines. Do not smoke and do not handle with naked flame. Use explosion-proof lamps and non-sparking tools. Avoid contact with the substance. Apply recommended full protective personal equipment. When escaping from the contaminated area, wear mask with cartridge against organic vapours. Evacuate personnel from danger area. In places under the ground level and in enclosed spaces (including drains) risk of explosion and accumulation of toxic vapours.

### 6.2 Precautions for protection of the environment

Prevent from further leaks of substance. Do not allow substance to enter soil, water and sewage systems. In case of substance discharge to water courses or water containers, inform water consumers immediately, stop service and exploitation of water.

### 6.3 Recommended methods for cleaning and disposal

Pump off substance safely, soak up residues with compatible porous material and forward for disposal in closed containers. Dispose off under valid legal waste regulations.

## Section 7 – HANDLING AND STORAGE

### 7.1 Information for safe handling

Observe all fire-fighting measures (no smoking, do not handle with naked flame and remove all possible sources of ignition). Take precautionary measures against static discharges. Wear recommended personal protective equipment and observe instructions to prevent possible contact of substance with skin and eyes and



inhalation. Avoid leak to environment.

### 7.2 Information for storage

Storerooms should meet the requirements for the fire safety of constructions and electrical facilities and should be in conformity with valid regulations. Store in cool, well-ventilated place with effective exhaust, away from heat and all sources of ignition. Store in tightly closed container. Do not store together with oxidizing agents. Take precautionary measures against static discharges. Avoid leak to environment.

### 7.3 Information for specific use

Not applicable.

## Section 8 – EXPOSURE CONTROL & PERSONAL PROTECTION

### 8.1 Occupational Exposure Limits:

| Material | Source | Type         | ppm  | mg/m <sup>3</sup> | Notation |
|----------|--------|--------------|------|-------------------|----------|
| BENZENE  | ACGIH  | TWA          | 0.5  |                   |          |
|          | ACGIH  | STEL         | 2.5  |                   |          |
|          | ACGIH  | SKIN_DES TWA | NA   |                   |          |
|          | NIOSH  | IDLH         | 500* |                   |          |
|          | OSHA   | TWA          | 1    |                   |          |
|          | OSHA   | STEL         | 5    |                   |          |

NA: Data not available

\*Data revised in the year 1995

**Odor Threshold:** In air: 4.9 mg/cu m (characteristic odor), in water: 2.0 mg/l.

DATA REFERENCE: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

Recommended determination method in the work place atmosphere: gas chromatography, detector tube.

### 8.2 Occupational exposure controls

Collective protection measures: General and local ventilation, effective exhaust.

Individual protection measures: Personal protective equipment (PPE) for the protection of eyes, hands and skin corresponding with the performed labor has to be kept at disposition for the employees. In cases, where the workplace exposure control limits cannot be observed with the help of technical equipment or where it is not possible to ensure that the respiratory system exposure does not represent a health hazard for the personnel, adequate respiratory protection have to be kept at disposition. In the case of continuous use of this equipment during constant work, safety breaks have to be scheduled, if the PPE-character requires this. All PPE have to be kept in disposable state and the damaged or contaminated equipment has to be replaced immediately.

#### RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE):

| HANDS   | EYES  | BODY   | RESPIRATORY   |
|---|---|--|---|
|  |  |  |  |

**Respiratory protection:** If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-face piece respirator, airline hood, or full face piece self-contained breathing apparatus. Protective mask with canister A (brown coloured, protecting against organic vapours), self-contained breathing

apparatus.

**Eye protection:** Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

**Hand protection:** Wear gloves of impervious material.

Protective gloves: Routine work:

Glove material /Layer thickness/Breakthrough time

Nitrile 0.4 mm 10 min

Out flow/accident disposal: Viton 0.7 mm 480 min

**Body protection:** Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Protective coverall antistatic design recommended, impervious when handling big amounts (nitrile rubber), sealed leather footwear (free from synthetic adhesives)

**Hygiene Measures:** Wash hands, forearms and face thoroughly after handling. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

### 8.3 Environmental exposure controls

Proceed in accordance with valid air and water legislative regulations.

**Engineering measures:** Use only with adequate ventilation. If user operations generate dust, fumes, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

## Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

|   |                                    |
|---|------------------------------------|
| Appearance                                    | Liquid, colourless or light yellow |
| Odour   | Aromatic odour                     |
| Solubility in water                           | Negligible                         |
| Relative Density (H <sub>2</sub> O=1) @ 15 °C | 0.87                               |
| Boiling Point °C                              | 80.1 °C                            |
| Melting Point °C                              | 5.5 °C                             |
| Relative Vapour Density (Air=1)               | 2.8                                |
| Flash point °C                                | -11°C Closed cup                   |
| Auto ignition °C                              | 498 °C                             |
| Vapour pressure (mmHg) @ 25 °C                | 94.8                               |
| Molecular weight                              | 78.1                               |
| Explosive limits in air % by volume           | LEL 1.4% UEL 8%                    |
| PH  | NA                                 |
| Viscosity mPa.s @25 °C                        | 0.604                              |
| Pour point                                    | NA                                 |
| Evaporation rate (ether=1)                    | 2.8                                |
| Octanol/water partition coefficient log Kow   | 2.13                               |
| % volatile                                    | NA                                 |

NA: NOT AVAILABLE

DATA REFERENCE: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>:



## Section 10 – CHEMICAL STABILITY AND REACTIVITY INFORMATION

### 10.1 Conditions to avoid

Concentrations within the explosion limits, sources of ignition, high temperature, sun radiation.

### 10.2 Material to avoid

BENZENE reacts vigorously with allyl chloride or other alkyl halides even at minus 70°C in the presence of ethyl aluminum dichloride or ethyl aluminum sesquichloride. Explosions have been reported [NFPA 491M 1991]. Ignites in contact with powdered chromic anhydride [Mellor 11:235 1946-47]. Incompatible with oxidizing agents such as nitric acid. Mixtures with bromine trifluoride, bromine pentafluoride, iodine pentafluoride, iodine heptafluoride and other interhalogens can ignite upon heating [Bretherick 5th ed. 1995]. Benzene and cyanogen halides yield HCl as a byproduct (Hagedorn, F. H. Gelbke, and Federal Republic of Germany. 2002. Nitriles. In Ullman's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag GmbH & Co. KGaA.). The reaction of benzene and trichloroacetonitrile evolves toxic chloroform and HCl gasses. (Hagedorn, F., H.-P. Gelbke, and Federal Republic of Germany. 2002. Nitriles. In Ullman's Encyclopedia of Industrial Chemistry. Wiley-VCH Verlag GmbH & Co. KGaA.). Explosive reaction with chlorine (on light), with acid, nitric acid, nitrosyl perchlorate, silver perchlorate, oxygen, ozone, permanganic acid. Violent reactions with iodine fluoride, ignition with sodium peroxide. Hazardous reactions with concentrated mineral acids, halogens, melted sulphur. Dissolves non-polar rubber.

**REACTIVE GROUPS:** Hydrocarbons, Aromatics

### 10.3 Hazardous decomposition products

Thermal decomposition generates carbon monoxide and carbon dioxide.

## Section 11 – TOXICOLOGICAL INFORMATION

### 11.1 Acute effects

Toxic substance with carcinogenic and mutagenic effects. Acute intoxication leads to central nervous system attenuation and narcotic effects occur. After swallowing possibility of aspiration (passage into the lung) and danger of chemical pneumonia. Product irritates eyes and skin. High vapour concentrations irritate respiratory system and eyes and may lead to fast coma and death. Liquid is absorbed through skin and may develop allergic eruption.

Acute toxicity data:

| Parameter | Route      | Species | Values      | Exposure period |
|-----------|------------|---------|-------------|-----------------|
| LD50      | Oral       | Rat     | 3306 mg/Kg  | Not applicable  |
| LD50      | Dermal     | Rabbit  | >8260 mg/kg | Not applicable  |
| LC50      | Inhalation | Rat     | 10000 ppm   | 7 hours         |

Data Reference: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

### 11.2 Repeated dose toxicity

Chronic effects cause bone marrow damage, haemopoiesis disorder and may develop leukaemia.

### 11.3 Sensitisation

May cause skin allergy.

### 11.4 CMR effects (carcinogenicity, mutagenicity, toxicity for reproduction)

Proved carcinogenic effects for humans. Substance has mutagenic effects. Substance may have adverse effect on reproduction.

**11.5 Toxicokinetics, metabolism, distribution:** NA.

## Section 12 – ECOLOGICAL INFORMATION

### 12.1 Ecotoxicity data:

| Parameter | Route      | Species                           | Values  | Exposure period | Condition of bioassay |
|-----------|------------|-----------------------------------|---------|-----------------|-----------------------|
| LC50      | Inhalation | Palaemonetes pugio (grass shrimp) | 27 ppm  | 96 hours        | Not specified         |
| LC50      | Inhalation | Carassius auratus (goldfish)      | 46 mg/l | 24 hours        | Not specified         |
| LC50      | Inhalation | Crangon franciscorum (shrimp);    | 20 ppm  | 96 hours        | Not specified         |

Data Reference: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>; European Union Benzene Risk Assessment (2008)

**12.2 Mobility :** Highly mobile in soil.

### 12.3 Persistence and degradability

Benzene is readily biodegradable.

Data Reference: European Union Benzene Risk Assessment (2008)

### 12.4 Bioaccumulative potential

Benzene has a low to moderate bioaccumulation potential

Data Reference: European Union Benzene Risk Assessment (2008)

### 12.5 Results of PBT assessment Persistence and Degradation:

Hydrolysis at environmental conditions is not likely due to the lack of reactive functional.

Data Reference: European Union Benzene Risk Assessment (2008)

**12.6 Other adverse effects:** NA

**Environmental Fate:** Benzene is expected to have high mobility in soil.

Data Reference: European Union Benzene Risk Assessment (2008)

## Section 13– DISPOSAL CONSIDERATION

**Local Legislation:** Disposal should be in accordance with applicable regional, national, and local laws and regulations. This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

### 13.1 Recommended disposal methods for the substance / preparation

Product reuse or disposal in accordance with valid waste legislative regulations.

### 13.2 Recommended disposal methods for contaminated packaging

Product is transported in tank-vehicles.

### 13.3 Waste management measures that control exposure of humans and

**environment**

Proceed in accordance with valid health, air and water local legislative regulations.

**13.4 Waste regulation**

Follow local regulation.

**Section 14 – TRANSPORT INFORMATION**

**14.1 International Transport Regulation:**

**ADR/RID (Road/Rail), IMDG (Sea) and ICAO/IATA (Air)**

**Proper Shipping Name:** BENZENE  
**Hazard Class:** 3 Flammable Liquid  
**UN Number:** 1114  
**Packing Group:** II  
**Emergency Action Code:** 3WE

**14.2 Special transport precautionary measures:** Not applicable.

**Section 15 – REGULATORY INFORMATION**

**(M)SDS format on a 16 Section based on guidance provided in:**

**Indian Regulation:**

Manufacture, Storage and Import of Hazardous Chemicals Rule, 1989.

The Factories Act 1948

**International Regulations:**

European SDS Directive

ANSI MSDS Standard

ISO 11014-1 1994

WHMIS Requirements

**United States**

Hazard Communication Standard

**Canada**

Hazardous Products Act and Controlled Products Regulations

**Europe**

Dangerous Substance and Preparations Directives

**Australia**

National Model Regulations for the Control of Workplace Hazardous Substances

**The Globally Harmonized System of Classification and Labeling of Chemicals endorsed by The UN Economic and Social Council**

\*RISK PHRASES: R11 Highly flammable, R23 Toxic by inhalation, R24 Toxic in contact with skin, R25 Toxic if swallowed, R36 Irritating to eyes, R38 Irritating to skin, R45 may cause cancer, R46 May cause heritable genetic damage, R48 Danger of serious damage to health by prolonged exposure, R65 Harmful: may cause lung damage if swallowed, R67 Vapours may cause drowsiness and dizziness.

\*SAFETY PHRASES: S45 In case of accident or if you feel unwell, seek medical advice immediately, S53 Avoid exposure – obtain special instruction before use. May cause cancer, flammable, Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.

\*These standard risk and safety phrases for use when interpreting (Material) Safety data Sheets are derived from the European Union Regulation, CHIP Regulations - Chemicals (Hazard Information and Packaging for Supply). They are required to be used in (Materials) Safety Data Sheets to identify potential hazards and offer safe handling advice.

**Section 16 – OTHER INFORMATION**

Training instructions

Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

Tremcard details/Reference: Refer Section 14

Local bodies involved (Applicable only with in India): Local District Authority and Local Crisis Group

Sources of data used to compile the (Material) Safety Data Sheet

**Data compilation reference:** National Institute for Occupational Safety and Health guide to chemical hazards and International Chemical Safety Cards (WHO/IPCS/ILO) and <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>, <http://webnet3.oecd.org/eChemPortal/Results2.aspx?SubstanceId=169630>, <http://ecb.jrc.ec.europa.eu/esis/index.php?PGM=ein>, <http://www.cdc.gov/niosh/npg/npgd0049.html>, Data reference: Official Journal of the European Union regarding EU GHS

(M)SDS Revision Status:

| Date of Revision | Revised Sections                | Supersedes    |
|------------------|---------------------------------|---------------|
| Sep. 01, 2009    | Format revised                  | Feb. 01, 2008 |
| Sep. 01, 2011    | Section 4 (4.3)                 | Sep. 01, 2009 |
| Aug. 01, 2013    | Section 2 NFPA Hazard statement | Sep. 01, 2011 |
| Feb.01,2016      | Section 2,11,12                 | Aug. 01, 2013 |

**This (M)SDS is issued by the Centre for HSE Excellence, Reliance Industries Limited**

**Contact Details: For any enquiry/comment regarding this (Material) Safety Data Sheet, kindly contact the Centre for HSE Excellence at HSE.ExcellenceCentre@ril.com**

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End of (M)SDS