Environmental Impact Assessment Report

for

Proposed Project of Synthetic organic chemical manufacturing unit
(1350 Kg/Month)

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prepared by

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# INDEX

<table>
<thead>
<tr>
<th>Details</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terms of Reference</td>
<td>t.1</td>
</tr>
<tr>
<td>Compliance of Terms of Reference</td>
<td>T.1</td>
</tr>
</tbody>
</table>

## Chapter-1  INTRODUCTION

| 1.1          | Preamble                              | 1.1  |
| 1.2          | Purpose of the EIA report             | 1.1  |
| 1.3          | Identification of project and project proponent | 1.1  |
| 1.4          | Need of the project and its importance to the country | 1.2  |
| 1.5          | Location of the proposed project site selection criteria | 1.2  |
| 1.6          | Site selection criteria               | 1.3  |
| 1.7          | Scope and methodology of the EIA study | 1.3  |

## Chapter-2  PROJECT DESCRIPTION

<p>| 2.1          | Introduction                          | 2.1  |
| 2.2          | Type of project                       | 2.1  |
| 2.3          | Need for the project                  | 2.1  |
| 2.4          | Project cost                          | 2.1  |
| 2.5          | Location of the project site          | 2.1  |
| 2.5.1        | Land requirement details              | 2.3  |
| 2.5.2        | Plant Layout                          | 2.4  |
| 2.5.3        | Environmental settings                | 2.5  |
| 2.5.4        | Site photographs                      | 2.5  |
| 2.6          | Size or magnitude of operation        | 2.6  |
| 2.6.1        | Products and Production Capacities    | 2.6  |
| 2.6.2        | Raw Materials Requirement             | 2.7  |
| 2.7          | Proposed schedule for approval and implementation | 2.11 |
| 2.8          | Manufacturing process                 | 2.12 |
| 2.9          | Plant Infrastructure and Basic requirements | 2.12 |
| 2.9.1        | List of Plant Machineries             | 2.12 |
| 2.9.2        | Water requirement                     | 2.12 |
| 2.9.3        | Power requirement                     | 2.14 |
| 2.9.4        | Fuel requirement                      | 2.14 |
| 2.9.5        | Manpower requirement                  | 2.14 |
| 2.10         | Emission, Effluent Generation &amp; Waste Generation With Control System | 2.15 |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.10.1</td>
<td>Air Emission</td>
<td>2.15</td>
</tr>
<tr>
<td>2.10.2</td>
<td>Effluent generation and its management</td>
<td>2.15</td>
</tr>
<tr>
<td>2.10.3</td>
<td>Details of Hazardous Waste Management</td>
<td>2.16</td>
</tr>
<tr>
<td>2.10.4</td>
<td>Details of Solvent Recovery</td>
<td>2.19</td>
</tr>
<tr>
<td>2.11</td>
<td>Safety &amp; Occupational Measure For Storage &amp; Handling Of The Raw Material &amp; Product</td>
<td>2.20</td>
</tr>
<tr>
<td>2.11.1</td>
<td>Storage &amp; Handling of Hazardous Chemicals</td>
<td>2.20</td>
</tr>
<tr>
<td>2.11.2</td>
<td>Vessel and other Equipment related</td>
<td>2.21</td>
</tr>
<tr>
<td>2.11.3</td>
<td>Fire related</td>
<td>2.21</td>
</tr>
<tr>
<td>2.11.4</td>
<td>Electrical related</td>
<td>2.21</td>
</tr>
<tr>
<td>2.11.5</td>
<td>Safety related</td>
<td>2.21</td>
</tr>
<tr>
<td>2.11.6</td>
<td>Noise level and control system</td>
<td>2.21</td>
</tr>
<tr>
<td>2.12</td>
<td>Control of fugitive emission</td>
<td>2.21</td>
</tr>
<tr>
<td>2.13</td>
<td>Details of surrounding industries</td>
<td>2.22</td>
</tr>
</tbody>
</table>

**Chapter-3**

**DESCRIPTION OF ENVIRONMENT**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Introduction</td>
<td>3.1</td>
</tr>
<tr>
<td>3.2</td>
<td>Methodology</td>
<td>3.1</td>
</tr>
<tr>
<td>3.3</td>
<td>Hydro-geology of the study area</td>
<td>3.2</td>
</tr>
<tr>
<td>3.4</td>
<td>Geology</td>
<td>3.3</td>
</tr>
<tr>
<td>3.5</td>
<td>Topography</td>
<td>3.5</td>
</tr>
<tr>
<td>3.6</td>
<td>Land use</td>
<td>3.6</td>
</tr>
<tr>
<td>3.7</td>
<td>Seismicity of the study area</td>
<td>3.8</td>
</tr>
<tr>
<td>3.8</td>
<td>Climate of the region</td>
<td>3.8</td>
</tr>
<tr>
<td>3.8.1</td>
<td>Site Specific Meteorology</td>
<td>3.8</td>
</tr>
<tr>
<td>3.8.2</td>
<td>Wind Rose</td>
<td>3.9</td>
</tr>
<tr>
<td>3.9</td>
<td>Ambient air quality</td>
<td>3.10</td>
</tr>
<tr>
<td>3.10</td>
<td>Noise environment</td>
<td>3.14</td>
</tr>
<tr>
<td>3.11</td>
<td>Water quality</td>
<td>3.17</td>
</tr>
<tr>
<td>3.12</td>
<td>Soil environment</td>
<td>3.24</td>
</tr>
<tr>
<td>3.13</td>
<td>Biological environment</td>
<td>3.29</td>
</tr>
<tr>
<td>3.14</td>
<td>Socioeconomic environment</td>
<td>3.24</td>
</tr>
<tr>
<td>3.15</td>
<td>Traffic study</td>
<td>3.40</td>
</tr>
</tbody>
</table>

**Chapter-4**

**ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

<table>
<thead>
<tr>
<th>Section</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Identification of impact</td>
<td>4.1</td>
</tr>
<tr>
<td>4.2</td>
<td>Valued environmental components and potential impacts</td>
<td>4.1</td>
</tr>
<tr>
<td>4.3</td>
<td>Potential impacts and mitigation measures during construction phase</td>
<td>4.1</td>
</tr>
<tr>
<td>4.4</td>
<td>Potential impacts and mitigation measures during operation phase</td>
<td>4.3</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Air Environment</td>
<td>4.5</td>
</tr>
<tr>
<td>4.4.2</td>
<td>Noise Environment</td>
<td>4.14</td>
</tr>
<tr>
<td>4.4.3</td>
<td>Water Environment</td>
<td>4.14</td>
</tr>
<tr>
<td>4.4.4</td>
<td>Land Environment</td>
<td>4.15</td>
</tr>
<tr>
<td>4.4.5</td>
<td>Socio-Economic Environment</td>
<td>4.15</td>
</tr>
<tr>
<td>4.4.6</td>
<td>Ecology and Biodiversity</td>
<td>4.16</td>
</tr>
<tr>
<td>4.4.7</td>
<td>Odour Problem</td>
<td>4.16</td>
</tr>
<tr>
<td>4.4.8</td>
<td>Overall Impact Analysis</td>
<td>4.16</td>
</tr>
</tbody>
</table>

**Chapter-5 ANALYSIS OF ALTERNATIVES**

<table>
<thead>
<tr>
<th>5.1</th>
<th>Alternative of site</th>
<th>5.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>Alternative for technologies</td>
<td>5.2</td>
</tr>
</tbody>
</table>

**Chapter-6 ENVIRONMENTAL MONITORING PROGRAM**

<table>
<thead>
<tr>
<th>6.1</th>
<th>Environmental monitoring program</th>
<th>6.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td>Objectives of monitoring</td>
<td>6.1</td>
</tr>
<tr>
<td>6.3</td>
<td>Environmental monitoring program</td>
<td>6.1</td>
</tr>
<tr>
<td>6.4</td>
<td>Infrastructural Requirement for Monitoring</td>
<td>6.2</td>
</tr>
<tr>
<td>6.5</td>
<td>Environmental Management Cell</td>
<td>6.2</td>
</tr>
<tr>
<td>6.6</td>
<td>Data Analysis, Documentation &amp; Reporting</td>
<td>6.3</td>
</tr>
</tbody>
</table>

**Chapter-7 ADDITIONAL STUDIES**

<table>
<thead>
<tr>
<th>7.1</th>
<th>Risk Assessment</th>
<th>7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1.1</td>
<td>Objective of the Study</td>
<td>7.2</td>
</tr>
<tr>
<td>7.1.2</td>
<td>Hazard identification</td>
<td>7.2</td>
</tr>
<tr>
<td>7.1.3</td>
<td>Ways to minimize the manual handling of the hazardous chemicals</td>
<td>7.3</td>
</tr>
<tr>
<td>7.1.4</td>
<td>Action Plan for Consumption, Storage &amp; Transportation of Hazardous Chemicals</td>
<td>7.3</td>
</tr>
<tr>
<td>7.2</td>
<td>Disaster Management Plan</td>
<td>7.8</td>
</tr>
<tr>
<td>7.2.1</td>
<td>Disasters</td>
<td>7.8</td>
</tr>
<tr>
<td>7.2.2</td>
<td>Objectives of Disaster Management Plan</td>
<td>7.9</td>
</tr>
<tr>
<td>7.2.3</td>
<td>Emergencies</td>
<td>7.10</td>
</tr>
<tr>
<td>a)</td>
<td>General, Industrial, Emergencies</td>
<td>7.10</td>
</tr>
<tr>
<td>b)</td>
<td>Specific Emergencies Anticipated</td>
<td>7.10</td>
</tr>
<tr>
<td>7.2.4</td>
<td>Emergency Organization</td>
<td>7.11</td>
</tr>
<tr>
<td>7.2.5</td>
<td>Emergency Communication</td>
<td>7.12</td>
</tr>
<tr>
<td>7.2.6</td>
<td>Emergency Responsibilities</td>
<td>7.12</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>7.2.7</td>
<td>Emergency Facilities</td>
<td>7.15</td>
</tr>
<tr>
<td>7.2.8</td>
<td>Emergency Actions</td>
<td>7.16</td>
</tr>
<tr>
<td>a)</td>
<td>Emergency Warning</td>
<td>7.16</td>
</tr>
<tr>
<td>b)</td>
<td>Emergency Shutdown</td>
<td>7.16</td>
</tr>
<tr>
<td>c)</td>
<td>Evacuation of Personnel</td>
<td>7.16</td>
</tr>
<tr>
<td>d)</td>
<td>All Clear Signal</td>
<td>7.17</td>
</tr>
<tr>
<td>7.2.9</td>
<td>General</td>
<td>7.17</td>
</tr>
<tr>
<td>a)</td>
<td>Employee Information</td>
<td>7.17</td>
</tr>
<tr>
<td>b)</td>
<td>Public Information and Warning</td>
<td>7.17</td>
</tr>
<tr>
<td>c)</td>
<td>Co-ordination with Local Authorities</td>
<td>7.17</td>
</tr>
<tr>
<td>d)</td>
<td>Mutual Aid</td>
<td>7.17</td>
</tr>
<tr>
<td>e)</td>
<td>Mock Drills</td>
<td>7.17</td>
</tr>
<tr>
<td>f)</td>
<td>Important Information</td>
<td>7.18</td>
</tr>
<tr>
<td>7.2.10</td>
<td>Off-Site Emergency Preparedness Plan</td>
<td>7.19</td>
</tr>
<tr>
<td>a)</td>
<td>Introduction</td>
<td>7.19</td>
</tr>
<tr>
<td>b)</td>
<td>Aspects Proposed to be considered in the Off-Site Emergency Plan</td>
<td>7.20</td>
</tr>
<tr>
<td>c)</td>
<td>Role of the Emergency Coordinating Officer</td>
<td>7.21</td>
</tr>
<tr>
<td>d)</td>
<td>Role of the Local Authority</td>
<td>7.21</td>
</tr>
<tr>
<td>e)</td>
<td>Role of Police</td>
<td>7.21</td>
</tr>
<tr>
<td>f)</td>
<td>Role of Fire Authorities</td>
<td>7.21</td>
</tr>
<tr>
<td>g)</td>
<td>Role of Health Authorities</td>
<td>7.22</td>
</tr>
<tr>
<td>h)</td>
<td>Role of Government Safety Authority</td>
<td>7.22</td>
</tr>
<tr>
<td>i)</td>
<td>Personal Protective Equipment</td>
<td>7.22</td>
</tr>
<tr>
<td>j)</td>
<td>Occupational Health And Safety</td>
<td>7.23</td>
</tr>
<tr>
<td>7.3</td>
<td>Social Impact Assessment</td>
<td>7.27</td>
</tr>
<tr>
<td>a)</td>
<td>Impact</td>
<td>7.27</td>
</tr>
<tr>
<td>b)</td>
<td>Mitigation / management measures Corporate Social Responsibility (CSR)</td>
<td>7.28</td>
</tr>
<tr>
<td>7.4</td>
<td>Details of occupational health program</td>
<td>7.28</td>
</tr>
<tr>
<td>7.5</td>
<td>Fire control plan</td>
<td>7.36</td>
</tr>
<tr>
<td>7.6</td>
<td>Do’s &amp; Don’ts</td>
<td>7.36</td>
</tr>
<tr>
<td>7.7</td>
<td>Plan and fund allocation to ensure the occupational health &amp; safety of all contract and casual workers</td>
<td>7.37</td>
</tr>
<tr>
<td>7.8</td>
<td>Scenarios identified for consequence analysis</td>
<td>7.38</td>
</tr>
<tr>
<td>7.9</td>
<td>Leak detection and repair systems (LDAR)</td>
<td>7.45</td>
</tr>
<tr>
<td>7.10</td>
<td>Hazardous analysis of raw material</td>
<td>7.46</td>
</tr>
<tr>
<td>Chapter-8</td>
<td>PROJECT BENEFITS</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td>Improvement in the infrastructure</td>
<td></td>
</tr>
<tr>
<td>8.3</td>
<td>Employment potential</td>
<td></td>
</tr>
<tr>
<td>8.4</td>
<td>CSR Activities</td>
<td></td>
</tr>
<tr>
<td>8.5</td>
<td>Economic Development</td>
<td></td>
</tr>
<tr>
<td>8.6</td>
<td>Green belt Development</td>
<td></td>
</tr>
<tr>
<td>8.7</td>
<td>Corporate Environment Responsibility (CER)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter-9</th>
<th>ENVIRONMENTAL MONITORING PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Introduction</td>
</tr>
<tr>
<td>9.2</td>
<td>The environmental management plan</td>
</tr>
<tr>
<td>9.3</td>
<td>Objectives of environmental management plan</td>
</tr>
<tr>
<td>9.4</td>
<td>EMP for operational phase</td>
</tr>
<tr>
<td>9.4.1</td>
<td>Management of Air Environment</td>
</tr>
<tr>
<td>9.4.2</td>
<td>Management of Noise</td>
</tr>
<tr>
<td>9.4.3</td>
<td>Management of Water Environment</td>
</tr>
<tr>
<td>9.4.4</td>
<td>Management of Land Environment</td>
</tr>
<tr>
<td>9.4.5</td>
<td>Management of Solid/ Hazardous Waste</td>
</tr>
<tr>
<td>9.4.6</td>
<td>Management of Hazardous Raw materials</td>
</tr>
<tr>
<td>9.4.7</td>
<td>Management of Biological Environment</td>
</tr>
<tr>
<td>9.4.8</td>
<td>Greenbelt development plan</td>
</tr>
<tr>
<td>9.4.9</td>
<td>Management of Socio-economic factors</td>
</tr>
<tr>
<td>9.4.10</td>
<td>Management of Traffic</td>
</tr>
<tr>
<td>9.5</td>
<td>Additional mitigation measures</td>
</tr>
<tr>
<td>9.5.1</td>
<td>Water conservation</td>
</tr>
<tr>
<td>9.5.2</td>
<td>Odour Management Plan</td>
</tr>
<tr>
<td>9.5.3</td>
<td>Safety measures to prevent the Occupational Health Hazards</td>
</tr>
<tr>
<td>9.5.4</td>
<td>Social welfare measures for future planning</td>
</tr>
<tr>
<td>9.5.5</td>
<td>Cleaner production strategies</td>
</tr>
<tr>
<td>9.5.6</td>
<td>Energy Conservation</td>
</tr>
<tr>
<td>9.6</td>
<td>Occupational health &amp; safety plan</td>
</tr>
<tr>
<td>9.7</td>
<td>Summary of environment management plan and actions</td>
</tr>
<tr>
<td>9.8</td>
<td>Environment policy</td>
</tr>
<tr>
<td>9.9</td>
<td>Environment budget</td>
</tr>
<tr>
<td>9.10</td>
<td>Reporting system of non compliances/ violations of environmental norms</td>
</tr>
</tbody>
</table>
List of Table

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>2.1</td>
<td>2.3</td>
</tr>
<tr>
<td>2.2</td>
<td>2.5</td>
</tr>
<tr>
<td>2.3</td>
<td>2.6</td>
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<td>2.7</td>
</tr>
<tr>
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<td>2.9</td>
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<tr>
<td>2.6</td>
<td>2.12</td>
</tr>
<tr>
<td>2.7</td>
<td>2.12</td>
</tr>
<tr>
<td>2.8</td>
<td>2.14</td>
</tr>
<tr>
<td>2.9</td>
<td>2.14</td>
</tr>
<tr>
<td>2.10</td>
<td>2.15</td>
</tr>
<tr>
<td>2.11</td>
<td>2.15</td>
</tr>
<tr>
<td>2.12</td>
<td>2.15</td>
</tr>
<tr>
<td>2.13</td>
<td>2.16</td>
</tr>
<tr>
<td>2.14</td>
<td>2.22</td>
</tr>
<tr>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>3.2</td>
<td>3.6</td>
</tr>
<tr>
<td>3.3</td>
<td>3.8</td>
</tr>
<tr>
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<td>3.11</td>
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<tr>
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<td>3.12</td>
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<td>3.12</td>
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<td>3.7</td>
<td>3.12</td>
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<tr>
<td>3.8</td>
<td>3.13</td>
</tr>
<tr>
<td>3.9</td>
<td>3.13</td>
</tr>
<tr>
<td>3.10</td>
<td>3.13</td>
</tr>
</tbody>
</table>
## List of Figure

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Project location with boundary</td>
<td>1.2</td>
</tr>
<tr>
<td>2.1</td>
<td>Project Location Map</td>
<td>2.2</td>
</tr>
<tr>
<td>2.2</td>
<td>Google Image of Project site (10 km radius)</td>
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<tr>
<td>2.3</td>
<td>Plant Layout</td>
<td>2.4</td>
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<td>2.4</td>
<td>Site Photographs</td>
<td>2.5</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
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<td>2.5</td>
<td>Water Balance Diagram</td>
<td>2.13</td>
</tr>
<tr>
<td>2.6</td>
<td>ETP Flow Diagram</td>
<td>2.16</td>
</tr>
<tr>
<td>2.7</td>
<td>Recovery of solvent plant</td>
<td>2.20</td>
</tr>
<tr>
<td>3.1</td>
<td>Location Map of Study area</td>
<td>3.3</td>
</tr>
<tr>
<td>3.2</td>
<td>Hydrogeological map of Bharuch District</td>
<td>3.3</td>
</tr>
<tr>
<td>3.3</td>
<td>Geological Structure of Gujarat State</td>
<td>3.4</td>
</tr>
<tr>
<td>3.4</td>
<td>Topo map of project site covering 10 km radius</td>
<td>3.5</td>
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<tr>
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<td>Land Use Distribution of the study area (10 km radius)</td>
<td>3.7</td>
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<tr>
<td>3.6</td>
<td>Seismic Zones of Gujarat</td>
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<tr>
<td>3.7</td>
<td>Wind Rose</td>
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<td>3.8</td>
<td>Google image showing Ambient Air Monitoring Location</td>
<td>3.11</td>
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<tr>
<td>3.9</td>
<td>Ambient Noise Quality monitoring location</td>
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<tr>
<td>3.10</td>
<td>Google Image showing Water Monitoring Location</td>
<td>3.18</td>
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<tr>
<td>3.11</td>
<td>Google Image showing Soil Sampling Location</td>
<td>3.26</td>
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<tr>
<td>3.12</td>
<td>List of villages within 5 km &amp; 10 km radius</td>
<td>3.35</td>
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<tr>
<td>3.13</td>
<td>Population of the study area</td>
<td>3.37</td>
</tr>
<tr>
<td>3.14</td>
<td>Population Literacy of the study area</td>
<td>3.38</td>
</tr>
<tr>
<td>3.15</td>
<td>Social profile of the study area</td>
<td>3.39</td>
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<tr>
<td>3.16</td>
<td>Occupational pattern of the study area</td>
<td>3.40</td>
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<td>3.17</td>
<td>Image showing Traffic surveying Location</td>
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<td>4.1</td>
<td>Ground Level Concentration of PM</td>
<td>4.6</td>
</tr>
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<td>4.2</td>
<td>Ground Level Concentration of SO₂</td>
<td>4.8</td>
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<tr>
<td>4.3</td>
<td>Ground Level Concentration of NOₓ</td>
<td>4.10</td>
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<td>4.4</td>
<td>Ground Level Concentration of HCl</td>
<td>4.12</td>
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<td>Environmental Management Cell</td>
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<td>7.1</td>
<td>Plant Layout showing Safe Assembly Point</td>
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</tr>
<tr>
<td>7.2</td>
<td>On-site emergency organization chart</td>
<td>7.19</td>
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<td>7.3</td>
<td>Toxic area of vapor cloud (Acetic Ahnydride)</td>
<td>7.39</td>
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<tr>
<td>7.4</td>
<td>Toxic area of vapor cloud (Acetic Acid)</td>
<td>7.40</td>
</tr>
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<td>7.5</td>
<td>Toxic area of vapor cloud (Acetone)</td>
<td>7.40</td>
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<td>7.6</td>
<td>Toxic area of vapor cloud (Acetonitrile)</td>
<td>7.41</td>
</tr>
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<td>7.7</td>
<td>Toxic area of vapor cloud (Acetyl Chloride)</td>
<td>7.41</td>
</tr>
<tr>
<td>7.8</td>
<td>Toxic area of vapor cloud (Benzoyl Chloride)</td>
<td>7.42</td>
</tr>
<tr>
<td>7.9</td>
<td>Toxic area of vapor cloud (Chloroform)</td>
<td>7.42</td>
</tr>
<tr>
<td>7.10</td>
<td>Toxic area of vapor cloud (Sulphuric Acid)</td>
<td>7.43</td>
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<tr>
<td>7.11</td>
<td>Toxic area of vapor cloud (Pyridine)</td>
<td>7.43</td>
</tr>
<tr>
<td>7.12</td>
<td>Toxic area of vapor cloud (n-Pantane)</td>
<td>7.44</td>
</tr>
<tr>
<td>7.13</td>
<td>Flammable area of vapor cloud (n-Pantane)</td>
<td>7.44</td>
</tr>
<tr>
<td>7.14</td>
<td>Blast area of vapor cloud (n-Pantane)</td>
<td>7.44</td>
</tr>
</tbody>
</table>
## List of Annexure

<table>
<thead>
<tr>
<th>Annexure No.</th>
<th>Description</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Manufacturing process</td>
<td>A-1</td>
</tr>
<tr>
<td>II</td>
<td>Adequacy Report</td>
<td>A-48</td>
</tr>
<tr>
<td>III</td>
<td>Summary of project</td>
<td>A-58</td>
</tr>
<tr>
<td>IV</td>
<td>GIDC land document</td>
<td>A-68</td>
</tr>
<tr>
<td>V</td>
<td>GIDC water letter</td>
<td>A-75</td>
</tr>
<tr>
<td>VI</td>
<td>Undertaking of PP</td>
<td>A-77</td>
</tr>
<tr>
<td>VII</td>
<td>High Court Order</td>
<td>A-78</td>
</tr>
<tr>
<td>VIII</td>
<td>Undertaking of Consultant</td>
<td>A-80</td>
</tr>
<tr>
<td>IX</td>
<td>Membership of CETP and MEE</td>
<td>A-81</td>
</tr>
<tr>
<td>X</td>
<td>MSDS</td>
<td>A-83</td>
</tr>
</tbody>
</table>
No. SEIAA/GUJ/TOR/S(I)/5&5/2019
Date: 10 Apr 2019


Dear Sir,

This has reference to your online application dated 19/01/2019 along with Form-I submitted to SEIAA. The project activity is covered in 5(i) and is of ‘B’ Category.

The SEAC, Gujarat vide their letter dated 12/03/2019 had recommended to the SEIAA, Gujarat, to grant the Terms Of Reference for the above-mentioned project based on its meeting held on 29/01/2019.

The proposal was considered by SEIAA, Gujarat in its meeting held on 15/03/2019 at Gandhinagar. After careful consideration, the SEIAA hereby accords Terms Of Reference to above project under the provisions of EIA Notification dated 14th September, 2008. The copy of Terms Of Reference is attached herewith.

With regards,

Yours sincerely,

(S. M. SAIYAD)
Member Secretary

Encl: As Above

Issued to:
M/s. Sanjivani Pharma
Plot No. D-2-CH-102,
GIDC Dahej-II, Vagra,
Bharuch
Terms of Reference [ToR] to M/s. Sanjivani pharma for setting up manufacturing plant of ‘Synthetic Organic Chemicals’ at Plot No. D-2-Ch-102, GIDC Dahej-II, Vagra, Dist. Bharuch

Category of the unit: 5(f)
Project status: New

I. This is in reference to proposal no. SIA/GJ/MID2/50480/2018 dated 15/01/2018 regarding grant of Terms of Reference [ToR] for preparation of EIA/EIAEMP report.

II. This is a new unit proposes manufacturing of synthetic organic chemicals as tabulated below:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the Products</th>
<th>CAS no. /ICI no.</th>
<th>Quantity Kgf/month</th>
<th>End-use of products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hormones</td>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>1</td>
<td>Hydroxy Progestosterone Propionate</td>
<td>630-58-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nandrolone Decanoate</td>
<td>385-72-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nandrolone Phenyl Propionate</td>
<td>82-90-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Mifepristone</td>
<td>64371-85-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Medroxy Progesterone Acetate</td>
<td>71-50-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Progesterone</td>
<td></td>
<td>57-53-0</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Testosterone Acetate</td>
<td>1045-69-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Testosterone Decanoate</td>
<td>5721-91-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Estradiol Benzoate</td>
<td>50-50-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Estradiol Valerate</td>
<td>978-32-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cortico Steroids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Betamethasone Dipropionate</td>
<td>5393-20-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Betamethasone Sodium Phosphate</td>
<td>181-73-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Beta Methasone Valerate</td>
<td>2152-44-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Budesonide Dipropionate</td>
<td>8533-09-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Dexamethasone</td>
<td>1484-67-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Clobetasol Butyrate</td>
<td>25122-57-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Clobetasol Propionate</td>
<td>25122-45-7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Mometasone Furoate</td>
<td>89319-23-7</td>
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<td>19</td>
<td>Methyl Prednisolone Acetate</td>
<td>53-36-1</td>
<td></td>
<td></td>
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<td>20</td>
<td>Prednisolone Acetate</td>
<td>59-21-1</td>
<td></td>
<td></td>
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<td>21</td>
<td>Hydrocortisone Acetate</td>
<td>50-03-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Desoniamethasone Sodium Phosphate</td>
<td>2392-38-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Vitamin</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Methyl Cobalamine</td>
<td>15422-55-4</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>1350</td>
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</tbody>
</table>

As Pharmaceutical ingredient and in Pharma Formulation

III. The project falls under Category B of project activity 5(f) as per the schedule of EIA Notification 2006.

IV. PP was called for presentation in the SEAC meeting dated 28/01/2019.

V. The project proponent along with their expert consultant Ms. Enviro Fluid Consultants attended the meeting and made presentation before the committee.

VI. Salient features of the project are as under:

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Total cost of Proposed Project (Rs. In Crores):</td>
<td>4.65 Crores</td>
</tr>
<tr>
<td>B</td>
<td>Total Plot area (sq. meter)</td>
<td>5000 C Sq. m.</td>
</tr>
<tr>
<td>C</td>
<td>Green belt area (sq. meter)</td>
<td>1053 Sq. m.</td>
</tr>
<tr>
<td>D</td>
<td>Employment generation</td>
<td>Total: 60</td>
</tr>
<tr>
<td>E</td>
<td>Water consumption (KLD)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Source of Water Supply [GIDC Bore well, Surface water, Tanker supply etc...]</td>
<td>GIDC water supply</td>
</tr>
<tr>
<td></td>
<td>Status of permission from the concenf authority.</td>
<td>Permission obtained from GIDC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Quantity KLD</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Domestic</td>
<td>5.0</td>
<td>Fresh Water</td>
</tr>
<tr>
<td>(B) Gardening</td>
<td>8.3</td>
<td>Fresh Water</td>
</tr>
<tr>
<td>(C) Industrial</td>
<td></td>
<td>Fresh Water</td>
</tr>
<tr>
<td>Prepost</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Floor Washing</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Equipment Cleaning</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Scrubbing</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Waste water (KLD)</td>
<td>Remarks</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Domestic</td>
<td>4.0</td>
<td>Septic tank followed by soak pit</td>
</tr>
<tr>
<td>Industrial Process</td>
<td>0.45</td>
<td>To Common MEE</td>
</tr>
<tr>
<td>Washing</td>
<td>0.3</td>
<td>Waste Water to primary treatment to CETP</td>
</tr>
<tr>
<td>Scrubbing</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Cooling</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Total industrial waste water</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>Total (A + B)</td>
<td>5.45</td>
<td></td>
</tr>
</tbody>
</table>

IV | Treatment facility within premises with capacity: in-house ETP (Primary, Secondary, Tertiary), MEE, Stripper, Spray Dryer, STP etc.

V | Mode of Disposal & Final meeting point
Domestic: Septic tank followed by Soak pit.
Industrial: Process wastewater will be directly sent to common MEE; Diluted streams will be treated in in-house ETP and treated effluent will be sent to CETP for further treatment (Refer Annexure A for CIDC CETP ASSURANCE and BEL NOC letter).

VI | In case of Common facility (CF) like CETP, Common Spray dryer, Common MEE etc. Names of CF
Process wastewater at 450 L/day will be sent to Common MEE
Membership of Common facility (CF)
(For waste water treatment)
> Will be obtained as soon as possible.

VII | Simplified water balance diagram with reuse/recycle of waste water

Water balance diagram

Source of Water Supply:
CIDC Supply
Total: 12 KLD/day

Domestic 5 KLD/day

Gardening 3.9 KLD/day
Industrial 3.2 KLD/day

Process 0.1 KLD/day

Effluent treatment plant 0.5 KLD/day

Reagent water 0.3 KLD/day

Cooling 5.5 KLD/day

Mixing washing 0.3 KLD/day

Scrubbing 0.3 KLD/day

Water treatment plant 3.4 KLD/day

Purified water 0.6 KLD/day

Wastewater 0.1 KLD/day

Wastewater 0.3 KLD/day
Scrubbed 0.3 KLD/day

To Common MEE 0.45 KLD/day

From CETP 1.0 KLD/day
**Air**

**Flue gas emission details**

<table>
<thead>
<tr>
<th>No. of Boilers/TPH/Furnaces/DG sets etc. with capacities viz. TPH, Kcal/hr, MT/hr, KVA etc.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Source of emission With Capacity</th>
<th>Stack Height (meter)</th>
<th>Type of Fuel</th>
<th>Quantity of Fuel MT/Day</th>
<th>Type of emissions i.e. Air Pollutants</th>
<th>Air Pollution Control Measures (APCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D. G. Sel (50 KVA)</td>
<td>8.0</td>
<td>Diesel</td>
<td>5 L/Hr</td>
<td>Particulate Matter SO₂, NOₓ</td>
<td>Adequate Stack height</td>
</tr>
</tbody>
</table>

**Process gas i.e. Type of pollutant gases (SO₂, HCl, NH₃, Cl₂, NOₓ etc.)**

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Specific Source of emission (Name of the Product &amp; Process)</th>
<th>Typo of emission</th>
<th>Stack/Vent Height (meter)</th>
<th>Air Pollution Control Measures (APCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass reactor</td>
<td>HCl ≤ 20 mg/Nm³</td>
<td>12</td>
<td>Alkali Scrubber</td>
</tr>
</tbody>
</table>

**Fugitive emission details with its mitigation measures. As below**

Standard handling practices are adopted for powdered chemical. Proper storage, charging system, handling system and online monitoring systems are provided and same will be taken care for proposed project.

**Hazardous wastes**

*(as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016)*

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Type/ Name of Hazardous waste</th>
<th>Specific Source of generation (Name of the Activity, Product etc.)</th>
<th>Category and Schedule as per HW Rules</th>
<th>Quantity (MT/Annnum)</th>
<th>Management of HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Used /spent Oil</td>
<td>Plant &amp; Machines</td>
<td>5.1</td>
<td>0.01</td>
<td>Collection, storage, and reuse within premises for lubrication or disposal to registered recycler</td>
</tr>
<tr>
<td>2</td>
<td>Discarded Containers/bags</td>
<td>Raw materials</td>
<td>3.3.1</td>
<td>3.0</td>
<td>Collection, storage, Transportation &amp; sell to authorized vendor</td>
</tr>
<tr>
<td>3</td>
<td>ETP Sludge</td>
<td>Wastewater treatment systems</td>
<td>3.6.3</td>
<td>3.0</td>
<td>Collection, storage, Transportation and Disposal to TSDF</td>
</tr>
<tr>
<td>4</td>
<td>Process waste</td>
<td>Mfg Process</td>
<td>28.1</td>
<td>3.0</td>
<td>Collection, storage, Transportation and Disposal to CHWIF</td>
</tr>
<tr>
<td>5</td>
<td>Spent Carbon</td>
<td>Mfg Process</td>
<td>28.2</td>
<td>4.50</td>
<td>Collection, recovery and reuse in next batch</td>
</tr>
<tr>
<td>6</td>
<td>Distillation residue</td>
<td>Solvent recovery**</td>
<td>20.3</td>
<td>0.20</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to SETP</td>
</tr>
<tr>
<td>7</td>
<td>Spent Solvent</td>
<td>Mfg Process*</td>
<td>20.2</td>
<td>540.0</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to SETP</td>
</tr>
<tr>
<td>8</td>
<td>Spent HCl</td>
<td>Scrubbing system</td>
<td>SC-II-B15</td>
<td>54.0</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to SETP</td>
</tr>
</tbody>
</table>

**Solvent management, VOC emissions etc.**

**Types of solvents, Details of Solvent recovery, % recovery, reuse of recovered Solvents**

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Name of Solvent</th>
<th>Quantity (Kg/Month)</th>
<th>Fresh</th>
<th>Recovered</th>
<th>Total</th>
<th>% Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methylene Dichloride</td>
<td>558.0</td>
<td>8528.3</td>
<td>9087.3</td>
<td>95.8</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Di isopropyl ether (DIPE)</td>
<td>68.3</td>
<td>748.2</td>
<td>816.5</td>
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<tr>
<td>3</td>
<td>Acetone</td>
<td>214.1</td>
<td>4785.7</td>
<td>4999.8</td>
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<tr>
<td>Substance</td>
<td>Wt%</td>
<td>M (g/mmol)</td>
<td>Molar R (g/mol)</td>
<td>Molar E (%)</td>
<td></td>
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<td>n-Paraffin</td>
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<td>1570.1</td>
<td>1852.6</td>
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<td>Chloroform</td>
<td>291.5</td>
<td>5168.6</td>
<td>5458.1</td>
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<td>Acetone</td>
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<td>n-Hexane</td>
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<td>Pyridine</td>
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<td>Methanol</td>
<td>268.6</td>
<td>6035.7</td>
<td>6324.2</td>
<td>95.4</td>
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<td>Isopropyl Alcohol</td>
<td>240.0</td>
<td>5580.0</td>
<td>7200.0</td>
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<td>Methyl Ethyl Ketone (MEK)</td>
<td>65.4</td>
<td>1570.9</td>
<td>1635.4</td>
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<td>Tetrahydro Furan</td>
<td>114.7</td>
<td>2682.7</td>
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<td>Ethyl Acetate</td>
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<td>525.3</td>
<td>584.6</td>
<td>97.0</td>
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</tbody>
</table>

VOC emission sources and its mitigation measures:

- Due to manufacturing processes and solvent handling changes of VOC emissions, entire process and material changing has been carried out in closed loop. Regular work place monitoring will be done. Standard SOP will be followed to handle powder and liquid raw materials.

VII. Considering the above project details, after detailed discussion, the terms of reference (ToR) were prescribed as below and as per the standard ToR for the synthetic Organic Chemical projects recommended by SEAC vide letter no. EIA-10-GEN-21/1439 dated 14/09/2017 and approved by SEIAA in its 12th meeting dated 18/08/2017 for the EIA study to be done covering 10 Km radial distance from the project boundary:

1. Adequacy of proposed area with respect to plant machineries, EMS, green belt, safety aspect, raw material & product storage considering worst case scenario. Submit proper lay out plan clearly demarcating all activities with scale.

2. Compliance of MoEFCCC’s OM dated 01/05/2018 regarding “Corporate Environment Responsibility” (CER). Fund allocation for Corporate Environment Responsibility (CER) shall be made as per MoEFCCC’s OM. No. 22-652017-IA III dated 01/05/2018 for various activities therein. The details of fund allocation and activities for CER shall be incorporated in EA/EMP report.

3. Explore the use of renewable energy to the maximum extent possible. Detail of provisions to make the project energy efficient through energy efficient devices and adoption of modes of alternative eco-friendly sources of energy like solar water heater, solar lighting etc. Measures proposed for energy conservation.

4. Leak Detection and Repair Programme (LDAR) for all the volatile organic solvent proposed for use in-house with detailed chemical properties including vapor pressure. LDAR shall endeavor prevention of losses of solvents to the best minimum extent.

5. Qualitative and quantitative analysis of hazardous waste streams generation from the manufacturing process (Product wise). Explore the possibility to reuse such waste streams within premises as raw materials for other products or to convert it into valuable products instead of selling out side. Sound management of such waste streams as per the HV Rules 2018 as amended time to time. Feasibility report for utilization shall be incorporated in EIA report.

6. PP shall furnish status of all the applicable Rules, Acts, Regulation, Clearances in a tabular form.

VIII. The ToR prescribed as above and as per the standard ToR approved by SEIAA and the model ToRs available in the MoEFCCC’s sector specific EIA Manual for Synthetic Organic Chemical Industry shall be considered as generic ToRs for preparation of the EIA report in addition to all the relevant information as per the generic structure of EIA given in Appendix III in the EIA Notification 2006.

The project proponent shall have to apply for Environmental clearance through online portal http://environmentclearance.nic.in/ along with final EIA report.
## COMPLIANCE OF TERMS OF REFERENCE (TOR)

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>TOR Points</th>
<th>Compliance Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adequacy of proposed area with respect to plant machineries, EMS, green belt, safety aspect, raw material &amp; product storage considering worst case scenario. Submit proper lay out plan clearly demarcating all activities with scale.</td>
<td>Proposed plot area is 5000 sqm which is more than sufficient for present requirements. After provision of 33% greenbelt, unit has kept some area for future expansion. Thus, available plot area is adequate for the proposed project. Refer plant layout with area break-up in section 2.5.1 and 2.5.2 of Chapter-2 with figure 2.3 on page 2.3 &amp; 2.4</td>
</tr>
<tr>
<td>2</td>
<td>Compliance of MoEFCC’s OM dated 01/05/2018 regarding “Corporate Environment Responsibility” (CER). Fund allocation for Corporate Environment Responsibility (CER) shall be made as per MoEFCC s O.M. No. 22-65/2017-IA. III. Dated 01/05/2018 for various activities therein. The details of fund allocation for CER shall be incorporated in EIA/EMP report.</td>
<td>Refer Section 8.7 on page 8.2 of Chapter-8 for Fund allocation under CER</td>
</tr>
<tr>
<td>3</td>
<td>Explore the use of renewable energy to the maximum extent possible. Details of provisions to make the project energy-efficient through of energy efficient devices and adoption of modes of alternative eco-friendly sources of energy like solar water heater, solar lighting etc. Measures proposed for energy conservation.</td>
<td>Refer section 9.5.6, page no. 9.10-9.11 of chapter-9</td>
</tr>
<tr>
<td>4</td>
<td>Leak Detection and repairing Programme (LDAR) for all the volatile organic solvent proposed for use in-house with detailed chemical properties including vapor pressure. LDER shall endeavour prevention of losses of solvents to the best minimum extent.</td>
<td>Refer section 7.9, page no. 7.48-7.49 of chapter-7</td>
</tr>
<tr>
<td>5</td>
<td>Qualitative and quantitative analysis of hazardous waste streams generation from the manufacturing process (Product wise). Explore the possibility to reuse such waste streams within premises as raw materials for other product or to convert it into valuable products instead of selling out side. Sound management of such waste streams as per the HW Rules 2016 as amended time to time. Feasibility report for utilization shall be incorporated in EIA report.</td>
<td>Refer section 2.10.3 and table 2.13 of Chapter-2 on page 2.16 &amp; 2.19</td>
</tr>
<tr>
<td></td>
<td>Compliance of Terms of Reference</td>
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<tr>
<td>6</td>
<td>PP shall furnish status of all the applicable Rules, Acts, Regulation and Clearance in a tabular form.</td>
<td>Refer section 2.7 of Chapter-2 on page 2.11 &amp; 2.12</td>
</tr>
<tr>
<td><strong>Standard ToR by SEIAA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A tabular chart with index for point-wise compliance of below mentioned TORs.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Executive summary of the project – giving a prima facie idea of the objectives of, use of resources, justification, etc. In addition, it should provide a compilation of EIA report, including EMP and the post-project monitoring plan in brief.</td>
<td>Complied</td>
</tr>
<tr>
<td>3</td>
<td>Justification for selecting the proposed product and unit size.</td>
<td>Attached as Annexure-III.</td>
</tr>
<tr>
<td>4</td>
<td>Land requirement for the project including its break up for various purposes, its availability and optimization.</td>
<td>Proposed plot area is 5000 sqm which is more than sufficient for present requirements. After provision of 33% greenbelt, unit has kept some area for future expansion. Thus, available plot area is adequate for the proposed project. Refer plant layout with area break-up in section 2.5.1 and 2.5.2 of Chapter-2 with figure 2.3 on page 2.3 &amp; 2.4</td>
</tr>
<tr>
<td>5</td>
<td>Land possession documents. Copy of NA order showing permission to use the project land for industrial purpose. If located in GIDC, copy of plot holding certificate obtained from GIDC Authority.</td>
<td>Plot holding certificate from GIDC Dahej is Attached as Annexure-IV.</td>
</tr>
<tr>
<td>6</td>
<td>Location of the project site and nearest habitats with distances from the project site to be demarcated on a top sheet (1:50000 scale).</td>
<td>Refer Section 2.5 for project location on page 2.1 to 2.3 of chapter 2. Topomap is given as Figure 3.4 in section 3.5 on page 3.5 of chapter-3</td>
</tr>
<tr>
<td>7</td>
<td>Topography details of the project area.</td>
<td>Topography details of the project area and Topomap is given as Figure 3.4 in section 3.5 on page 3.5 of chapter-3</td>
</tr>
<tr>
<td>8</td>
<td>Geological features and hydrological status of the study area.</td>
<td>Refer section 3.3 &amp; 3.4 on page no. 3.2-3.4 of chapter-3</td>
</tr>
<tr>
<td>9</td>
<td>In case of project located outside notified area: Legal Undertaking stating that unit is complying the three conditions [i.e. water consumption less than 25 M3/day; Fuel consumption less than 25 TPD; and not covered in the category of MAH units as per the Management, Storage, Import of Hazardous Chemicals Rules (MSIHC Rules), 1989] as per the amendment to EIA Notifica-</td>
<td>Not applicable as proposed project is located in Dahej GIDC.</td>
</tr>
<tr>
<td>10</td>
<td>Present land use pattern of the study area shall be given based on satellite imagery.</td>
<td>Refer section 3.6 with figure 3.5 on page no. 3.6-3.7 of Chapter 3.</td>
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<tr>
<td>11</td>
<td>Layout plan of the factory premises clearly demarcating various units within the plant. Provision of separate entry &amp; exit and adequate margin all-round the periphery for unobstructed easy movement of the emergency vehicle / fire tenders without reversing back. Mark the same in the plant layout.</td>
<td>Proposed plot area is 5000 sqmt which is more than sufficient for present requirements. After provision of 33% greenbelt, unit has kept some area for future expansion. Thus, available plot area is adequate for the proposed project. Refer plant layout with area break-up in section 2.5.1 and 2.5.2 of Chapter-2 with figure 2.3 on page 2.3 &amp; 2.4. 12 meter wide road has been proposed for unobstructed easy vehicle movement.</td>
</tr>
<tr>
<td>12</td>
<td>Technical details of the plant/s along with details on best available technologies (BAT), proposed technology and reasons for selecting the same.</td>
<td>Detailed technical details of manufacturing process are covered in section 2.8, page no. 2.12 of chapter-2. However, the same is attached as Annexure-I.</td>
</tr>
<tr>
<td>13</td>
<td>Product spectrum (Proposed products along with production Capacity) and processes.</td>
<td>Refer section 2.6.1 on page no. 2.6 &amp; 2.7 of chapter-2 for product profile and Annexure-I for Manufacturing processes.</td>
</tr>
<tr>
<td>14</td>
<td>Chemical name of each proposed product to be manufactured. Details on end use of each product. (Provide CAS number of all the products &amp; raw materials. In case of Dyes, CI number).</td>
<td>Refer section 2.6.1 on page no. 2.6 &amp; 2.7 of chapter-2</td>
</tr>
<tr>
<td>15</td>
<td>Details on raw materials, source and storage within the premises.</td>
<td>Refer section 2.6.2 on page no. 2.7-2.11 of chapter-2</td>
</tr>
<tr>
<td>16</td>
<td>Details of complete manufacturing process / operations of each product along with chemical reactions, process flow diagram describing each unit processes and unit operations along with material balance, consumption of raw materials etc.</td>
<td>Detailed technical details of manufacturing process are covered in section 2.8, page no. 2.12 of chapter-2. However, the same is attached as Annexure-I.</td>
</tr>
<tr>
<td>17</td>
<td>Details on strategy for the implementation of cleaner production activities.</td>
<td>Refer section 9.5.4, page no. 9.9-9.10 of chapter-9.</td>
</tr>
<tr>
<td>18</td>
<td>Assessment of source of the water supply with adequacy of the same to meet with the requirements for the project. Permission obtained from the concern authority for supply of raw water.</td>
<td>The unit will get fresh water from GIDC water supply. Permission from the concern authority for supply of raw water is attached as Annexure-V. Refer section 2.9.2 of chapter-2 on page 2.12-2.13</td>
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<tr>
<td>19</td>
<td>Undertaking stating that no bore well shall be dug within the premises (If project is located within the Industrial estate).</td>
<td>Attached as Annexure-V.</td>
</tr>
<tr>
<td>20</td>
<td>Details on water balance including</td>
<td>Refer section 2.9.2, figure 2.5 of</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
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<tr>
<td>21</td>
<td>Efforts to minimize effluent discharge and to maintain quality of receiving water body. There will be only 1.45 KLD wastewater generation which will be properly treated and discharged. No direct discharge in any water body. Refer section 2.9.2, figure 2.5 of chapter-2 on page 2.12-2.13 for water and wastewater details w.r.t. quantity and quality. Refer section 2.10.2, page no. 2.15-2.16 of chapter-2 for wastewater treatment and management.</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Explore the possibilities for Zero Liquid Discharge (ZLD) option for the proposed project. There is no zero discharge in proposed project. However, possibility will be explored.</td>
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</tr>
<tr>
<td>23</td>
<td>Segregation of waste streams, characterization and quality with specific treatment and disposal of each stream including action plan for maximum recycle of treated waste water and minimum discharge for effluent. There will be only 1.45 KLD wastewater generation which will be properly treated and discharged. Refer section 2.9.2, figure 2.5 of chapter-2 on page 2.12-2.13 for water and wastewater details w.r.t. quantity and quality. Refer section 2.10.2, page no. 2.15-2.16 of chapter-2 for wastewater treatment and management. Membership of CETP and Common MEE has already been obtained which is enclosed as Annexure-IX.</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Capacity of ETP in KL/day. Details of ETP including dimensions of each unit along with schematic flow diagram. Inlet, transitional and treated effluent qualities with specific efficiency of each treatment unit in reduction in respect of all concerned/regulated environmental parameters. Inlet effluent quality should be based on worst case scenario considering production of most polluting products that can be manufactured in the plant concurrently. Refer section 2.9.2, figure 2.5 of chapter-2 on page 2.12-2.13 for water and wastewater details w.r.t. quantity and quality. Refer section 2.10.2, page no. 2.15-2.16 of chapter-2 for wastewater treatment and management. Membership of CETP and Common MEE has already been obtained which is enclosed as Annexure-IX.</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>In case of discharge into GIDC drainage/Pipeline: I Copy of permission letter with quantity (KL/day) from the concern authority of drainage network/pipeline with confirmation for spare capacity available to take additional effluent. II Characteristics of the combined effluent and treated water to be sent to Common pipeline with reference to the MoEFCC/CPCB/GPCB disposing. 1 KLD primarily treated low concentrated stream will be discharged to CETP of Dahej GIDC through pumping into overhead tank. Acceptance letter for wastewater by GIDC for treatment in CETP is enclosed as Annexure-IX. Flow meters will be provided and records will be maintained for wastewater generation, treatment and discharge. There will be no direct discharge from any GIDC drain for direct disposal in water body.</td>
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Compliance of Terms of Reference T.4
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<td><strong>26</strong></td>
<td><strong>In case of waste water sent to Common Facilities (CF) like CETP, MEE, Spray Dryer etc.</strong></td>
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<tr>
<td><strong>I</strong></td>
<td>Details of Common facilities including (1) Total capacity of the CF (2) Copy of CC&amp;A of the CF. (3) Actual load at present (Qualitative and Quantitative – KL per day) (4) Booked quantity &amp; Spare capacity of CF (5) Copies of XGN generated Inspection reports with analysis reports of the water/Air/Hazardous samples collected by GPCB (Last 2 year). Copies of instructions issued by GPCB in last 2 year and point wise compliance thereof. (6) Copies of Show- cause notices, closure notices etc. served by the GPCB and its compliance (6) Recommendations and suggestions of the last two Environment Audit reports of CETP and its compliance report. (7) Common Facility Up gradation scheme, if any.</td>
</tr>
<tr>
<td><strong>II</strong></td>
<td>Status of compliance to the 18(1) (b) direction issued by the CPCB with respect to CETP compliance &amp; CEPI area action plan along with relevant supportive document.</td>
</tr>
<tr>
<td><strong>III</strong></td>
<td>Give status of compliance of Environmental norms of existing Common Infrastructure i.e. CETP, MEE &amp; Spray Dryer (Whichever is applicable) in which you are a member.</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>Submit adequacy of Common Infrastructure i.e. CETP, MEE &amp; Spray Dryer for additional load (Whichever is applicable) along with written confirmation/membership certificate mentioning the same (Total consented quantity, total quantity booked so far, quantity booked for the unit, spare quantity available).</td>
</tr>
<tr>
<td><strong>27</strong></td>
<td><strong>In case of Zero Liquid Discharge (ZLD):</strong></td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>Action plan for ‘Zero’ discharge of effluent shall be included. Notarized undertaking for assuring that underground drainage connection will not be taken in the unit and there shall be no effluent discharge out-</td>
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</table>

0.45 KLD concentrated process water stream will be sent for treatment to common MEE of BEIL, Dahej. Consent letter of BEIL is enclosed as Annexure-IX.

1.0 KLD low concentrated stream will be treated in in-house primary ETP and sent to CETP of Dahej GIDC for further treatment. Acceptance letter of GIDC is enclosed as Annexure-IX.

Refer section 2.9.2, figure 2.5 of chapter-2 on page 2.12-2.13 for water and wastewater details w.r.t. quantity and quality. Refer section 2.10.2, page no. 2.15-2.16 of chapter-2 for wastewater treatment and management.

There is no zero discharge in proposed project. However, possibility will be explored.
<table>
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<th>Compliance of Terms of Reference</th>
<th>T.6</th>
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<tbody>
<tr>
<td>28</td>
<td>In case of in-house MEE/Spray dryer for waste water treatment:</td>
<td>There is no provision of in-house MEE/spray dryer.</td>
</tr>
<tr>
<td></td>
<td>Capacity of MEE/Spray dryer in KL/hr.</td>
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<td></td>
<td>Technical details of MEE including evaporation capacity, steam required for evaporation, adequacy of the proposed boiler to supply steam for evaporation in addition to the steam required for the process etc. Techno-economic viability of the evaporation system. Control measures proposed for the evaporation system in order to avoid/reduce gaseous emission/VOC from evaporation of industrial effluent containing solvents &amp; other chemicals.</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Technical details of ATFD/ Crystallizer/Dryer, RO/NF system etc. (If any).</td>
<td>Not applicable</td>
</tr>
<tr>
<td>30</td>
<td>Undertaking stating that a separate electric meter will be provided for the waste water treatment system viz. ETP, RO, MEE, Spray dryer etc. (Whichever is applicable).</td>
<td>Attached as Annexure-VI.</td>
</tr>
<tr>
<td>31</td>
<td>Economical and technical viability of the effluent treatment system.</td>
<td>0.45 KLD concentrated process water stream will be sent for treatment to common MEE of BEIL, Dahej. Consent letter of BEIL is enclosed as Annexure-IX. 1.0 KLD low concentrated stream will be treated in in-house primary ETP and sent to CETP of Dahej GIDC for further treatment. Acceptance letter of GIDC is enclosed as Annexure-IX. Refer section 2.9.2, figure 2.5 of</td>
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<tr>
<td><strong>32.</strong> Plans for management, collection and disposal of waste streams to be generated from spillage, leakages, vessel washing, used container washing etc. Measures proposed for preventing effluent discharge during unforeseen circumstances.</td>
<td>In case of wastewater streams generated from spillage, leakages, vessel washing, the same will be collected and sent to ETP for treatment. Container/drum will be given to decontamination facilities. Precaution will be taken while handling and the same are given in Section 2.11 of chapter 2 on page 2.20-2.21 as well action plan for handling and management of hazardous chemical is given in section 7.1.4 on page 7.3-7.5 of chapter-7 to avoid any kind of leakage and spillage.</td>
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</tr>
<tr>
<td><strong>33.</strong> Action plan for reuse of liquid waste streams like Spent acids, Poly Aluminium Chloride etc. within premises to convert into valuable products instead of sending outside to actual end-users.</td>
<td>Not applicable as ours is API manufacturing. Spent solvent to be generated will be take to in-house solvent recovery and recovered solvent will be utilized in next batch.</td>
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</tr>
<tr>
<td><strong>34.</strong> Adequacy of the proposed EMS with respect to the pollution load envisaged in terms of Air, Water and hazardous waste.</td>
<td>Attached as Annexure-II.</td>
<td></td>
</tr>
<tr>
<td><strong>35.</strong> One season Site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall should be incorporated.</td>
<td>Refer section 3.8.1, page no. 3.8 of chapter-3.</td>
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<tr>
<td><strong>36.</strong> Anticipated environmental impacts due to the proposed project/production may be evaluated for significance and based on corresponding likely impacts VECs (Valued Environmental Components) may be identified. Baseline studies may be conducted within the study area for all the concerned/identified VECs and likely impacts will have to be assessed for their magnitude in order to identify mitigation measures.</td>
<td>Anticipated environment impacts due to the proposed projects are covered under chapter-4 namely section 4.4 from page no. 4.3. Baseline studies are given under sec. 3.9 to 3.14 of chapter-3 from page no. 3.10 to 3.40.</td>
<td></td>
</tr>
<tr>
<td><strong>37.</strong> One complete season base line ambient air quality data (except monsoon season) to be given along with the dates of monitoring. The parameters to be cov.</td>
<td>One season complete baseline monitoring of ambient air quality is given under sec 3.9 of chapter-3 from page no. 3.10 to 3-13.</td>
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<td>Page</td>
<td>Description</td>
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<tr>
<td>38</td>
<td>Modelling indicating the likely impact on ambient air quality due to proposed activities. The details of model used and input parameters used for modelling should be provided. The air quality contours may be shown on location map clearly indicating the location of sensitive receptors, if any, and the habitation. The wind rose showing predominant wind direction should also be indicated on the map. Impact due to vehicular movement shall also be included into the prediction using suitable model. Results of Air dispersion modelling should be superimposed on satellite Image / geographical area map. ISCST3 Lakes Environment AERMOD View 9.1 is used for modelling. Refer section 4.4.1, page no 4.5 of chapter-4. Cumulative impact on air quality is given in table 4.3, page no. 4.5, table no. 4.4, page no. 4.7, table 4.5, page no. 4.9 and table 4.6, and page no. 4.11. Air quality contour superimposed on location map &amp; Wind rose showing pre-dominant direction is given in figure 4.1 - 4.4 on page no. 4.6 - 4.12 of chapter-4.</td>
<td></td>
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<tr>
<td>39</td>
<td>Base line status of the noise environment, impact of noise on present environment due to the project and proposed measures for noise reduction including engineering controls. Baseline noise level data is given in table 3.13; page no. 3.16 of chapter-3. Impact of noise on present environment is given in sec. 4.4.2, page no. 4.14. Mitigation measures are covered under topic no. 9.4.2 of chapter-9 on page no. 9.4.</td>
<td></td>
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<tr>
<td>40</td>
<td>Specific details of 1) Process gas emission from each unit process with its quantification. 2) Air pollution Control Measures (APCM) proposed for process gas emission. Adequacy of the air pollution control measures (APCM) for process gas emission measures to achieve the GPCB norms. 3) Details of the utilities required. 4) Type and quantity (MT/hr &amp; MT/Day) of fuel to be used for each utility. 1), 2) Refer table 2.11, Page no. 2.15 of chapter – 2. 3) Only one D.G Set (50 KVA). 4) Diesel @ L/Hr will be used in proposed project.</td>
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<td>No.</td>
<td>Requirement</td>
<td>Compliant/Non-compliant</td>
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<td>5</td>
<td>Flue gas emission rate emission from each utility.</td>
<td>5) Refer table 2.10, page no. 2.15 of chapter-2.</td>
</tr>
<tr>
<td>6</td>
<td>Air Pollution Control Measures (APCM) proposed to each of the utility along with its adequacy.</td>
<td>6) Refer table 2.10, page no. 2.15 of chapter-2.</td>
</tr>
<tr>
<td>7</td>
<td>List the project specific sources of fugitive emission along with its quantification and proposed measures to control it.</td>
<td>7) Refer section 2.12, page no. 2.21 of chapter-2.</td>
</tr>
<tr>
<td>8</td>
<td>Details on tail gas treatment. (If any)</td>
<td>8) No any tail gas.</td>
</tr>
<tr>
<td>41</td>
<td>Provision of CEMS (Continuous Emission Monitoring System).</td>
<td>APCM proposed are given in table 2.10, page no. 2.15 of chapter-2. Adequate stack height is provided. No such flue gas or process gas emission which requires CEMS. However, after commencement if any requirement then unit will provide the same.</td>
</tr>
<tr>
<td>42</td>
<td>Action plan for odour control to be submitted.</td>
<td>Refer section 9.5.2, page no. 9.8 of chapter-9.</td>
</tr>
<tr>
<td>43</td>
<td>Management plan for hazardous/Solid waste including storage, handling, utilization and safe disposal as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016. CPCB guidelines in respect of specific treatment, such as solar evaporation, incineration, etc., need to be followed.</td>
<td>Refer section 2.10.3, page no. 2.17 of chapter-2.</td>
</tr>
<tr>
<td>44</td>
<td>How the manual handling of the hazardous wastes will be minimized? Methodology of decontamination and disposal of discarded containers and its record keeping.</td>
<td>Refer section 7.1.3, from page no. 7.3 of chapter-7.</td>
</tr>
<tr>
<td>45</td>
<td>Management of by-products which fall under the purview of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016 as per the said rules and necessary permissions from the concern authority.</td>
<td>Not applicable</td>
</tr>
<tr>
<td>46</td>
<td>Membership of Common Environmental Infrastructure like TSDF, Common Incineration Facility (CHWIF), MEE, Spray dryer etc.</td>
<td>Membership of Common Environmental Infrastructure like TSDF, CHWIF and MEE. Attached as Annexure – IX.</td>
</tr>
<tr>
<td>47</td>
<td>Name and quantity of each type of solvents to be used for proposed production. Details of in-house solvent recovery system including mass balance, solvent loss, recovery efficiency (% recovery), feasibility of reusing the recovered solvents etc. for each type of solvent.</td>
<td>Refer section 2.10.4, from page no. 2.19-2.20 of chapter – 2.</td>
</tr>
<tr>
<td>48</td>
<td>Appropriate monitoring network has to be designed and proposed, to assess the possible residual impacts on VECs.</td>
<td>Details of monitoring plan are given in table 6.1 of chapter-6 on page no. 6.1-6.2.</td>
</tr>
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<td>Page No.</td>
<td>Description</td>
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<td>49</td>
<td>A detailed EMP including the protection and mitigation measures for impact on human health and environment as well as detailed monitoring plan and environmental management cell proposed for implementation and monitoring of EMP. The EMP should also include the concept of waste minimization, recycle/reuse/recover techniques, energy conservation, and natural resource conservation. Total capital cost and recurring cost/annum earmarked for environment pollution control measures. Detailed EMP is given in Chapter-9 of EIA report. Details of monitoring plan are given in table 6.1 of chapter-6 on page no. 6.1. Environment Management Cell is covered in sec. 6.5, page no. 6.2-6.3. Pls. refer sec. 9.5.5 &amp; 9.5.6, page no. 9.9-9.10 for cleaner production &amp; energy conservation details. Total capital cost and recurring cost/annum is given in table 9.3, page no. 9.14.</td>
<td></td>
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<tr>
<td>50</td>
<td>Details of in-house monitoring capabilities and the recognized agencies if proposed for conducting monitoring. Monitoring will be performed by outside agencies authorized by GPCB at regular frequencies.</td>
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<tr>
<td>51</td>
<td>Permission from PESO, Nagpur for storage of solvents, other toxic chemicals, if any. Not required.</td>
<td></td>
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<tr>
<td>52</td>
<td>Occupational health impacts on the workers and mitigation measures proposed to avoid the human health hazards along with the personal protective equipment to be provided. Provision of industrial hygienist and monitoring of the occupational injury to workers as well as impact on the workers. Plan for periodic medical check-up of the workers exposed. Details of work place ambient air quality monitoring plan as per Gujarat Factories Rules. All details are mentioned in Chapter 9. Occupational Health&amp; Safety Plan is covered in Section 9.6, page no 9.11 of chapter-9. Environment Monitoring Plan are given in table 6.1, page no. 6.1 of chapter-6. And budget allocation is mentioned in Table 9.3, page no 9.14 of chapter-9.</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Details on volatile organic compounds (VOCs) from the plant operations and occupational safety and health protection measures. Proposal for Leak Detection and Repair (LDAR) program as per the CPCB guidelines. Refer section 7.9, page no. 7.45 of chapter-7.</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Risk assessment including prediction of the worst-case scenario and maximum credible accident scenarios should be carried out. The worst-case scenario should take into account the maximum inventory of storage at site at any point of time. The risk contours should be plotted on the plant layout map clearly showing which of the facilities would be affected in case of an accident taking place. Based on the same, proposed safeguard measures including On-Site / Off-Site Emergency Plan should be provided. Refer section 7.1, from page no 7.1 of chapter-7 for Risk Assessment.</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>MSDS of all the products and raw materials. Attached as Annexure-X.</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Details of hazardous characteristics and toxicity of raw materials and products to be handled and the control measures proposed to ensure safety and avoid the human health impacts. This shall include the details of Antidotes also.</td>
<td>Pls. refer table no. 2.5, page no 2.9 of chapter-2 for characteristic of raw materials. Section 7.1.4, page 7.3-7.8 and section 7.10, page 7.46-7.48 of chapter-7</td>
</tr>
<tr>
<td>57</td>
<td>Details of quantity of each hazardous chemical (including solvents) to be stored, Material of Construction (MoC) of major hazardous chemical storage tanks, dyke details, threshold storage quantity as per schedules of the Manufacture, Storage &amp; Import of Hazardous Chemicals Rules of major hazardous chemicals, size of the biggest storage tank to be provided for each raw material&amp; product etc. How the manual handling of the hazardous chemicals will be minimized?</td>
<td>Pls. refer table no. 2.5, page no 2.9 of chapter-2.</td>
</tr>
<tr>
<td>58</td>
<td>Details of the separate isolated storage area for flammable chemicals. Details of flame proof electrical fittings, DCP extinguishers and other safety measures proposed. Detailed fire control plan for flammable substances and processes showing hydrant pipeline network, provision of DG Sets, fire pumps, jockey pump, toxic gas detectors etc.</td>
<td>Refer table 7.1, page no 7.5 of chapter-7 for storage details of raw materials. Refer section 7.5, page no 7.38 of chapter-7 for fire control plan.</td>
</tr>
<tr>
<td>59</td>
<td>Submit checklist in the form of Do’s &amp; Don’ts of preventive maintenance, strengthening of HSE, manufacturing utility staff for safety related measures.</td>
<td>Refer section 7.6, page no 7.39 of chapter-7.</td>
</tr>
<tr>
<td>60</td>
<td>Specify safety precautions to be taken for Chemical storage, process, and handling &amp; transportation hazard.</td>
<td>Refer section 7.1.4, page no. 7.3-7.4 of chapter-7.</td>
</tr>
<tr>
<td>61</td>
<td>Details on workers training before engaging work, periodical, in-house, outside etc.</td>
<td>Details on Workers training in section 7.4 in chapter-7.</td>
</tr>
<tr>
<td>62</td>
<td>Details on various SOP to be prepared.</td>
<td>Refer section 7.1.3, page no. 7.3 and section 7.6, page no. 7.39 of chapter-7.</td>
</tr>
<tr>
<td>63</td>
<td>Details on safety audit to be carried out and their compliance status.</td>
<td>This is a proposed unit. However, safety audit will be carried out on regular basis.</td>
</tr>
<tr>
<td>64</td>
<td>Specific safety measures to be taken for general Public living in the vicinity.</td>
<td>Detailed Occupational Health &amp; Safety Programme is given in section 7.4, page no. 7.31 of chapter-7.</td>
</tr>
<tr>
<td>65</td>
<td>Details on hazard identification i.e. HAZOP, HAZAN, Fault tree analysis, Event tree analysis, Checklist, Audit etc. to be adopted for the safety operation of the plant.</td>
<td>Refer section 7.1, page no 7.1 of chapter-7. Refer section 7.10, page no 7.49-7.51 of chapter-7 for hazardous analysis of raw material.</td>
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<td>66</td>
<td>Detection and monitoring of VOC’s / Environment Monitoring plans are</td>
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|**Rapid Environmental Impact Assessment Report**  
**Proposed Synthetic chemicals**  
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GIDC Dahej - II  
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<th>Rule</th>
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<th>Compliance</th>
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<tr>
<td>74</td>
<td>Certificate of accreditation issued by the NABET, QCI to the environmental consultant should be incorporated in the EIA Report.</td>
<td>Attached as Annexure-IX.</td>
</tr>
<tr>
<td>75</td>
<td>An undertaking by the Project Proponent on the ownership of the EIA report as per the MoEF&amp; CCOM dated 05/10/2011 and an undertaking by the Consultant regarding the prescribed TORs have been complied with and the data submitted is factually correct as per the MoEF&amp; CCOM dated 04/08/2009.</td>
<td>Attached as Annexure-VI and Annexure-VIII.</td>
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<tr>
<td>76</td>
<td>All documents to be properly referenced with index and continuous page numbering.</td>
<td>It is done in the report.</td>
</tr>
<tr>
<td>77</td>
<td>Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.</td>
<td>It is mentioned in the report.</td>
</tr>
<tr>
<td>78</td>
<td>Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&amp; CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.</td>
<td>The analysis was performed in the NABL approved laboratory of Greenleaf Envirotech Pvt. Ltd. The results are included in the EIA report.</td>
</tr>
</tbody>
</table>
| 79   | In case of Expansion of the project  
   a. Need for the proposed expansion should be justified in detail.  
   b. Adequacy of existing EMS (Environmental Management System).  
   c. Explore the possibility to achieve Zero Liquid Discharge (ZLD) for existing as well as proposed activity.  
   d. Records of any legal breach of Environmental laws i.e. details of show-cause notices, closure notices etc. served by the GPCB to the existing unit in last five years and actions taken then after for prevention of pollution.  
   e. Copies of Environmental Clearances obtained for the existing plant, its point wise compliance report.  
   f. Environmental audit reports for last 3 years and compliance of its recommendations/Suggestions. (Include latest audit report and its com- | Not applicable as it is a new project. |
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<tr>
<td><strong>Compliance of Terms of Reference</strong></td>
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<tr>
<td>g. Copy of Consent to Operate (CC&amp;A) obtained along with point wise compliance status of all the conditions stipulated therein.</td>
<td></td>
</tr>
<tr>
<td>i. Copies of XGN generated Inspection reports with analysis reports of the water/Air/Hazardous samples collected by GPCB (Last 2 year). Copies of instructions issued by GPCB in last 2 year and point wise compliance thereof.</td>
<td></td>
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<tr>
<td><strong>80</strong></td>
<td>In case of project is located in Ankleshwar-Panoli, Vatva-Narol &amp; Vapi GIDC.</td>
</tr>
<tr>
<td>(B) Compliance of direction under section 18 (1) (b) of the Water (Prevention and Control of Pollution)act, 1974 issued by CPCB dated 31/03/2016 regarding compliance of CETP.</td>
<td></td>
</tr>
<tr>
<td>a. Action initiated by GPCB, if any, against proposed unit regarding non-compliance of prescribed standards under the various environmental laws.</td>
<td></td>
</tr>
<tr>
<td>b. Performance of CETP with respect to current hydraulic load &amp; prescribed standards with No Objection Certificate of CETP regarding incorporation of the proposed unit for acceptance of waste water.</td>
<td></td>
</tr>
<tr>
<td>c. Performance of TSDF site with respect to current load &amp; prescribed standards with No Objection Certificate of TSDF site regarding incorporation of the proposed unit for acceptance of hazardous waste to the common infrastructure.</td>
<td></td>
</tr>
<tr>
<td>d. Copies of quarterly action report taken for the above points submitted to the CPCB.</td>
<td></td>
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<tr>
<td>e. Report of GPCB which have conducted monitoring as per the said</td>
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### Model ToR by MoEF

#### A. Standard TOR

##### 1. Introduction

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<tbody>
<tr>
<td>i. Information about the project proponent.</td>
<td>Refer table 1.1, page no. 1.2 of chapter-1.</td>
</tr>
<tr>
<td>ii. Importance and benefits of the project.</td>
<td>Refer chapter-8 for importance and benefits of the project.</td>
</tr>
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##### 2. Project Description

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<tr>
<td>i. Cost of project and time of completion.</td>
<td>465 lakh is the proposed project cost. Construction and erection work will take about 3 months to complete and then after obtaining regulatory permissions only, plant will be commissioned.</td>
</tr>
<tr>
<td>ii. Products with capacities for the proposed project.</td>
<td>Refer table 2.3, page no. 2.6 of chapter-2.</td>
</tr>
<tr>
<td>iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.</td>
<td>Not applicable as this is a new project.</td>
</tr>
<tr>
<td>iv. Other chemicals and materials required with quantities and storage capacities.</td>
<td>Refer section 2.6.2, page no. 2.7-2.11 of chapter-2.</td>
</tr>
<tr>
<td>vii. Hazard identification and details of proposed safety systems.</td>
<td>Refer sec. 7.1.2, page no 7.2 for hazard identification and section 7.10, from page no 7.49 of chapter-7 for details of proposed safety system.</td>
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##### viii. Expansion/modernization Proposals:

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<tr>
<td>a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forest as pre circular dated 30th May, 2012 on the status compliance of conditions stipulated in all the existing Environmental clearances including Amendments shall be provided. In</td>
<td>Not applicable, as this is a new project.</td>
</tr>
</tbody>
</table>
addition, status of compliance of Consent to Operate for the ongo-
ing/existing operation of the project from SPCB shall be attached with
the EIA-EMP report.

b. In case the existing project has not Obtained Environmental clear-
ance, reasons for not taking EC un-
der the provisions of the EIA Notifi-
cation 1994 and/or EIA Notification
2006 shall be provided. Copies of
Consent to Establish/No Objection
Certificate and Consent to Operate
(in case of units operating prior to
EIA Notification 2006, CTE and CTO
of FY 2005-2006) obtained from
the SPCB shall be submitted. Fur-
ther, compliance report to the con-
ditions of consents from the SPCB
shall be submitted.

Not applicable, as this is a new pro-
ject.

3. Site Details

i. Details w.r.t. option analysis for
Selection of site.

No alternate site was examined. Refer
chapter-5 page 5.1

ii. Co-ordinates (lat-long) of all four
corners of the site.

Refer figure 1.1, page no. 1.2-1.3 of
chapter-1.

iii. Google map-Earth downloaded of
the project site.

Refer figure 1.1, page no 1.2 of chap-
ter-1 and figure 2.2, page no. 2.3 of
chapter-2.

iv. Photographs of the proposed
and existing (if applicable) plant
site. If existing, show photographs
of plantation/ greenbelt in particu-
lar.

Refer section 2.5.4, page no. 2.5-2.6
of chapter-2.

v. A list of major industries with name
and type within study area (10 km
radius) shall be incorporated. Land
use details of the study area.

Refer section 2.13, page no 2.16 of
chapter-2 for surrounding industries.
Refer section 3.6, page no 3.6-3.7 of
chapter-3 for land use details.

vi. Details of Drainage of the project
up to 5km radius of study area. If
the site is within 1km radius of any
major river, peak and lean season
river discharge as well as flood oc-
currence frequency based on peak
rainfall dataofthe past30years. De-
tails of Flood Level of the project
site and maximum Flood Level of
the river shall also be provided. (Mega green field projects).

No river within 1 km. Refer section
3.3 of chapter-3

vii. Status of acquisition of land. If Ac-
quisionist not complete, stage of
the acquisition process and ex-
pected time of complete possession
of the land.

Refer Annexure-IV.
<p>| viii. | R&amp;R details in respect of land in line with state Government policy. | Not applicable |
| 4. <strong>Forest and wildlife related issues (if applicable):</strong> |  |
| i. | Permission and approval for the use of forestland (forestry clearance), if any, and recommendations of the State Forest Department. (If applicable). | Not applicable, as unit is in GIDC. |
| ii. | Land use map based on HighResolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forestlandmorethan40ha). | Refer section 3.6, page no 3.6-3.7 of chapter-3. |
| iii. | Status of Application submitted for obtaining the stage if or entry clearance along with latest status shall be submitted. | Not applicable. |
| iv. | The projects to be located within 10kmotheNational Parks, Sanctuaries, Biosphere Reserves. Migratory Corridors of Wild Animals, the project proponent shall submit the map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and there commendation so comments of the Chief Wildlife Wardenthereon. | Not applicable |
| v. | Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule If auna, if any exists in the study area. | Not applicable. |
| vi. | Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife. | Not applicable. |
| 5. <strong>Environmental Status</strong> |  |
| i. | Determination of atmospheric Inversion level at the project site and site-specific micrometeorological data using temperature, relative humidity, hourly wind speed and direction and rainfall. | Refer section 4.4.1, page no. 4.5 of chapter-4.  Refer section 3.8.1, page no 3.8 of chapter-3. |
| ii. | Raw data of all AAQ measurement- for 12 weeks of all stations as per frequency given in the NAAQM Notification of Nov. 2009along with min., max., average and 98% values for each of the AAQ parame- | AAQ data of 8 locations is given in table no 3.4-3.10, page no 3.11-3.13 of chapter-3. |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Assessment of ground level Concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on location map showing the location of project site, habitation nearby,</td>
</tr>
<tr>
<td></td>
<td>For Air Quality Contours, refer figure 4.1-4.3, page no 4.4-4.9 of chapter-4. Details are covered under section 4.4.1, page no 4.2 of chapter-4.</td>
</tr>
<tr>
<td>ii.</td>
<td>Socio-economic status of the study area.</td>
</tr>
<tr>
<td>iii.</td>
<td>Surface water quality of nearby River (100 m upstream and downstream of discharge point) and other surface drain sat eight locations as per CPCB/MoEF&amp; CC guidelines.</td>
</tr>
<tr>
<td></td>
<td>Refer table 3.18, page no. 3.24 of chapter-3.</td>
</tr>
<tr>
<td>iv.</td>
<td>Whether the site falls near to polluted stretch of river identified by the CPCB/ MoEF&amp; CC, if yes give details.</td>
</tr>
<tr>
<td></td>
<td>Not applicable.</td>
</tr>
<tr>
<td>v.</td>
<td>Soil Characteristic as per CPCB Guidelines.</td>
</tr>
<tr>
<td></td>
<td>Refer table 3.20, page no 3.27-3.28 of chapter-3.</td>
</tr>
<tr>
<td>vi.</td>
<td>Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.</td>
</tr>
<tr>
<td>vii. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.</td>
<td></td>
</tr>
<tr>
<td>viii.</td>
<td>Socio-economic status of the study area.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>sensitive receptors, if any.</td>
</tr>
<tr>
<td>ii.</td>
<td>Water Quality modelling - in case of discharge in water body.</td>
</tr>
<tr>
<td></td>
<td>Not applicable</td>
</tr>
<tr>
<td>iii.</td>
<td>Impact of the transport of the raw materials and end products on the surrounding Environmental shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor cum-rail transport shall be examined.</td>
</tr>
<tr>
<td></td>
<td>Refer section 3.15, page no 3.43-3.45 of chapter-3.</td>
</tr>
<tr>
<td>iv.</td>
<td>Details of stack emission and action plan for control of emissions to meet standards.</td>
</tr>
<tr>
<td></td>
<td>Refer section 2.10.1, page no 2.15 of chapter-2.</td>
</tr>
<tr>
<td>v.</td>
<td>Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.</td>
</tr>
<tr>
<td></td>
<td>Not applicable as unit will not use any solid fuel.</td>
</tr>
<tr>
<td>vi.</td>
<td>Action plan for rain water harvesting measures at plant site shall be submitted to harvest rain water from the roof tops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.</td>
</tr>
<tr>
<td></td>
<td>Unit will provide adequate system to collect rain water and will utilize the same as per requirement. Refer section 9.7, page no 9.12 of chapter-9.</td>
</tr>
<tr>
<td>vii.</td>
<td>Action plan for post project Environmental monitoring shall be submitted.</td>
</tr>
<tr>
<td>viii.</td>
<td>Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.</td>
</tr>
<tr>
<td></td>
<td>Refer section 7.1 &amp; 7.2, page no 7.1-7.4 and from page no 7.4 respectively of chapter-7 for Risk assessment Disaster Management Plan.</td>
</tr>
</tbody>
</table>

7. **Occupational health**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Plan and fund allocation to ensure the occupational health &amp; safety of all contract and casual workers.</td>
</tr>
<tr>
<td>ii.</td>
<td>Details of exposure specific health status evaluation of worker. If the workers’ health is being evaluated by predesigned format, chest x-rays, Audiometry, Spirometry, Vision testing (Far &amp; Near vision, color vision and any other ocular defect) ECG, during pre-placement.</td>
</tr>
<tr>
<td></td>
<td>This is a proposed project. Refer section 9.6, page no 9.11-9.12 of chapter-9. Refer section 7.4, page no 7.27-7.35 of chapter-7.</td>
</tr>
</tbody>
</table>
and periodical examinations give the details of the same. Details regarding last month analysed data of above mentioned parameters as per age, sex, duration of exposure and department wise.

iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the worker can be preserved.

This is a proposed project. Refer section 9.6, page no 9.11-9.12 of chapter-9. Refer section 7.4, page no 7.27-7.35 of chapter-7.


Not applicable, as this is a new proposed project. However, after commencement unit will maintain all records.

8. Details regarding infrastructure Facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during constructions well as to the casual workers including truck drivers during operation phase.

Local people through contractor will be utilized for construction. All required facilities will be provided to them.

9 Enterprise Social Commitment(ESC)

i. Adequate funds (at least 2.5% of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socioeconomic development activities need to be elaborated upon.

Refer section ‘q’ of section 10.2, page no 10.2 of chapter-10.

10. Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environmental (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.

No litigation pending against the project and no any direction/order passed by any court of Law against the project.
CHAPTER – 1

INTRODUCTION

1.1 PREAMBLE

M/s. Sanjivani Pharma is a proposed unit located at Plot No.: D-2-CH-102 in GIDC Dahej - II of Bharuch, Taluka Vagra in District Bharuch in Gujarat State for the production of industrial chemicals.

Now, looking to the market demand, we intend to manufacture various active Pharmaceutical Ingredients (API) products. Total product capacity will be @ 1350 Kg/Month.

1.2 PURPOSE OF THE EIA REPORT

As per EIA Notification 2006 as amended, the proposed project falls under project activity 5(f) Synthetics Organic Chemical, hence required prior environmental clearance. Project is located in notified industrial estate i.e. in GIDC Dahej - II and therefore unit requires obtaining Environmental Clearance for the proposed from State Level Environmental Impact Assessment Authority (SEIAA), Gujarat under Category ‘B’.

Thus, an application was made online on environmental clearance portal for obtaining the related TOR. The proposal was considered by SEAC in the meeting held on 29/01/2019 and issued the TOR vide minutes for 477th SEAC meeting, published on SEIAA, Gujarat website. The TOR was issued by SEIAA, Gujarat vide their letter no: SEIAA/GUJ/TOR/5(f)/585/2019, dated 10/04/2019.

As a part of obtaining Environmental Clearance, M/s. Sanjivani Pharma has assigned the work to M/s. Enviro Fluid Consultants for assessing environmental impact due to the proposed and carrying out EIA/EMP studies. Based on the Terms of Reference (TOR) points issued by SEIAA, Gujarat, Environmental Impact Assessment (EIA) report has been prepared covering all aspects of the TOR. The purpose of preparation of Environment Impact Assessment (EIA) report is also to understand the likely impacts and to take Environment Protection measures during the project.

1.3 IDENTIFICATION OF PROJECT AND PROJECT PROONENT

Unit proposes to manufacture Synthetic organic chemicals in GIDC Dahej-II. Proposed products i.e. Synthetic organic chemicals are covered under project sector 5(f) and because of it is located in notified industrial estate, it falls under category ‘B’.

Sanjivani Pharma is a partnership firm promoted by following partners having wide experience in Industries for chemical manufacturing;
Table 1.1: Details of Partners

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Partners</th>
<th>Residential Address</th>
<th>Age</th>
<th>Work Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Patel Sandipkumar Jayntibhai</td>
<td>30-Abhishek Avenue, Opp. Samruddhi apartment, Sawminarayan road, jadeshwar, Bharuch.</td>
<td>36</td>
<td>15 Years</td>
</tr>
<tr>
<td>2</td>
<td>Patel Rajendrakumar Prabhudas</td>
<td>A-33, Vaibhav Bungalows, jadeshwar, Bharuch.</td>
<td>49</td>
<td>25 years</td>
</tr>
<tr>
<td>3</td>
<td>Patel Pintubhai Jayntibhai</td>
<td>30-Abhishek Avenue, Opp. Samruddhi apartment, Sawminarayan road, jadeshwar, Bharuch.</td>
<td>39</td>
<td>18 Years</td>
</tr>
</tbody>
</table>

1.4 NEED OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY

As an approach towards proposed manufacturing activity, availability of basic infrastructural facility, availability of finance through internal and external sources, administrative ease and looking to the increasing demand for end products in domestic as well as in international market, unit has planned to manufacture these products.

The project will help industrial development in the region. It will increase employment opportunities in the region and will earn foreign exchange for the Country.

1.5 LOCATION OF THE PROPOSED PROJECT

Figure 1.1: Project Location with boundary
New Proposed project will be carried out at Plot No. D-2-CH-102, GIDC Dahej-II and Taluka: Vagra, District: Bharuch, Gujarat. GPS coordinates of the project site is as given below and four corner coordinates are given in above figure;

Latitude: 21.727643° N and
Longitude: 72.621961°E

1.6 SITE SELECTION CRITERIA

The proposed activity carried out in Dahej - II GIDC in new infrastructure as per requirement and following are the favourable conditions for the project location.

Proposed Project will be carried out site is having favourable conditions like availability of raw materials, consumer centres and infrastructure facilities like power, water, transportation, skilled & unskilled labours etc.

- Proposed project in Dahej – II GIDC which is notified industrial estate having various types of industries with different scales.
- Availability of adequate land.
- Due to located in GIDC, away from the inhabited area & it will also have minimum impact on vegetation and cultivation.
- Uninterrupted power and water supply by GIDC.
- Availability of common infrastructural facilities road, rail for transportation in the area.
- Availability of requisite skilled, semi-skilled and unskilled labour in vicinity.
- Dahej and Bharuch are the nearest city within 4 km and 34 km distance respectively, which is well connected by road & rail to the rest of India.

1.7 SCOPE AND METHODOLOGY OF THE EIA STUDY

The scope of Environmental Impact Assessment (EIA) is to determine environmental impacts of proposed project & development activities associated with the project. The detailed EIA report is prepared in accordance with the Terms of Reference (TOR) issued by SEIAA vide letter no. SEIAA/GUJ/TOR/5(f)/585/2019, dated 10/04/2019. Compliance of Terms of Reference (TOR) is given in the beginning of the EIA Report.

The EIA study includes determination of baseline conditions, assessment of the Impacts on the environment due to the construction and operation of the project and making recommendations on the preventive measures to be taken, to minimize the impact on the environment to acceptable levels. A suitable post-study monitoring program will be outlined. Preparation of Environment Management Plan will be given based on the emissions and feasibility report. As per the guidelines, the Generic structure of EIA is given in EIA notification dated 14th September, 2006 is maintained. The scope of study based on MoEF / CPCB guidelines is tabulated below;
CHAPTER – 2  PROJECT DESCRIPTION

2.1 INTRODUCTION

This section of the report describes the features of the proposed project in detail to allow an assessment of its environmental impact. A complete description is important to understand the potential environmental implications of the initiative and accordingly addressing issues in an appropriate manner. Description of the proposed project components and activities are presented together with the aspects during the construction and operation phase of the project which are also important from the environmental perspective.

2.2 TYPE OF PROJECT

The project is neither an interlinked project nor an interdependent project. As per the EIA Notification, 2006 & subsequent amendments, the proposed project comes under category ‘B’ listed at item 5(f) “Synthetic organic chemicals industry (API Manufacturing). Project is located in notified industrial estate i.e. in GIDC Dahej- II and therefore unit requires obtaining Environmental Clearance for the proposed activity from State Level Environmental Impact Assessment Authority (SEIAA), Gujarat under Category ‘B’.

2.3 NEED FOR THE PROJECT

Looking to the market demand of API in Pharma sectors, unit has decided to establish the API manufacturing unit. To solve the purpose, unit has acquired plot in Dahej GIDC, a perfect location to establish such chemical unit due to availability of water, fuel and electricity, raw material etc.

2.4 PROJECT COST

Estimated cost for the proposed project is approximately Rs. 4.65 Crores.

2.5 LOCATION OF THE PROJECT SITE

The unit is located at Plot No.: D-2-CH-102, GIDC Dahej- II, Taluka: Vagra District: Bharuch, Gujarat.

Latitude: 21.727643° N and
Longitude: 72.621961°E
Figure 2.1: Project Location Map

Chapter-2: Project Description
2.5.1 Land requirement details

The proposed project is within the proposed premises which are sufficient to accommodate the proposed activity. The Total land area for project is 5,000 Sq.mt. The area details are given in below table:

**Table 2.1: Area Details**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Details of Land</th>
<th>Area (in Sq.mt.)</th>
<th>% of Total Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ground Floor</td>
<td>First Floor</td>
</tr>
<tr>
<td>1</td>
<td>Security Cabin</td>
<td>9.92</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Plant BLDG-1</td>
<td>247.74</td>
<td>247.74</td>
</tr>
<tr>
<td>3</td>
<td>Tank farm</td>
<td>318.98</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Utility block</td>
<td>146.88</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Engg. Store &amp; Scrap yard</td>
<td>153.12</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>ETP</td>
<td>156.00</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Plant BLDG-2 (Future)</td>
<td>244.80</td>
<td>244.80</td>
</tr>
<tr>
<td>8</td>
<td>Plant BLDG-3 (Future)</td>
<td>315.20</td>
<td>315.20</td>
</tr>
<tr>
<td>9</td>
<td>Green belt &amp; Cop-1,2</td>
<td>1663.00</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Road &amp; Open space</td>
<td>1744.36</td>
<td>-</td>
</tr>
<tr>
<td>Total plot area</td>
<td><strong>5000.0</strong></td>
<td><strong>807.74</strong></td>
<td><strong>807.74</strong></td>
</tr>
</tbody>
</table>

*Figure 2.2: Google Image of Project site (10 Km radius)*
2.5.2 Plant Layout:

*Figure 2.3: Plant Layout*
2.5.3 Environmental settings

**Table 2.2: Environmental settings of the project site**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Latitude</td>
<td>21.727643° N</td>
</tr>
<tr>
<td>2.</td>
<td>Longitude</td>
<td>72.621961° E</td>
</tr>
<tr>
<td>3.</td>
<td>MSL (Mean Sea Level)</td>
<td>7 meter</td>
</tr>
<tr>
<td>4.</td>
<td>Nearest power station</td>
<td>DGVCL (Dakshin Gujarat vij Company Limited)</td>
</tr>
<tr>
<td>5.</td>
<td>Nearest Residence Area (Vadadla)</td>
<td>1.0 Km, E</td>
</tr>
<tr>
<td>6.</td>
<td>Nearest Railway station (Bharuch)</td>
<td>39.0 Km, E</td>
</tr>
<tr>
<td>7.</td>
<td>Nearest Airport (Surat)</td>
<td>70.0 Km, S</td>
</tr>
<tr>
<td>8.</td>
<td>Nearest State Highway</td>
<td>40.0 Km</td>
</tr>
<tr>
<td>9.</td>
<td>Seismic Zone</td>
<td>Zone-III (Less Active)</td>
</tr>
<tr>
<td>10.</td>
<td>National Parks / Sanctuary</td>
<td>None within 10 Km radius</td>
</tr>
</tbody>
</table>

2.5.4 Site Photographs:

*Figure 2.4: Site photographs*
2.6 SIZE OR MAGNITUDE OF OPERATION

2.6.1 Products and Production Capacities

Proposed project manufacturing products and capacity are given in below table:

Table 2.3: Products and production capacities

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Product No.</th>
<th>Name of Products</th>
<th>CAS No.</th>
<th>Production Capacity (Kg/Month)</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td>630-58-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>H2</td>
<td>Nandrolone Deconoate</td>
<td>360-70-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
<td>62-90-8 / 434-22-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>H4</td>
<td>Mifepristone</td>
<td>84371-65-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>H5</td>
<td>Medroxy Progesterone Acetate</td>
<td>71-58-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>H6</td>
<td>Progesterone</td>
<td>57-83-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>H7</td>
<td>Testosterone Acetate</td>
<td>1045-69-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>H8</td>
<td>Testosterone Deconoate</td>
<td>5721-91-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>H9</td>
<td>Estradiol Benzoate</td>
<td>50-50-0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>H10</td>
<td>Estradiol Valerate</td>
<td>979-32-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Cortico Steroids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>S1</td>
<td>Betamethasone Dipropionate</td>
<td>5593-20-4</td>
<td></td>
<td>As Pharmaceutical ingredient and in Pharma Formulation</td>
</tr>
<tr>
<td>12</td>
<td>S2</td>
<td>Betamethasone Sodium Phosphate</td>
<td>151-73-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>S3</td>
<td>Beta Methasone Valerate</td>
<td>2152-44-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>S4</td>
<td>Beclomethasone Dipropionate</td>
<td>5534-09-8-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Rapid Environmental Impact Assessment Report
Proposed Synthetic organic chemicals

Sanjivani Pharma
GIDC Dahej - II
Ta.: Vagra, Dist.: Bharuch

Chapter-2: Project Description

2.6.2 Raw Materials Requirement

Sources of Raw Material: Traders and distributors from Domestic market.
Mode of Transportation: Raw materials & finished product will be transported by road (liquid in drums & solid materials in bags).

Details of the raw materials are given in below table:

Table 2.4: Details of Raw Materials

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Raw Material</th>
<th>CAS No.</th>
<th>Requirement (Kg/Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HORMONES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>17 Alpha-Hydroxy Progesterone</td>
<td>630-56-8</td>
<td>500.0</td>
</tr>
<tr>
<td>2</td>
<td>Acetic Acid</td>
<td>64-19-7</td>
<td>1575.0</td>
</tr>
<tr>
<td>3</td>
<td>N-Caproic Anhydride</td>
<td>2051-49-2</td>
<td>363.0</td>
</tr>
<tr>
<td>4</td>
<td>Methylene Dichloride (Fresh)</td>
<td>75-09-2</td>
<td>399.0</td>
</tr>
<tr>
<td>5</td>
<td>Alumina Oxide</td>
<td>1344-28-1</td>
<td>260.87</td>
</tr>
<tr>
<td>6</td>
<td>Di iso Propyl ethar (DIPE) (Fresh)</td>
<td>108-20-3</td>
<td>68.348</td>
</tr>
<tr>
<td>7</td>
<td>Activated Carbon</td>
<td>7440-44-0</td>
<td>75.0</td>
</tr>
<tr>
<td>8</td>
<td>Nandrolone Base</td>
<td>434-22-0</td>
<td>500.0</td>
</tr>
<tr>
<td>9</td>
<td>Decanoy Chloride</td>
<td>112-13-0</td>
<td>401.077</td>
</tr>
<tr>
<td>10</td>
<td>Acetone (Fresh)</td>
<td>67-64-1</td>
<td>102.783</td>
</tr>
<tr>
<td>11</td>
<td>Pyridine</td>
<td>110-86-1</td>
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## Chapter-2: Project Description

### 2.8

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### Table 2.5: Storage details of Raw Materials

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<tr>
<td>49</td>
<td>Sulphuric Acid</td>
<td>Liquid</td>
<td>3.3</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>15.0</td>
</tr>
<tr>
<td>50</td>
<td>21-acetoxy-17-hydroxy-16beta-methylpregna-1,4,9(11)-triene-3,20-dione</td>
<td>Solid</td>
<td>16.0</td>
<td>Bag</td>
<td>50</td>
<td>5</td>
<td>250</td>
<td>15.6</td>
</tr>
</tbody>
</table>
## 2.7 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

In order to control and regulate the development of chemical project, a legal framework has been developed by Govt. of India. Accordingly, several clearances and approvals shall be required to be obtained from different Government and Statutory Agencies at various stages of development and operation at phase of the project. Indicative list of Approvals /Clearances to be obtained from Govt. Authorities for this project are as below:

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Name of Raw Material</th>
<th>Physical Form</th>
<th>Requirement Kg/Day</th>
<th>Mode of Storage</th>
<th>Capacity of storage unit (Kg)</th>
<th>No. of Units</th>
<th>Total storage capacity (kg)</th>
<th>Storage Inventory (Day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>N Chloro Succanamide</td>
<td>Solid</td>
<td>11.2</td>
<td>Bag</td>
<td>50</td>
<td>4</td>
<td>200</td>
<td>17.9</td>
</tr>
<tr>
<td>52</td>
<td>Deflazacort intermediate (DS)</td>
<td>Solid</td>
<td>18.2</td>
<td>Bag</td>
<td>50</td>
<td>6</td>
<td>300</td>
<td>16.5</td>
</tr>
<tr>
<td>53</td>
<td>Iodine</td>
<td>Solid</td>
<td>9.1</td>
<td>Bag</td>
<td>50</td>
<td>3</td>
<td>150</td>
<td>16.5</td>
</tr>
<tr>
<td>54</td>
<td>Potassium Acetate</td>
<td>Liquid</td>
<td>10.9</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>18.3</td>
</tr>
<tr>
<td>55</td>
<td>Calcium Chloride</td>
<td>Solid</td>
<td>5.5</td>
<td>Bag</td>
<td>50</td>
<td>2</td>
<td>100</td>
<td>18.3</td>
</tr>
<tr>
<td>56</td>
<td>Tri ethyl Butyrate</td>
<td>Liquid</td>
<td>14.5</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>13.8</td>
</tr>
<tr>
<td>57</td>
<td>Chromium Trioxide</td>
<td>Solid</td>
<td>12.7</td>
<td>Bag</td>
<td>50</td>
<td>4</td>
<td>200</td>
<td>15.7</td>
</tr>
<tr>
<td>58</td>
<td>DMF</td>
<td>Liquid</td>
<td>80.0</td>
<td>Drum</td>
<td>200</td>
<td>6</td>
<td>1200</td>
<td>15.0</td>
</tr>
<tr>
<td>59</td>
<td>Lithium Chloride</td>
<td>Solid</td>
<td>20.0</td>
<td>Bag</td>
<td>50</td>
<td>6</td>
<td>300</td>
<td>15.0</td>
</tr>
<tr>
<td>60</td>
<td>Methyl Ethyl Ketone (MEK) (Fresh)</td>
<td>Liquid</td>
<td>2.2</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>22.9</td>
</tr>
<tr>
<td>61</td>
<td>HCl</td>
<td>Liquid</td>
<td>1.8</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>27.5</td>
</tr>
<tr>
<td>62</td>
<td>Betamethasone Acetate</td>
<td>Solid</td>
<td>20.0</td>
<td>Bag</td>
<td>50</td>
<td>6</td>
<td>300</td>
<td>15.0</td>
</tr>
<tr>
<td>63</td>
<td>2-Furoyl Chloride</td>
<td>Liquid</td>
<td>10.0</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>20.0</td>
</tr>
<tr>
<td>64</td>
<td>4-DMAP</td>
<td>Solid</td>
<td>6.0</td>
<td>Bag</td>
<td>50</td>
<td>2</td>
<td>100</td>
<td>16.7</td>
</tr>
<tr>
<td>65</td>
<td>Methylprednisolone</td>
<td>Solid</td>
<td>18.2</td>
<td>Bag</td>
<td>50</td>
<td>8</td>
<td>400</td>
<td>22.0</td>
</tr>
<tr>
<td>66</td>
<td>Acetyl Chloride</td>
<td>Liquid</td>
<td>18.2</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>11.0</td>
</tr>
<tr>
<td>67</td>
<td>Chloroform (Fresh)</td>
<td>Liquid</td>
<td>0.7</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>69.4</td>
</tr>
<tr>
<td>68</td>
<td>Prednisolone</td>
<td>Liquid</td>
<td>18.2</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>11.0</td>
</tr>
<tr>
<td>69</td>
<td>Acetic Anhydride</td>
<td>Liquid</td>
<td>16.4</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>12.2</td>
</tr>
<tr>
<td>70</td>
<td>Hydrocortisone</td>
<td>Solid</td>
<td>18.2</td>
<td>Bag</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>11.0</td>
</tr>
<tr>
<td>71</td>
<td>Dexamethasone</td>
<td>Solid</td>
<td>16.0</td>
<td>Bag</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>12.5</td>
</tr>
<tr>
<td>72</td>
<td>Tetrahydrofuran (Fresh)</td>
<td>Liquid</td>
<td>3.8</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>13.1</td>
</tr>
<tr>
<td>73</td>
<td>Pyro phosphyl chloride</td>
<td>Liquid</td>
<td>9.9</td>
<td>Drum</td>
<td>200</td>
<td>1</td>
<td>200</td>
<td>20.2</td>
</tr>
<tr>
<td>74</td>
<td>Ethyl Acetate (Fresh)</td>
<td>Liquid</td>
<td>0.7</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>76.2</td>
</tr>
<tr>
<td>75</td>
<td>Activated Carbon</td>
<td>Solid</td>
<td>3.2</td>
<td>Bag</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>15.6</td>
</tr>
<tr>
<td>76</td>
<td>Cynocabalamine</td>
<td>Solid</td>
<td>4.3</td>
<td>Bag</td>
<td>50</td>
<td>2</td>
<td>100</td>
<td>23.0</td>
</tr>
<tr>
<td>77</td>
<td>TMSI</td>
<td>Solid</td>
<td>1.0</td>
<td>Bag</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>52.3</td>
</tr>
<tr>
<td>78</td>
<td>sodium Borohydrade</td>
<td>Solid</td>
<td>0.9</td>
<td>Bag</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>57.5</td>
</tr>
<tr>
<td>79</td>
<td>phenol</td>
<td>Liquid</td>
<td>8.3</td>
<td>Bag</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>6.1</td>
</tr>
<tr>
<td>80</td>
<td>chloroform (Fresh)</td>
<td>Liquid</td>
<td>0.9</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>57.5</td>
</tr>
<tr>
<td>81</td>
<td>Acetone (Fresh)</td>
<td>Liquid</td>
<td>0.3</td>
<td>Drum</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>143.8</td>
</tr>
<tr>
<td>82</td>
<td>Ferrous Sulphate</td>
<td>Solid</td>
<td>0.6</td>
<td>Bag</td>
<td>50</td>
<td>1</td>
<td>50</td>
<td>88.5</td>
</tr>
</tbody>
</table>
1. Environmental Clearance (EC) : State Level Environment Impact Assessment Authority (SEIAA)
2. Consent To Establish (NOC) : Gujarat Pollution Control Board
3. Consent To Operate (CCA) : Gujarat Pollution Control Board
4. Plant Installation : Factory Inspectorate
5. Electricity Installation : Electrical Inspectorate

### 2.8 MANUFACTURING PROCESS

Please refer Annexure-1 for manufacturing details with chemical reaction, process flow diagram and mass balance.

### 2.9 PLANT INFRASTRUCTURE AND BASIC REQUIREMENTS

#### 2.9.1 List of Plant Machineries

Proposed project machineries are sufficient to produce proposed production capacity. Details of plant machineries are given in below table:

**Table 2.6: List of Proposed Plant Machineries**

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Equipment</th>
<th>Size/ Capacity</th>
<th>Qty (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Glass assembly</td>
<td>200 L</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Glass assembly</td>
<td>100 L</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>Nutch Filter</td>
<td>10 Inches</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>Vacuum Tray Dryer</td>
<td>6 tray</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Cooling Tower</td>
<td>20 TR</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Chiller</td>
<td>5 TR</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>D.G. Set</td>
<td>50 KVA</td>
<td>1</td>
</tr>
</tbody>
</table>

#### 2.9.2 Water requirement

**During Construction phase:**

During construction phase, water requirement will be met through GIDC water supply. Sanitary facilities will also be used by construction workmen.

**During Operation phase:**

The source of water is GIDC water supply. Total water requirement proposed project will be 17.0 KLD. Domestic proposed water requirement 5.0 KLD and Industrial proposed water requirement 12.0 KLD. The Domestic wastewater generations 4.0 KDL is disposed by Septic tank and soak pit and Effluent wastewater generation 1.45 KLD is disposed by ETP with primary treatment facility 1 KLD and Common MEE 0.45 KLD.

**Table 2.7: Water Consumption and Waste water generation details**

<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Type of Activity</th>
<th>Water Requirement KLD</th>
<th>Wastewater Generation KLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Domestic</td>
<td>5.0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>Gardening</td>
<td>8.3</td>
<td>Nil</td>
</tr>
<tr>
<td>3.</td>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sr No.</td>
<td>Type of Activity</td>
<td>Water Requirement KLD</td>
<td>Wastewater Generation KLD</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>-----------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>a.</td>
<td>Process</td>
<td>0.3</td>
<td>0.45</td>
</tr>
<tr>
<td>b.</td>
<td>Floor Washing</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>c.</td>
<td>Equipment Cleaning</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>d.</td>
<td>Scrubbing</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>e.</td>
<td>Cooling</td>
<td>2.2</td>
<td>0.1</td>
</tr>
<tr>
<td>f.</td>
<td>Reject Water to Cooling</td>
<td>0.3</td>
<td>Nil</td>
</tr>
<tr>
<td></td>
<td><strong>Industrial Total</strong></td>
<td><strong>3.7</strong></td>
<td><strong>1.45</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total (1+2+3)</strong></td>
<td><strong>17.0</strong></td>
<td><strong>5.45</strong></td>
</tr>
</tbody>
</table>

**Figure 2.5: Water Balance Diagram**

- Source of Water Supply: GIDC Supply
  - Total: 17 KL/day

- Domestic: 5 KL/day
  - Sewage to septic tank & Soak Pit: 4 KL/day

- Gardening: 8.3 KL/day

- Industrial: 3.7 KL/day

- Water Treatment Plant: 0.9 KL/day
  - Purified water: 0.6 KL/day

- Cooling: 2.5 KL/day
  - Reject water: 0.3 KL/day

- Floor Washing: 0.3 KL/day

- Scrubbing: 0.3 KL/day
  - Scrubbed Liquid: 0.3 KL/day

- Process: 0.3 KL/day
  - Wastewater: 0.45 KL/day
  - To Common MEE: 0.45 KL/day

- Equipment Cleaning: 0.3 KL/day
  - Wastewater: 0.3 KL/day

- ETP with primary treatment facility: 1.0 KL/day
  - To CETP: 1.0 KL/day
Table 2.8: Stream-wise characteristics of Effluent

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Parameters</th>
<th>Unit</th>
<th>Cooling Purge</th>
<th>Floor washing</th>
<th>Equipment cleaning</th>
<th>Scrubbing</th>
<th>Composite diluted stream</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity</td>
<td>KLD</td>
<td>0.1</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>1</td>
<td>pH</td>
<td>--</td>
<td>6.5-7.5</td>
<td>6.0-7.0</td>
<td>6.5-7.5</td>
<td>4.0-5.0</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>2</td>
<td>COD mg/l</td>
<td>50-60</td>
<td>300-400</td>
<td>1000-1500</td>
<td>40-50</td>
<td>500-1000</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SS mg/l</td>
<td>200-300</td>
<td>150-200</td>
<td>150-200</td>
<td>100-150</td>
<td>150-200</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TDS mg/l</td>
<td>2000-2500</td>
<td>400-500</td>
<td>2500-3000</td>
<td>800-1000</td>
<td>2000-3000</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.9: Details of Fuel Requirement

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Name of utility</th>
<th>Fuel &amp; its requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D.G Set (50 KVA)</td>
<td>Diesel &amp; 5 L/hr</td>
</tr>
</tbody>
</table>

2.9.3 Power requirement

Proposed project will be carried out in existing premises having power connection. Energy/power requirement will be 90 kW which will be supplied through Dakshin Gujarat Vij Company Limited.

2.9.4 Fuel requirement

Diesel will be used as a fuel for D.G set. Detail of the same is given in below table.

2.9.5 Manpower requirement

This proposed project will provide direct employment to 60 people whereas it will provide employment to many others indirectly.
2.10 EMISSION, EFFLUENT GENERATION & WASTE GENERATION WITH CONTROL SYSTEM

2.10.1 Air Emission

**Table 2.10: Details of Flue Gas stacks**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Stacks attached to</th>
<th>Stack Height (m)</th>
<th>Fuel &amp; its requirement</th>
<th>APCM</th>
<th>Pollutants &amp; Permissible limit</th>
</tr>
</thead>
</table>
| 1       | D.G Set (50 KVA)   | 6                | Diesel & 5 L/hr        | Adequate Stack Height | Particulate Matter ≤ 150 mg/Nm$^3$  
SO$_2$ ≤ 100 ppm  
NOx ≤ 50 ppm |

**Table 2.11: Process Gas Stacks Details**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Stack attached to</th>
<th>Stack Height (m)</th>
<th>APCM</th>
<th>Pollutants &amp; Permissible limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass reactor</td>
<td>20</td>
<td>Water Scrubber</td>
<td>HCl ≤ 20 mg/Nm$^3$</td>
</tr>
</tbody>
</table>

2.10.2 Effluent generation and its management

During Operation phase:

Domestic Sewage will be sent in soak pit through Septic tank. Process effluent stream will be collected and sent to common MEE. Other low concentrated effluent will be treated in in-house Primary Effluent treatment plant and then sent to CETP for further treatment.

**Table 2.12: Details of ETP**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular</th>
<th>Quantity</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Diluted stream Collection cum Neutralization Tank</td>
<td>01</td>
<td>1500 L</td>
</tr>
<tr>
<td>2</td>
<td>Feed pump</td>
<td>01</td>
<td>0.25 L/hr</td>
</tr>
<tr>
<td>3</td>
<td>Nutch/ Disc filter</td>
<td>01</td>
<td>100 L/Hr</td>
</tr>
<tr>
<td>4</td>
<td>Treated water tank</td>
<td>01</td>
<td>1500 L</td>
</tr>
<tr>
<td>5</td>
<td>Process effluent storage tank</td>
<td>01</td>
<td>1500 L</td>
</tr>
</tbody>
</table>
2.10.3 Details of Hazardous Waste Management

Discarded drums/Containers & used/spent oil will be the hazardous waste generated from raw material storage and plant machineries respectively. Empty drums/bags will be sent to authorized vendors for decontamination and recycle purpose, while used/spent oil will be sent to authorized re-processors. ETP waste and Process waste will be collected, stored and disposed at TSDF. The details of Hazardous wastes are shown in below table:

**Table 2.13: Hazardous waste Management**

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Type/ Name of Hazardous waste</th>
<th>Specific Source of generation (Name of the Activity, Product etc.)</th>
<th>Category and Schedule as per HW Rules.</th>
<th>Quantity (MT/Annum)</th>
<th>Management of HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Used /spent Oil</td>
<td>Plant &amp; Machineries</td>
<td>5.1</td>
<td>0.01</td>
<td>Collection, storage, and reuse within premises for lubrication or disposal to registered recycler.</td>
</tr>
<tr>
<td>2</td>
<td>Discarded Containers/bags</td>
<td>Raw materials</td>
<td>33.1</td>
<td>5.0</td>
<td>Collection, storage, Transportation &amp; sell to authorized vendor</td>
</tr>
<tr>
<td>3</td>
<td>ETP Sludge</td>
<td>Wastewater treatment</td>
<td>35.3</td>
<td>5.0</td>
<td>Collection, storage, Transportation and</td>
</tr>
</tbody>
</table>
### Project Description

#### Sr. no. Type/ Name of Hazardous waste Specific Source of generation (Name of the Activity, Product etc.) Category and Schedule as per HW Rules. Quantity (MT/Annum) Management of HW systems

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Type/ Name of Hazardous waste</th>
<th>Specific Source of generation (Name of the Activity, Product etc.)</th>
<th>Category and Schedule as per HW Rules.</th>
<th>Quantity (MT/Annum)</th>
<th>Management of HW systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Process waste</td>
<td>Mfg Process**</td>
<td>28.1</td>
<td>3.50</td>
<td>Disposal to TSDF</td>
</tr>
<tr>
<td>5</td>
<td>Spent Carbon</td>
<td>Mfg Process**</td>
<td>28.3</td>
<td>4.50</td>
<td>Collection, storage, Transportation and Disposal to CHWIF</td>
</tr>
<tr>
<td>6</td>
<td>Distillation residue</td>
<td>Solvent recovery**</td>
<td>20.3</td>
<td>0.20</td>
<td>Collection, recovery and reuse in next batch</td>
</tr>
<tr>
<td>7</td>
<td>Spent Solvent</td>
<td>Mfg Process**</td>
<td>20.2</td>
<td>540.0</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to CETP</td>
</tr>
<tr>
<td>8</td>
<td>Spent HCl</td>
<td>Scrubbing system</td>
<td>SC-II-B15</td>
<td>54.0</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to CETP</td>
</tr>
</tbody>
</table>

**Please refer below tables for worst case scenario calculations for hazardous wastes;**

<table>
<thead>
<tr>
<th>Name of Waste</th>
<th>Product No.</th>
<th>Generation during production of</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Waste</td>
<td></td>
<td></td>
<td>Kg/Month MT/Annum</td>
</tr>
<tr>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td>250.0</td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>Nandrolone Deconoate</td>
<td>230.8</td>
<td></td>
</tr>
<tr>
<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
<td>250.0</td>
<td></td>
</tr>
<tr>
<td>H7</td>
<td>Testosterone Acetate</td>
<td>260.9</td>
<td>3.13</td>
</tr>
<tr>
<td>H8</td>
<td>Testosterone Deconoate</td>
<td>54.5</td>
<td></td>
</tr>
<tr>
<td>H9</td>
<td>Estradiol Benzoate</td>
<td>33.6</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td></td>
<td>260.9</td>
<td>3.13</td>
</tr>
</tbody>
</table>

| Spent Carbon  |                                  |                                 | Kg/Month MT/Annum |
| H1            | Hydroxy Progesterone Caproate    | 50.0                           |            |
| H2            | Nandrolone Deconoate             | 230.8                          |            |
| H3            | Nandrolone Phenyl Propionate    | 250.0                          |            |
| H5            | Medroxy Progesterone Acetate    | 54.5                           |            |
| H6            | Progesterone                    | 75.0                           |            |
| H7            | Testosterone Acetate            | 260.9                          | 3.13       |
| H8            | Testosterone Deconoate          | 24.7                           |            |
| H9            | Estradiol Benzoate              | 33.6                           |            |
| H10           | Estradiol Valerate              | 50.0                           |            |
| Maximum       |                                  | 260.9                          | 3.13       |

<table>
<thead>
<tr>
<th>Distillation residue</th>
<th></th>
<th></th>
<th>Kg/Month MT/Annum</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td>2.5</td>
<td>0.06</td>
</tr>
<tr>
<td>H2</td>
<td>Nandrolone Deconoate</td>
<td>1.4</td>
<td>0.04</td>
</tr>
<tr>
<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
<td>2.0</td>
<td>0.16</td>
</tr>
<tr>
<td>H4</td>
<td>Mifepristone</td>
<td>3.0</td>
<td>0.09</td>
</tr>
<tr>
<td>H5</td>
<td>Medroxy Progesterone Acetate</td>
<td>2.2</td>
<td>0.12</td>
</tr>
<tr>
<td>H6</td>
<td>Progesterone</td>
<td>6.8</td>
<td>0.50</td>
</tr>
<tr>
<td>H7</td>
<td>Testosterone Acetate</td>
<td>1.6</td>
<td>0.11</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>4.3</td>
</tr>
</tbody>
</table>
### Project Description

#### Name of Waste | Product No. | Generation during production | Generation
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Kg/Month</td>
<td>MT/Annum</td>
</tr>
</tbody>
</table>

#### Solvents

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Solvent</th>
<th>Product No.</th>
<th>Used in production of</th>
<th>Quantity (Kg/Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fresh</td>
<td>Recovered</td>
</tr>
<tr>
<td>1</td>
<td>Methylene Dichloride</td>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td>213.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
<td>166.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H4</td>
<td>Mifepristone</td>
<td>299.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H6</td>
<td>Progesterone</td>
<td>399.0</td>
</tr>
<tr>
<td></td>
<td><strong>Hormones</strong></td>
<td></td>
<td><strong>Maximum</strong></td>
<td>399.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S1</td>
<td>Betamethasone Dipropionate</td>
<td>120.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3</td>
<td>Beta Methasone Valerate</td>
<td>160.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S6</td>
<td>Clobetasone Butyrate</td>
<td>65.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S7</td>
<td>Clobetasone Propionate</td>
<td>81.8</td>
</tr>
<tr>
<td></td>
<td><strong>Steroids</strong></td>
<td></td>
<td><strong>Maximum</strong></td>
<td>160.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>559.0</td>
</tr>
<tr>
<td>2</td>
<td>Di Iso Propyl ethar (DIPE)</td>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td>65.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H7</td>
<td>Testosterone Acetate</td>
<td>68.3</td>
</tr>
<tr>
<td></td>
<td><strong>Hormones</strong></td>
<td></td>
<td><strong>Maximum</strong></td>
<td>68.3</td>
</tr>
<tr>
<td>3</td>
<td>Acetone</td>
<td>H2</td>
<td>Nandrolone Deconate</td>
<td>90.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H7</td>
<td>Testosterone Acetate</td>
<td>102.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H9</td>
<td>Estradiol Benzoate</td>
<td>68.2</td>
</tr>
<tr>
<td></td>
<td><strong>Hormones</strong></td>
<td></td>
<td><strong>Maximum</strong></td>
<td>102.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S1</td>
<td>Betamethasone Dipropionate</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S2</td>
<td>Betamethasone Sodium Phosphate</td>
<td>69.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3</td>
<td>Beta Methasone Valerate</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S4</td>
<td>Beclomethasone Dipropionate</td>
<td>43.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5</td>
<td>Deflazacort</td>
<td>100.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S6</td>
<td>Clobetasone Butyrate</td>
<td>49.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S7</td>
<td>Clobetasone Propionate</td>
<td>54.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S8</td>
<td>Mometasone Furoate</td>
<td>90.0</td>
</tr>
<tr>
<td></td>
<td><strong>Steroids</strong></td>
<td></td>
<td><strong>Maximum</strong></td>
<td>100.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V1</td>
<td>Methyl Cobalalmine</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>214.1</td>
</tr>
</tbody>
</table>
2.10.4 Details of Solvent Recovery

Some solvents will be used in manufacturing process like Acetone, Methylene Dichloride etc. Recovery of solvent and end use of recovered solvent are given in below table:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Solvent</th>
<th>Consumption (Kg)</th>
<th>Recovery (Kg)</th>
<th>% Recovery</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methylene Dichloride</td>
<td>559.0</td>
<td>8528.3</td>
<td>93.8</td>
<td>Used in next batch</td>
</tr>
<tr>
<td>2</td>
<td>Di iso Propyl ether (DIPE)</td>
<td>68.3</td>
<td>748.2</td>
<td>91.6</td>
<td>Used in next batch</td>
</tr>
</tbody>
</table>
### Chapter-2: Project Description

#### Sr. No. | Name of Solvent          | Consumption (Kg) | Recovery (Kg) | % Recovery | Remark                      
----------|--------------------------|-----------------|--------------|------------|-----------------------------
3         | Acetone                  | 214.1           | 4785.7       | 95.7       | Used in next batch          
4         | n-pentane                | 82.6            | 1570.1       | 95.0       | Used in next batch          
5         | Chloroform               | 291.5           | 5166.6       | 94.7       | Used in next batch          
6         | Acetonitrile             | 146.3           | 2778.8       | 95.0       | Used in next batch          
7         | n-Hexane                 | 66.0            | 1579.0       | 96.0       | Used in next batch          
8         | Pyridine                 | 72.0            | 1728.0       | 96.0       | Used in next batch          
9         | Methanol                 | 288.5           | 6035.7       | 95.4       | Used in next batch          
10        | Iso Propyl Alcohol       | 240.0           | 6960.0       | 96.7       | Used in next batch          
11        | Methyl Ethyl Ketone (MEK)| 65.5            | 1570.9       | 96.0       | Used in next batch          
12        | Tetrahydrofuran          | 114.7           | 2659.7       | 95.9       | Used in next batch          
13        | Ethyl Acetate            | 19.7            | 628.3        | 97.0       | Used in next batch          

The recovery of solvent will be carried out in a dedicated distillation through condenser having heat exchanger. Recovered solvent will be reused in respective process. The recovery of solvent will be around 95%. The schematic diagram for solvent recovery system is given below;

![Fig: 2.7 Recovery of solvent plant](image)

### 2.11 SAFETY & OCCUPATIONAL MEASURE FOR STORAGE & HANDLING OF THE RAW MATERIAL & PRODUCT

To prevent any spillage, accident and impacts of human health following safety measure will be taken while handling the raw material and products.

#### 2.11.1 Storage & Handling of Hazardous Chemicals

- Company will do planning to stock all the necessary material as minimum as possible.
- All containers with hazardous chemicals will have labels indicating the contents and warning of the hazard.
- Necessary information on safe handling and first aid measures and antidotes
Rapid Environmental Impact Assessment Report  
Proposed Synthetic organic chemicals

Sanjivani Pharma  
GIDC Dahej - II  
Ta.: Vagra, Dist.: Bharuch

of major hazardous material will be available on the label.
- Workers dealing with hazardous chemicals will be trained on health risks and safe handling.
- Exposure to hazardous chemicals will be minimized.
- Liquid Hazardous chemicals will be transferred in closed piping system.
- Separate storage section will be provided for storage of hazardous and non-hazardous raw materials.

2.11.2 Vessel and other Equipment related
- Checking of process vessels and equipment will be carried out regularly.
- Records related to maintenance and its planning schedule will be maintained.

2.11.3 Fire related
- Fire extinguishers are provided at all prominent places in the plant. Contact numbers of nearest fire fighting station is provided.
- Sprinkler system will be provided over hazardous chemical storage area.

2.11.4 Electrical related
- All electrical fitting and motors in the storage areas are flame proof.
- Checking of all earthing, wiring & connection are carried out regularly.
- Proper earthing is provided at all equipments and will be provided for additional equipment.
- Adequate Nos. of earth pits is provided.

2.11.5 Safety related
- Adequate types of personal protective equipment will be provided and also safety training will be provided to workers.
- Emergency showers and eye wash stations will be provided at work place.
- Arrangement for 24 hr. medical facilities by contact with nearest health care centre/ hospital.
- Pre-employment medical check-up and annual medical check-up will be carried out and its records will be maintained properly.
- Safety audit will be carried out regularly.

2.11.6 Noise level and control system
Extensive oiling and lubrication and preventive maintenance shall be carried out to reduce noise generation at source to the permissible limit. However, at place where noise level can exceed the permissible limit, Earplugs and Earmuffs are provided to those working in such area.

2.12 CONTROL OF FUGITIVE EMISSION:
- Airborne dust at all transfers operations/ points will be controlled either by spraying water or providing enclosures.
- Care will be taken to store construction material properly to prevent fugitive
emissions, if any.

- Raw materials loading and unloading will be done in covered area.
- Regular maintenance of valves, pumps, flanges, joints and other equipment will be done to prevent leakages and thus minimizing the fugitive emissions of VOCs.
- Entire process will be carried out in the closed reactors with proper maintenance of pressure and temperature.
- Periodic monitoring of work area will be carried out to check the fugitive emission.
- Breather valves will be provided on solvent tanks.
- To eliminate chances of leakages from glands of pumps, mechanical seal will be provided at all solvent pumps.
- Minimum number of flanges, joints and valves in pipelines.
- Adequate ventilation will be provided.
- Periodic monitoring of work area will be carried out to check the fugitive emission.
- Raw materials will be stored in storage area on pallets on PCC flooring. Hazardous chemicals will be stored in isolated storage area.
- Pucca flooring will be provided on the inner roads of the factory to control SPM concentration in ambient air.
- The unit has already developed Green Belt in the industrial premises.

2.13 DETAILS OF SURROUNDING INDUSTRIES:

Proposed site is located in GIDC Dahej having many different scale companies. However, below are some surrounding working units.

**Table 2.14: Details of Surrounding Industries**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Industry</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mehta Petro Refineries</td>
<td>Refineries Unit</td>
</tr>
<tr>
<td>2</td>
<td>Shree chem</td>
<td>Chemical Unit</td>
</tr>
<tr>
<td>3</td>
<td>Merino Industries limited</td>
<td>Laminates Unit</td>
</tr>
<tr>
<td>4</td>
<td>Majdha Industries</td>
<td>Chemical Unit</td>
</tr>
<tr>
<td>5</td>
<td>Vedant Chloro Chem</td>
<td>Chemical Unit</td>
</tr>
<tr>
<td>6</td>
<td>Payal Polyplast Pvt Ltd</td>
<td>Plasticizers Unit</td>
</tr>
<tr>
<td>7</td>
<td>Meghmani Organic Ltd.</td>
<td>Chemical Unit</td>
</tr>
</tbody>
</table>
CHAPTER – 3  DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

The baseline environmental qualities of various environmental components like air, noise, water, land, flora and fauna and socio-economic form an important and integral part of any environmental study. The baseline data forms the basis for predicting/assessing the environmental impacts of the proposed project. The baseline environmental quality is assessed through field surveys within the impact zone as well as secondary data for various components of the environment, viz. air, noise, water and land and socio-economic.

The proposed project is located at Plot No.: D-2-CH-102, GIDC Dahej-II and Taluka: Vagra, District: Bharuch, Gujarat. The coordinates of the site is 21.43’39.51”° N, 72.37’19.06”° E at an altitude of 7 Meter above MSL.

The present report presents the data collected during the sampling period of three months from October 2018 to December 2018. Various environmental components were monitored and samples were analyzed.

The baseline quality of various components of the environment, viz. air, noise, water, and land, biology, meteorological and socio-economic is assessed within the impact zone of about 10 km around the proposed site. Secondary data has also been incorporated from authentic sources viz. Government/Non-Governmental Agencies, Universities, Indian Meteorological Department (IMD), Ground Water Board etc.

3.2 METHODOLOGY

The methodology for conducting the baseline environmental survey has been obtained from the guidelines provided in the “EIA Guidance Manual for Synthetic organic chemicals Industry” issued by the Ministry of Environment and Forests (MoEF). Environmental attributes and frequency of monitoring is given in below table:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Attribute</th>
<th>Parameters</th>
<th>No. of Sampling Locations</th>
<th>Frequency of Monitoring / Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Meteorology</td>
<td>Wind speed &amp; direction, temperature, relative humidity, rainfall</td>
<td>1</td>
<td>During season</td>
</tr>
<tr>
<td>2</td>
<td>Ambient air quality</td>
<td>PM$<em>{10}$, PM$</em>{2.5}$, SO$_2$, NO$_x$, VOC, HCl</td>
<td>8</td>
<td>24 hourly samples twice a week.</td>
</tr>
<tr>
<td>3</td>
<td>Noise levels</td>
<td>Noise levels in dB(A) Leq</td>
<td>8</td>
<td>Once in a season for day time and night time on a working &amp; nonworking day.</td>
</tr>
</tbody>
</table>
### 3.3 HYDRO-GEOLOGY OF THE STUDY AREA

The geology of the area is underlain by recently placed alluvium, brown sand and millolite sand. As per the Geo-Environmental Regions of Gujarat, the study area falls in the Northern Alluvial Plains. The average elevation of the study area is about 7 m above mean sea level. There are no hills or hillocks in the study area.

The entire area of the district is underlain by the basaltic lava flows of upper Cretaceous to lower Eocene age. The shallow alluvial formation of recent age also occurs as narrow stretch along the major rivers flowing in the area.
3.4 GEOLOGY

The entire area comprises of a cover of thick Alluvium with a few sporadic outcrops of Deccan Trap and Limestone towards southern part of the region. The area is almost flat covered by brown sandy and clayey soil and has gentle southerly and south westerly slope. It forms part of cambay basin.
### Formation

<table>
<thead>
<tr>
<th>Formation</th>
<th>Wells Feasible</th>
<th>Depth of Well (m)</th>
<th>Discharge (lpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft Rock Aquifer</td>
<td>Dug Well Tubewell</td>
<td>10-25 50-100</td>
<td>200-300 400-600</td>
</tr>
<tr>
<td>Soft Rock Aquifer</td>
<td>Dug Well Tubewell</td>
<td>15-30 100-200</td>
<td>200-300 600-1200</td>
</tr>
<tr>
<td>Hard Rock Aquifer</td>
<td>Dug Well Borewell</td>
<td>10-25 100-200</td>
<td>60-150 100-300</td>
</tr>
<tr>
<td>Hilly Areas</td>
<td>Not Suitable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saline Area</td>
<td>Not Suitable except localised fresh water pockets</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-monsoon Decadal mean (1993-2006) Depth to Water Level (mgl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoride &gt; Maximum Permissible Limit (1.5 mg/l)</td>
</tr>
<tr>
<td>Over Exploited Taluka</td>
</tr>
<tr>
<td>Drainage</td>
</tr>
</tbody>
</table>

**Figure 3.3: Geological Structure of Gujarat State**
3.5 TOPOGRAPHY

The topography of the project site and the study area of 10.0 km radial zone are almost sea area cover. The average elevation of the study area is about 7 m above mean sea level. There are no hills or hillocks in the study area.

Figure 3.4: Topo map of Project Site covering 10 Km radius
3.6 LAND USE

The basic purpose of land use pattern and classification in an EIA study is to identify the manner in which different parts of land in an area are being utilized or not utilized. Remote sensing data provides reliable accurate baseline information for land use mapping, as it is a rapid method of acquiring up-to-date information of over a large geological area.

A systematic digital image interpretation approach was used to delineate the land use classes. The present study was focused on demarcating boundaries of different land use/land cover units from an analysis of different types of color registrations of land use/land cover units from satellite imagery. Data Used in the land use map preparation is the satellite Imagery of Indian Remote Sensing Satellite (IRS- ID , sensor P6, LISS III) of 24 m resolution.

**Table 3.2: Land use Distribution of the study area**

<table>
<thead>
<tr>
<th>Description</th>
<th>Area Ha.</th>
<th>% Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>River</td>
<td>3896.19</td>
<td>12.40%</td>
</tr>
<tr>
<td>Mangrove</td>
<td>765.98</td>
<td>2.44%</td>
</tr>
<tr>
<td>Open Forest</td>
<td>416.34</td>
<td>1.33%</td>
</tr>
<tr>
<td>Settlement</td>
<td>485.33</td>
<td>1.54%</td>
</tr>
<tr>
<td>Land with Scrub</td>
<td>5402.31</td>
<td>17.20%</td>
</tr>
<tr>
<td>Fallow Land</td>
<td>1909.28</td>
<td>6.08%</td>
</tr>
<tr>
<td>Industry</td>
<td>3550.43</td>
<td>11.30%</td>
</tr>
<tr>
<td>Salt Affected Land</td>
<td>1344.34</td>
<td>4.28%</td>
</tr>
<tr>
<td>Salt Pan</td>
<td>4810.16</td>
<td>15.31%</td>
</tr>
<tr>
<td>Crop Land</td>
<td>6395.50</td>
<td>20.36%</td>
</tr>
<tr>
<td>Built up Land</td>
<td>196.79</td>
<td>0.63%</td>
</tr>
<tr>
<td>Lake/Reservoir/Pond</td>
<td>128.00</td>
<td>0.41%</td>
</tr>
<tr>
<td>Marshy/Swampy Land</td>
<td>2114.87</td>
<td>6.73%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31415.51</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The land use land cover has been prepared for study area of 10 km radius comprising 31415.51 ha. From the above table, crop land is (6395.50 ha) and open scrub with land is (5402.31 ha), Lake/Reservoir/Pond of (128.0 ha), settlement (485.33 ha), industry (3550.43 ha), Fallow Land (1909.28 ha). Land Use Distribution of the Study Area (10 km Radius)
Figure 3.5: Land Use Distribution of the study area (10 Km Radius)
3.7 SEISMICITY OF THE STUDY AREA

Study area falls in Zone III in seismic zoning map of India, which is classified as moderate damage risk zone (Institute of Seismological Research (ISR), govt.) of Gujarat. The seismic study shown in Figure 3.5.

*Figure 3.6: Seismic Zones of Gujarat*

3.8 CLIMATE OF THE REGION

The climate of the region is classified as tropical dry climate as per Koppel Climate classification, with following four main seasons:

- Winter season: December to February
- Summer/Pre-monsoon season: March to May
- Monsoon season: June to September
- Post monsoon season: October to November

3.8.1 Site Specific Meteorology

Site specific climatic condition refers to average weather comprising of temperature, relative humidity, wind speed, rainfall, cloud cover etc. This determines the baseline conditions and probable impacts on environmental parameters with respect to the Project. The site specific climatic conditions are given below in the below table.

*Table 3.3: Site Specific Climatic Conditions*

<table>
<thead>
<tr>
<th>Month</th>
<th>--</th>
<th>Temp °C</th>
<th>Relative Humidity %</th>
<th>Wind Speed km/hr</th>
<th>Rainfall mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct, 18</td>
<td>Min</td>
<td>18.79</td>
<td>36.12</td>
<td>0.02</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>39.27</td>
<td>94.64</td>
<td>7.93</td>
<td>0.02</td>
</tr>
<tr>
<td>Nov, 18</td>
<td>Min</td>
<td>16.39</td>
<td>39.95</td>
<td>0.72</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>39.56</td>
<td>89.46</td>
<td>7.63</td>
<td>0.02</td>
</tr>
<tr>
<td>Dec, 18</td>
<td>Min</td>
<td>16.06</td>
<td>28.26</td>
<td>0.0</td>
<td>6.95</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>32.46</td>
<td>85</td>
<td>6.95</td>
<td>0.02</td>
</tr>
</tbody>
</table>
The maximum temperature is in the month of October (39.27°C) and minimum temperature is in the month of December (16.06°C).

The Maximum Relative Humidity is in the month of October (94.64%) and minimum is also in the month of November (28.26%).

### 3.8.2 Wind Rose

It can be observed that in the study period, wind blows mostly from NE direction to SW direction. Average wind speed is 1.99 m/s. Wind rose diagram during study period is shown in below figure:

**Figure 3.7: Wind Rose**
3.9 AMBIENT AIR QUALITY

Reconnaissance
The quality of ambient air depends upon the background concentrations of specific contaminants, the emission sources and meteorological conditions. The study on baseline ambient air quality status in the project area is an essential and primary requirement for assessing the impacts on air environment due to any proposed developmental activity.

The baseline studies on air environment include identification of specific air pollution parameters expected to have significant impacts and assessing their existing levels in ambient air within the impact zone. To assess the baseline status of ambient air quality in the study area monitoring is undertaken to ascertain the baseline pollutant concentrations in ambient air.

Methodology for air Monitoring:
AAQM was carried out and AAQM locations were monitored on 24 hourly average bases twice in a week as per guidelines of CPCB and NAAQS. The conventional and project specific parameters such as particulate matter PM$_{10}$ & PM$_{2.5}$, SO$_2$, NOx, VOCs, HC, etc. were monitored.

Selection of Stations for Sampling:
For EIA/ EMP, the purpose is to ascertain the baseline pollutant concentrations in ambient air. Accordingly, the criterion can be selected to ascertain quality of air on human settlements or environmentally sensitive areas if any located in the 10 km radius study area.

The locations for AAQM study were selected within the 10 km radius of the proposed plant installation. Ambient air quality was monitored on 8 locations to generate representative ambient air quality data. The sampling locations are shown in Figure 3.8 and listed in Table 3.4.
Table 3.4: Ambient Air Quality Monitoring Locations

<table>
<thead>
<tr>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance (km) &amp; Direction from site</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAQ-1</td>
<td>Project Site</td>
<td>-</td>
<td>21.727643°, 72.621961°</td>
</tr>
<tr>
<td>AAQ-2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>21.730380°, 72.633364°</td>
</tr>
<tr>
<td>AAQ-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>21.752790°, 72.643988°</td>
</tr>
<tr>
<td>AAQ-4</td>
<td>Panladara</td>
<td>7.94, NNE</td>
<td>21.799577°, 72.635975°</td>
</tr>
<tr>
<td>AAQ-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>21.713240°, 72.581973°</td>
</tr>
<tr>
<td>AAQ-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>23.331782°, 72.365852°</td>
</tr>
<tr>
<td>AAQ-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>21.673330°, 72.554134°</td>
</tr>
<tr>
<td>AAQ-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>21.688085°, 72.655569°</td>
</tr>
</tbody>
</table>
**Table 3.5: Ambient Air Quality Monitoring For PM$_{10}$ at Various Site Locations**

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum, µg/m$^3$</td>
<td>75.38</td>
<td>75.06</td>
<td>70.21</td>
<td>67.95</td>
<td>77.94</td>
<td>76.09</td>
<td>75.91</td>
<td>72.51</td>
</tr>
<tr>
<td>Maximum, µg/m$^3$</td>
<td>82.84</td>
<td>80.32</td>
<td>74.81</td>
<td>73.69</td>
<td>87.98</td>
<td>85.81</td>
<td>84.16</td>
<td>78.84</td>
</tr>
<tr>
<td>Average, µg/m$^3$</td>
<td>78.94</td>
<td>77.79</td>
<td>73.14</td>
<td>71.45</td>
<td>84.85</td>
<td>81.02</td>
<td>80.88</td>
<td>75.38</td>
</tr>
<tr>
<td>98$^{th}$ Percentile</td>
<td>82.35</td>
<td>80.23</td>
<td>74.79</td>
<td>73.61</td>
<td>87.82</td>
<td>85.73</td>
<td>84</td>
<td>78.83</td>
</tr>
</tbody>
</table>

Source: Primary Data Collection and analysis during study period by Laboratory

**Observation and Discussion:**

As shown in the Table PM$_{10}$ levels were ranging from 67.95 to 87.98 µg/m$^3$. The highest PM$_{10}$ level was found at Dahej and lowest PM$_{10}$ level were observed at Paniadara. PM$_{10}$ concentration was within the NAAQS level (i.e.100 µg/m$^3$) at all locations.

**Table 3.6: Ambient Air Quality Monitoring For PM$_{2.5}$ at Various Site Locations**

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum, µg/m$^3$</td>
<td>44.37</td>
<td>41.23</td>
<td>41.12</td>
<td>39.28</td>
<td>45.89</td>
<td>44.33</td>
<td>43.54</td>
<td>40.27</td>
</tr>
<tr>
<td>Maximum, µg/m$^3$</td>
<td>48.73</td>
<td>47.43</td>
<td>45.63</td>
<td>45.74</td>
<td>59.13</td>
<td>49.94</td>
<td>48.16</td>
<td>45.91</td>
</tr>
<tr>
<td>Average, µg/m$^3$</td>
<td>46.44</td>
<td>44.48</td>
<td>43.30</td>
<td>42.34</td>
<td>48.75</td>
<td>47.25</td>
<td>46.46</td>
<td>43.72</td>
</tr>
<tr>
<td>98$^{th}$ Percentile</td>
<td>48.67</td>
<td>47.34</td>
<td>45.58</td>
<td>45.17</td>
<td>54.92</td>
<td>49.91</td>
<td>48.14</td>
<td>46.21</td>
</tr>
</tbody>
</table>

**Observation and Discussion:**

As shown in the Table PM$_{2.5}$ levels were ranging from 39.28 to 59.13 µg/m$^3$. The highest PM$_{2.5}$ level was found at Dahej and lowest PM$_{2.5}$ level was observed at Paniadara. PM$_{2.5}$ concentration was found within the NAAQS level (i.e.60 µg/m$^3$) at all the locations.

**Table 3.7: Ambient Air Quality Monitoring For SO$_2$ at Various Site Locations**

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum, µg/m$^3$</td>
<td>11.66</td>
<td>12.58</td>
<td>10.59</td>
<td>9.49</td>
<td>12.66</td>
<td>11.47</td>
<td>12.02</td>
<td>11.78</td>
</tr>
<tr>
<td>Maximum, µg/m$^3$</td>
<td>15.88</td>
<td>15.86</td>
<td>14.11</td>
<td>13.85</td>
<td>16.91</td>
<td>14.91</td>
<td>14.37</td>
<td>15.63</td>
</tr>
<tr>
<td>Average, µg/m$^3$</td>
<td>13.50</td>
<td>14.46</td>
<td>12.58</td>
<td>11.98</td>
<td>15.02</td>
<td>13.44</td>
<td>12.99</td>
<td>13.41</td>
</tr>
<tr>
<td>98$^{th}$ Percentile</td>
<td>15.67</td>
<td>15.84</td>
<td>14</td>
<td>13.73</td>
<td>16.83</td>
<td>14.89</td>
<td>14.86</td>
<td>15.51</td>
</tr>
</tbody>
</table>

**Observation and Discussion:**

As shown in the Table SO$_2$ levels were ranging from 11.47 to 16.91 µg/m$^3$. The highest SO$_2$ level was found at Dahej and lowest SO$_2$ level was observed at Luvara. The SO$_2$ level in all the monitoring locations is within permissible limit i.e. NAAQS level 80µg/m$^3$. 

---

Chapter-3: Project Description 3.12
Table 3.8: Ambient Air Quality Monitoring For NO\textsubscript{x} at Various Site Locations

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum, (\mu g/m^3)</td>
<td>13.39</td>
<td>14.05</td>
<td>12.42</td>
<td>11.29</td>
<td>14.98</td>
<td>13.59</td>
<td>13.32</td>
<td>13.35</td>
</tr>
<tr>
<td>Maximum, (\mu g/m^3)</td>
<td>16.62</td>
<td>17.94</td>
<td>15.96</td>
<td>15.88</td>
<td>17.98</td>
<td>17.95</td>
<td>15.73</td>
<td>17.59</td>
</tr>
<tr>
<td>Average, (\mu g/m^3)</td>
<td>15.19</td>
<td>16.04</td>
<td>14.42</td>
<td>13.99</td>
<td>16.90</td>
<td>15.66</td>
<td>15.10</td>
<td>15.53</td>
</tr>
<tr>
<td>98\textsuperscript{th} Percentile</td>
<td>16.64</td>
<td>17.87</td>
<td>15.88</td>
<td>15.81</td>
<td>17.94</td>
<td>17.70</td>
<td>16.3</td>
<td>17.53</td>
</tr>
</tbody>
</table>

Observation and Discussion:
As shown in the Table NO\textsubscript{x} levels were found ranging from 11.29 to 17.98 \(\mu g/m^3\). The highest NO\textsubscript{x} level was found at Dahej and lowest NO\textsubscript{x} level were observed at Paniadara. The NO\textsubscript{x} level in all monitoring locations was under permissible limit i.e. NAAQS level 80 \(\mu g/m^3\).

Table 3.9: Ambient Air Quality Monitoring For HCl at Various Site Locations

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result, (\mu g/m^3)</td>
<td>1.8</td>
<td>1.5</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>1.2</td>
<td>1.5</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
</tr>
</tbody>
</table>

Observation and Discussion:
HCl levels were found ranging from <1.0 (BDL) to 1.8 \(\mu g/m^3\).

Table 3.10: Ambient Air Quality Monitoring For VOCs at Various Site Locations

<table>
<thead>
<tr>
<th>Locations of Sampling</th>
<th>AAQ1</th>
<th>AAQ2</th>
<th>AAQ3</th>
<th>AAQ4</th>
<th>AAQ5</th>
<th>AAQ6</th>
<th>AAQ7</th>
<th>AAQ8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum, ppm</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Maximum, ppm</td>
<td>1.1</td>
<td>0.6</td>
<td>0.5</td>
<td>0.3</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Standard, ppm</td>
<td>0.7</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
<td>0.6</td>
<td>0.5</td>
<td>0.6</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Observation and Discussion:
VOCs levels were found ranging from 0.1 to 1.1 ppm.

Table 3.11: National Ambient Air Quality Standards and Methods of Measurement

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Pollutants</th>
<th>Time Weighted Average</th>
<th>National Ambient Air Quality Standards (NAAQS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Industrial, Residential, Rural and other area</td>
</tr>
<tr>
<td>1</td>
<td>SO\textsubscript{2} ((\mu g/m^3))</td>
<td>Annual 24 hours</td>
<td>50 80</td>
</tr>
<tr>
<td>2</td>
<td>NO\textsubscript{x} ((\mu g/m^3))</td>
<td>Annual 24 hours</td>
<td>40 80</td>
</tr>
</tbody>
</table>
### National Ambient Air Quality Standards (NAAQS)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Pollutants</th>
<th>Time Weighted Average</th>
<th>Industrial, Residential, Rural and other area</th>
<th>Ecologically Sensitive Area</th>
<th>Methods of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>PM$_{10}$ (µg/m$^3$)</td>
<td>Annual 24 hours</td>
<td>60</td>
<td>60</td>
<td>-Gravimetric -TEOM -Beta attenuation</td>
</tr>
<tr>
<td>4</td>
<td>PM$_{2.5}$ (µg/m$^3$)</td>
<td>Annual 24 hours</td>
<td>40</td>
<td>40</td>
<td>-Gravimetric -TEOM -Beta attenuation</td>
</tr>
<tr>
<td>5</td>
<td>CO (mg/m$^3$)</td>
<td>8 hours 1 hours</td>
<td>2</td>
<td>2</td>
<td>-Non dispersive Infrared (NDIR) Spectroscopy</td>
</tr>
<tr>
<td>6</td>
<td>Ammonia (µg/m$^3$)</td>
<td>Annual 24 hours</td>
<td>100 400</td>
<td>100 400</td>
<td>-Chemiluminescence -Indophenol method</td>
</tr>
<tr>
<td>7</td>
<td>Ozone (µg/m$^3$)</td>
<td>8 hours 1 hours</td>
<td>100 180</td>
<td>100 180</td>
<td>-UV Photometric -Chemiluminescence -Chemical Method</td>
</tr>
<tr>
<td>8</td>
<td>Lead (µg/m$^3$)</td>
<td>Annual 24 hours</td>
<td>0.5 1.0</td>
<td>0.5 1.0</td>
<td>-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper -ED-XRF using Teflon filter</td>
</tr>
<tr>
<td>9</td>
<td>Arsenic (mg/m$^3$)</td>
<td>Annual</td>
<td>6.0</td>
<td>6.0</td>
<td>-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper</td>
</tr>
<tr>
<td>10</td>
<td>Nickel (mg/m$^3$)</td>
<td>Annual</td>
<td>20.0</td>
<td>20.0</td>
<td>-AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper</td>
</tr>
<tr>
<td>11</td>
<td>Benzene (µg/m$^3$)</td>
<td>Annual</td>
<td>5.0</td>
<td>5.0</td>
<td>-Gas Chromatography (GC) based continuous analyzer -Adsorption and desorption followed by GC analysis</td>
</tr>
<tr>
<td>12</td>
<td>Benzopyrene (mg/m$^3$)</td>
<td>Annual</td>
<td>1.0</td>
<td>1.0</td>
<td>-Solvent extraction followed by HPLC/GC analysis</td>
</tr>
</tbody>
</table>

### 3.10 NOISE ENVIRONMENT

Noise can be defined as an unwanted sound. It interferes with speech and hearing. If intense enough, it can damage hearing, or is otherwise irritating. Noise can also disturb natural wildlife and ecological system.

**Reconnaissance**

In order to measure the existing noise sources and to identify the background noise levels, the noise pollution survey around the proposed site was carried out.

**Methodology for Noise Monitoring**

Noise standards have been designated as per the Noise Pollution (Regulation & Control) Rules, 2000 Notified by Ministry of Environment and Forests, New Delhi, February 14, 2000. The ambient noise standards are presented in Equivalent noise levels (Leq). The measurements were carried out at each monitoring location during day time and night time. Noise survey was conducted using Sound Level Meter.
Noise Monitoring Locations
A total of 8 locations were identified for ambient noise monitoring in the study area. The noise monitoring locations are given in below table.

**Table 3.12: Ambient Noise Quality Monitoring Locations**

<table>
<thead>
<tr>
<th>Location Code</th>
<th>Name of Location</th>
<th>Category</th>
<th>Distance &amp; Direction from site</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1</td>
<td>Project Site</td>
<td>Industrial</td>
<td>--</td>
<td>21.727673°,72.621961°</td>
</tr>
<tr>
<td>N-2</td>
<td>Vadadla</td>
<td>Residential</td>
<td>1.04, ENE</td>
<td>21.730380°,72.633364°</td>
</tr>
<tr>
<td>N-3</td>
<td>Vav</td>
<td>Residential</td>
<td>3.29, NNE</td>
<td>21.752790°,72.643988°</td>
</tr>
<tr>
<td>N-4</td>
<td>Paniadara</td>
<td>Residential</td>
<td>7.94, NNE</td>
<td>21.799577°,72.635975°</td>
</tr>
<tr>
<td>N-5</td>
<td>Dahej</td>
<td>Residential</td>
<td>3.97, WSW</td>
<td>21.713240°,72.581973°</td>
</tr>
<tr>
<td>N-6</td>
<td>Luvara</td>
<td>Residential</td>
<td>8.95, WSW</td>
<td>23.331782°,72.365852°</td>
</tr>
<tr>
<td>N-7</td>
<td>Ambetha</td>
<td>Residential</td>
<td>5.30, SW</td>
<td>21.673330°,72.554134°</td>
</tr>
<tr>
<td>N-8</td>
<td>Suva</td>
<td>Residential</td>
<td>5.31, SSE</td>
<td>21.688085°,72.655569°</td>
</tr>
</tbody>
</table>
Table 3.13: Ambient Noise Quality in the Study Area

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Location name</th>
<th>Working Days</th>
<th>Non-Working Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Day Time db(A)</td>
<td>Night Time db(A)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Project Site</td>
<td></td>
<td>63.5</td>
<td>65.1</td>
</tr>
<tr>
<td>Residential area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Vadadla</td>
<td>48.3</td>
<td>51.6</td>
</tr>
<tr>
<td>2</td>
<td>Vav</td>
<td>50.4</td>
<td>53.5</td>
</tr>
<tr>
<td>3</td>
<td>Paniadara</td>
<td>50.5</td>
<td>52.0</td>
</tr>
<tr>
<td>4</td>
<td>Dahej</td>
<td>49.1</td>
<td>51.3</td>
</tr>
<tr>
<td>5</td>
<td>Luvara</td>
<td>51.7</td>
<td>54.4</td>
</tr>
<tr>
<td>6</td>
<td>Ambetha</td>
<td>50.2</td>
<td>53.9</td>
</tr>
<tr>
<td>7</td>
<td>Suva</td>
<td>51.6</td>
<td>54.6</td>
</tr>
<tr>
<td>Commercial area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Nr. Dahej SEZ-1</td>
<td>61.2</td>
<td>64.1</td>
</tr>
<tr>
<td>2</td>
<td>Nr. Vadadla Chowkadi</td>
<td>59.6</td>
<td>62.4</td>
</tr>
<tr>
<td>3</td>
<td>Nr. Ambetha by Pass Road</td>
<td>58.8</td>
<td>61.5</td>
</tr>
<tr>
<td>4</td>
<td>Nr. Dahej By Pass</td>
<td>61.2</td>
<td>63.4</td>
</tr>
<tr>
<td>5</td>
<td>Nr. Luvara By Pass Road</td>
<td>58.9</td>
<td>60.6</td>
</tr>
<tr>
<td>6</td>
<td>Nr. Dahej SEZ-2</td>
<td>59.0</td>
<td>62.5</td>
</tr>
<tr>
<td>7</td>
<td>Nr. Vav Chowkadi</td>
<td>56.5</td>
<td>60.1</td>
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Table 3.14: Noise Standards

<table>
<thead>
<tr>
<th>Area Code</th>
<th>Category of Area</th>
<th>Limit in dB (A) Leq</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Day Time</td>
</tr>
<tr>
<td>A</td>
<td>Industrial area</td>
<td>75</td>
</tr>
<tr>
<td>B</td>
<td>Commercial area</td>
<td>65</td>
</tr>
<tr>
<td>C</td>
<td>Residential area</td>
<td>55</td>
</tr>
<tr>
<td>D</td>
<td>Silence zone</td>
<td>50</td>
</tr>
</tbody>
</table>

Ambient Air Quality Standards in respect of Noise is notified under Noise Pollution (Regulation and Control) Rules, 2000

- **Note 1** Day time is reckoned in between 6 am and 10 pm.
- **Note 2** Night time reckoned in between 10 pm and 6 am.
- **Note 3** Silence zone is defined as areas up to 10 meters around such premises as hospitals, education, institutions and courts. The silence zones are to be declared by the Component Authority.
- **Note 4** Mixed categories of areas should be declared as one of the four above-mentioned categories by the Component Authority and the corresponding standard shall apply.

Observation on Ambient Noise Quality:

**Working Time**: The noise levels varied in the study area during Working day time from 48.3 dB(A) Leq to 65.1 dB(A) Leq. The working time noise level in the study area is within the noise Limits.
Non-Working Time: The Non-Working day time noise level in the study area is in the range of 48.1 dB (A) Leq to 63.6 dB (A) Leq. The night time noise was also within stipulated standards of CPCB.

3.11 WATER QUALITY

Reconnaissance Survey
Reconnaissance survey has been done for water quality monitoring in the Study Area. The baseline water quality of water in the region is obtained by collecting sample from villages in the area considering the 10 km radius for the baseline study.

Methodology of Monitoring
In order to establish the baseline water quality, water sampling locations were selected based on availability, following standard norms and requirement. Surface water samples were collected from village ponds. From village locality, samples were taken from tap water utilized from drinking purpose. GIDC water sample was collected as the same will be utilized as water source in project.

The samples collected were preserved, stored and analyzed as per standards methods of Analysis of Water and Waste water (APHA, 1995).

Water samples were collected from tap water from 7 village locations, GIDC water for project site, pond water from 7 village locations once during the study period and analyzed for physico-chemical parameters.

### Table 3.15: Water Sampling Locations

<table>
<thead>
<tr>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from site</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Site</td>
<td>-</td>
<td>21.727643°, 72.621961°</td>
</tr>
<tr>
<td>2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>21.730380°, 72.633364°</td>
</tr>
<tr>
<td>3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>21.752790°, 72.643988°</td>
</tr>
<tr>
<td>4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>21.799577°, 72.635975°</td>
</tr>
<tr>
<td>5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>21.713240°, 72.581973°</td>
</tr>
<tr>
<td>6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>23.331782°, 72.365852°</td>
</tr>
<tr>
<td>7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>21.673330°, 72.554134°</td>
</tr>
<tr>
<td>8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>21.688085°, 72.655569°</td>
</tr>
</tbody>
</table>
Figure 3.10: Google Image showing Water Monitoring Locations
### Table 3.16: Water Quality in the Study Area

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Units</th>
<th>TW2 Vadadla</th>
<th>TW3 Vav</th>
<th>TW4 Paniadara</th>
<th>TW5 Dahej</th>
<th>TW6 Luvara</th>
<th>TW7 Ambetha</th>
<th>TW8 Suva</th>
<th>Permissible limits as Per IS 10500:2012</th>
<th>Reference Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>pH</td>
<td>--</td>
<td>7.73</td>
<td>7.85</td>
<td>7.49</td>
<td>7.79</td>
<td>7.31</td>
<td>7.78</td>
<td>7.65</td>
<td>6.5-8.5</td>
<td>IS:3025(P-11):1983</td>
</tr>
<tr>
<td>3.</td>
<td>Salinity</td>
<td>ppt</td>
<td>0.26</td>
<td>0.28</td>
<td>0.37</td>
<td>0.41</td>
<td>1.36</td>
<td>0.81</td>
<td>0.38</td>
<td>-</td>
<td>Electrometric Method (Instrumental) &amp; Operational Manual</td>
</tr>
<tr>
<td>4.</td>
<td>Electrical Conductivity</td>
<td>µS/cm</td>
<td>441.4</td>
<td>478.1</td>
<td>750.8</td>
<td>699.3</td>
<td>497.0</td>
<td>601.4</td>
<td>-</td>
<td>IS:3025(P-14):1984</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Turbidity</td>
<td>NTU</td>
<td>4.4</td>
<td>0.7</td>
<td>0.3</td>
<td>0.7</td>
<td>0.6</td>
<td>0.4</td>
<td>1.1</td>
<td>5</td>
<td>IS:3025(P-10):1984</td>
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<tr>
<td>8.</td>
<td>Total Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>96</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>-</td>
<td>IS:3025(P-17):1984</td>
</tr>
<tr>
<td>10.</td>
<td>Chemical Oxygen Demand (COD)</td>
<td>mg/L</td>
<td>5.12</td>
<td>3.16</td>
<td>4.51</td>
<td>2.16</td>
<td>3.45</td>
<td>2.62</td>
<td>3.16</td>
<td>-</td>
<td>APHA &amp; AWWA.23 Ed.</td>
</tr>
<tr>
<td>11.</td>
<td>Biochemical Oxygen Demand (BOD3 27)</td>
<td>mg/L</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>-</td>
<td>IS:3025(P-44):1993</td>
</tr>
<tr>
<td>12.</td>
<td>Chlorides (as Cl-)</td>
<td>mg/L</td>
<td>20.12</td>
<td>23.69</td>
<td>21.47</td>
<td>61.51</td>
<td>151.35</td>
<td>120.9</td>
<td>46.83</td>
<td>1000</td>
<td>IS:3025(P-32):1988</td>
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<td>13.</td>
<td>Sulphates (as SO4²-)</td>
<td>mg/L</td>
<td>18.83</td>
<td>18.83</td>
<td>22.11</td>
<td>65.38</td>
<td>11.41</td>
<td>14.82</td>
<td>400</td>
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<td></td>
</tr>
<tr>
<td>14.</td>
<td>Total Alkalinity (as CaCO₃)</td>
<td>mg/L</td>
<td>145</td>
<td>140</td>
<td>235</td>
<td>135</td>
<td>140</td>
<td>120</td>
<td>130</td>
<td>600</td>
<td>IS:3025(P-23):1986</td>
</tr>
<tr>
<td>15.</td>
<td>Total Hardness (as CaCO₃)</td>
<td>mg/L</td>
<td>142.52</td>
<td>142.41</td>
<td>209.84</td>
<td>158.61</td>
<td>293.32</td>
<td>133.14</td>
<td>148.75</td>
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<tr>
<td>16.</td>
<td>Calcium Hardness</td>
<td>mg/L</td>
<td>74.22</td>
<td>80.35</td>
<td>122.48</td>
<td>80.32</td>
<td>94.37</td>
<td>83.70</td>
<td>78.31</td>
<td>600</td>
<td>APHA &amp; AWWA.23 Ed. - 3500 Ca-B (3-67)</td>
</tr>
<tr>
<td>17.</td>
<td>Calcium (as Ca)</td>
<td>mg/L</td>
<td>29.72</td>
<td>32.13</td>
<td>49.09</td>
<td>32.13</td>
<td>37.82</td>
<td>33.48</td>
<td>31.32</td>
<td>100</td>
<td>APHA &amp; AWWA.23 Ed. - 3500 Ca-B (3-67)</td>
</tr>
<tr>
<td>18.</td>
<td>Magnesium (as Mg)</td>
<td>mg/L</td>
<td>16.58</td>
<td>15.12</td>
<td>21.47</td>
<td>19.02</td>
<td>48.25</td>
<td>11.99</td>
<td>17.07</td>
<td>100</td>
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<tr>
<td>19.</td>
<td>Sulphide (as S²⁻)</td>
<td>mg/L</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>-</td>
<td>APHA &amp; AWWA.23 Ed. - 4500-S²⁻-F. (4-178)</td>
</tr>
<tr>
<td>20.</td>
<td>Ammonical Nitrogen</td>
<td>mg/L</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>-</td>
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### Chapter-3: Project Description

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<th>S. No.</th>
<th>Parameter (as)</th>
<th>Units</th>
<th>TW2 Vadadla</th>
<th>TW3 Vav</th>
<th>TW4 Paniadara</th>
<th>TW5 Dahej</th>
<th>TW6 Luvara</th>
<th>TW7 Ambetha</th>
<th>TW8 Suva</th>
<th>Permissible limits as Per IS 10500:2012</th>
<th>Reference Method</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(as NH₃-N)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>21.</td>
<td>Copper (as Cu)</td>
<td>mg/L</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>1.5 Ed.4500-S²-F. (4-178)</td>
<td>APHA &amp; AWWA, 23rd Ed.3500-Cu B. (3-74)</td>
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<td>22.</td>
<td>Fluorides (as F⁻)</td>
<td>mg/L</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>1.5 Ed.4500-F-B &amp; D. (4-84,87)</td>
<td>APHA &amp; AWWA, 23rd Ed.3500-S²-F. (4-178)</td>
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<td>23.</td>
<td>Total Iron (as Fe)</td>
<td>mg/L</td>
<td>1.587</td>
<td>0.243</td>
<td>&lt;0.01</td>
<td>0.121</td>
<td>0.151</td>
<td>0.231</td>
<td>0.081</td>
<td>0.3 IS:3025(P-53):2003</td>
<td>IS:3025(P-39):1991</td>
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<td>24.</td>
<td>Phenol (as C₆H₅OH)</td>
<td>mg/L</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.002 Ed.4500-S²-F. (4-178)</td>
<td>APHA &amp; AWWA, 23rd Ed.3500-S²-F. (4-178)</td>
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<td>25.</td>
<td>Oil &amp; Grease</td>
<td>mg/L</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>- IS:3025(P-54):2003</td>
<td>IS:3025(P-39):1991</td>
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<tr>
<td>26.</td>
<td>Hexavalent Chromium (as Cr⁶⁺)</td>
<td>mg/L</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>- APHA &amp; AWWA, 23rd Ed.3500-Cr-B. (3-69)</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Nickel (as Ni)</td>
<td>mg/L</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.02 IS:3025(P-54):2003</td>
<td>IS:3025(P-39):1991</td>
</tr>
<tr>
<td>28.</td>
<td>Phosphorus (as p)</td>
<td>Mg/L</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>- APHA &amp; AWWA, 23rd Ed.4500-P-B.(5)-161&amp;P-E.4-164</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Residual Chlorine</td>
<td>mg/L</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>1 APHA &amp; AWWA, 23rd Ed.4500-C-Cl-B. (4-63)</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Total Chromium (as Cr³⁺)</td>
<td>mg/L</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>0.05 APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Zinc (as Zn)</td>
<td>mg/L</td>
<td>&lt;0.022</td>
<td>0.04</td>
<td>&lt;0.022</td>
<td>0.041</td>
<td>0.022</td>
<td>0.082</td>
<td>0.064</td>
<td>15 APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Lead (as Pb)</td>
<td>mg/L</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>0.01 APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>Sodium (as Na)</td>
<td>mg/L</td>
<td>19.83</td>
<td>14.38</td>
<td>15.35</td>
<td>20.23</td>
<td>246.28</td>
<td>11.82</td>
<td>38.51</td>
<td>- APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Potassium (As K)</td>
<td>mg/L</td>
<td>3.08</td>
<td>3.24</td>
<td>5.41</td>
<td>4.37</td>
<td>9.61</td>
<td>1.93</td>
<td>3.99</td>
<td>- APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>Arsenic (as As)</td>
<td>mg/L</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>0.05 APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Cadmium (as Cd)</td>
<td>mg/L</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.003 APHA &amp; AWWA, 23rd Ed.3111. B-AAS (3-20)</td>
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</table>
Observation on tap water quality:

- All the samples meet the desirable standards (pH ranges from 7.31 to 7.87).
- TDS in samples ranges from 218 mg/L (Vav) to 1018 mg/L (Luvara). All the samples meet the permissible limit of 2000 mg/L.
- Magnesium content in the water ranges from 11.99 mg/L (Ambetha) to 48.25 mg/L (Luvara). All the samples meet the permissible limit of 100 mg/L.
- Sulphates content in the water ranges from 11.41 mg/L (Ambetha) to 65.38 mg/L (Luvara). All the samples meet the permissible limit of 400 mg/L for drinking water.
- Fluorides content in the water ranges from less than <0.05 mg/L. All the samples meet the permissible limit of 1.5 mg/L for drinking water.
- Total alkalinity in the water samples ranges from 120 mg/L (Ambetha) to 235 mg/L (Paniadara). All the samples are within the permissible limit of drinking water (600 mg/L).
- Chlorides range from 20.12 mg/L (Vadadala) to 151.35 mg/L (Luvara), which are below permissible limits (1000 mg/L).
- Heavy metals like Copper, Nickel, Fluorides, Cadmium and Zinc are well below the limit in all samples.

Hence, it can be observed that tap water qualities in terms of various essential and desirable characteristics are found within the limits specified by IS 10500:2012. This water is utilized in villages for domestic activities.
Table 3.17: Surface Water Quality in the Study Area

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Units</th>
<th>SW1 Project site (GIDC)</th>
<th>SW2 Vadadala</th>
<th>SW3 Vav</th>
<th>SW4 Paniadara</th>
<th>SW5 Dahej</th>
<th>SW6 Luvara</th>
<th>SW7 Ambetha</th>
<th>SW8 Suva</th>
<th>Permissible limits as Per IS 10500:2012</th>
<th>Reference Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>pH</td>
<td>---</td>
<td>7.69</td>
<td>7.73</td>
<td>7.85</td>
<td>7.49</td>
<td>7.79</td>
<td>7.31</td>
<td>7.78</td>
<td>7.65</td>
<td>6.5-8.5</td>
<td>IS:3025 (P-11):1983</td>
</tr>
<tr>
<td>3.</td>
<td>Salinity</td>
<td>ppt</td>
<td>0.33</td>
<td>0.26</td>
<td>0.28</td>
<td>0.37</td>
<td>0.41</td>
<td>1.36</td>
<td>0.81</td>
<td>0.38</td>
<td>-</td>
<td>Electrometric Method (Instrumental) &amp; Operation Manual</td>
</tr>
<tr>
<td>4.</td>
<td>Electrical Conductivity</td>
<td>µS/cm</td>
<td>439.8</td>
<td>441.4</td>
<td>478.7</td>
<td>750.8</td>
<td>699.3</td>
<td>--</td>
<td>497</td>
<td>601.4</td>
<td>-</td>
<td>IS:3025 (P-14):1984</td>
</tr>
<tr>
<td>5.</td>
<td>Turbidity</td>
<td>NTU</td>
<td>1.3</td>
<td>4.4</td>
<td>0.7</td>
<td>0.3</td>
<td>0.7</td>
<td>0.6</td>
<td>0.4</td>
<td>1.1</td>
<td>5</td>
<td>IS:3025 (P-10):1984</td>
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<tr>
<td>8.</td>
<td>Total Suspended Solids (TSS)</td>
<td>mg/l</td>
<td>10</td>
<td>96</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>-</td>
<td>IS:3025 (P-17):1984</td>
</tr>
<tr>
<td>10.</td>
<td>Chemical Oxygen Demand (COD)</td>
<td>mg/l</td>
<td>4.13</td>
<td>5.12</td>
<td>3.16</td>
<td>4.51</td>
<td>2.16</td>
<td>3.45</td>
<td>2.62</td>
<td>3.16</td>
<td>-</td>
<td>APHA &amp; AWWA, 23nd Ed.5220-B.(5-17)</td>
</tr>
<tr>
<td>11.</td>
<td>Biochemical Oxygen Demand (BOD₃)</td>
<td>mg/l</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>&lt;1.0</td>
<td>-</td>
<td>IS:3025 (P-44):1993</td>
</tr>
<tr>
<td>12.</td>
<td>Chlorides (As Cl⁻)</td>
<td>mg/l</td>
<td>24.35</td>
<td>20.12</td>
<td>23.69</td>
<td>21.47</td>
<td>61.51</td>
<td>151.35</td>
<td>121.9</td>
<td>46.83</td>
<td>1000</td>
<td>IS:3025 (P-32):1988</td>
</tr>
<tr>
<td>13.</td>
<td>Sulphates (as SO₄²⁻)</td>
<td>mg/l</td>
<td>12.98</td>
<td>18.83</td>
<td>11.82</td>
<td>18.83</td>
<td>22.11</td>
<td>65.38</td>
<td>11.41</td>
<td>14.82</td>
<td>400</td>
<td>APHA &amp; AWWA, 23rd Ed.4500- SO₄²⁻-E.(4-190)</td>
</tr>
<tr>
<td>14.</td>
<td>Total Alkalinity (as CaCO₃)</td>
<td>mg/l</td>
<td>130</td>
<td>145</td>
<td>140</td>
<td>235</td>
<td>135</td>
<td>140</td>
<td>120</td>
<td>130</td>
<td>600</td>
<td>IS:3025 (P-23):1986</td>
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<tr>
<td>15.</td>
<td>Total Hardness (as CaCO₃)</td>
<td>mg/l</td>
<td>132.62</td>
<td>142.52</td>
<td>142.41</td>
<td>209.84</td>
<td>158.61</td>
<td>293.32</td>
<td>133.14</td>
<td>148.75</td>
<td>600</td>
<td>IS:3025 (P-21):2009</td>
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<td>16.</td>
<td>Calcium Hardness</td>
<td>mg/l</td>
<td>70.21</td>
<td>74.22</td>
<td>80.35</td>
<td>122.48</td>
<td>80.32</td>
<td>94.37</td>
<td>83.70</td>
<td>78.31</td>
<td>600</td>
<td>APHA &amp; AWWA, 23nd Ed.3500 Ca-B.(3-69)</td>
</tr>
<tr>
<td>17.</td>
<td>Calcium (as Ca)</td>
<td>mg/l</td>
<td>28.16</td>
<td>29.72</td>
<td>32.13</td>
<td>49.09</td>
<td>32.13</td>
<td>37.82</td>
<td>33.48</td>
<td>31.32</td>
<td>-</td>
<td>APHA &amp; AWWA, 23nd Ed.3500 Ca-B.(3-69)</td>
</tr>
<tr>
<td>18.</td>
<td>Magnesium (as Mg)</td>
<td>mg/l</td>
<td>15.12</td>
<td>16.58</td>
<td>15.12</td>
<td>21.47</td>
<td>19.02</td>
<td>48.25</td>
<td>11.99</td>
<td>17.07</td>
<td>100</td>
<td>APHA &amp; AWWA, 23nd Ed.3500 Ca-B.(3-69)</td>
</tr>
<tr>
<td>S. No.</td>
<td>Parameter</td>
<td>Units</td>
<td>SW1 Project site(GIDC)</td>
<td>SW2 Vadadala</td>
<td>SW3 Vav</td>
<td>SW4 Paniadara</td>
<td>SW5 Dahej</td>
<td>SW6 Luvara</td>
<td>SW7 Ambetha</td>
<td>SW8 Suva</td>
<td>Permissible limits as Per IS 10500:2012 Reference Method</td>
<td></td>
</tr>
<tr>
<td>--------</td>
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<td>-------</td>
<td>-------------------------</td>
<td>--------------</td>
<td>---------</td>
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<td>-----------</td>
<td>-------------</td>
<td>----------</td>
<td>----------------------------------------------------------------</td>
<td></td>
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<tr>
<td>19.</td>
<td>Sulphide (as S²⁻)</td>
<td>mg/l</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
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<td>&lt;0.2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Ammonical Nitrogen (as NH₃-N)</td>
<td>mg/l</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Copper (as Cu)</td>
<td>mg/l</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Fluorides (as F⁻)</td>
<td>mg/l</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Total Iron (as Fe)</td>
<td>ml/l</td>
<td>0.144</td>
<td>1.587</td>
<td>0.243</td>
<td>&lt;0.01</td>
<td>0.121</td>
<td>0.151</td>
<td>0.231</td>
<td>0.081</td>
<td>0.3</td>
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<tr>
<td>24.</td>
<td>Phenol (as C₆H₅OH)</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.002</td>
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<tr>
<td>25.</td>
<td>Oil &amp; Grease</td>
<td>mg/l</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>&lt;0.4</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Hexavalent Chromium (as Cr⁶⁺)</td>
<td>mg/l</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Nickel (as Ni)</td>
<td>mg/l</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Phosphorus (as P)</td>
<td>mg/L</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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<td>-</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Residual Chlorine</td>
<td>mg/l</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Total Chromium (as Cr³⁺)</td>
<td>mg/l</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Zinc (as Zn)</td>
<td>mg/l</td>
<td>0.04</td>
<td>&lt;0.022</td>
<td>0.04</td>
<td>0.042</td>
<td>0.041</td>
<td>0.022</td>
<td>0.082</td>
<td>0.064</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Lead (as Pb)</td>
<td>mg/l</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>&lt;0.005</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>Sodium (as Na)</td>
<td>mg/l</td>
<td>25.40</td>
<td>19.83</td>
<td>14.38</td>
<td>15.35</td>
<td>20.23</td>
<td>246.28</td>
<td>11.82</td>
<td>38.51</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Potassium (as K)</td>
<td>mg/l</td>
<td>3.21</td>
<td>3.08</td>
<td>3.24</td>
<td>5.41</td>
<td>4.37</td>
<td>9.61</td>
<td>1.93</td>
<td>3.99</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>Arsenic (as As)</td>
<td>mg/l</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.00015</td>
<td>&lt;0.0015</td>
<td>&lt;0.0015</td>
<td>&lt;0.0015</td>
<td>&lt;0.0015</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Cadmium (as Cd)</td>
<td>mg/l</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.003</td>
<td>APHA &amp; AWWA, 23rd Ed. 3111. B-3111. B-AAS (3-30)</td>
<td></td>
</tr>
</tbody>
</table>

**Sanjivani Pharma**

**GIDC Dahej - II**

Ta.: Vagra, Dist.: Bharuch

**Rapid Environmental Impact Assessment Report**

**Proposed Synthetic chemicals**

**Chapter-3: Project Description**
**Table 3.18: Standard Water Quality Criteria**

<table>
<thead>
<tr>
<th>Class of Water</th>
<th>Designated best use</th>
<th>Criteria</th>
</tr>
</thead>
</table>
| A              | Drinking Water Source without conventional treatment but after disinfection        | • Total Coliforms Organism MPN/100ml shall be 50 or less  
• pH between 6.5 and 8.5  
• Dissolved Oxygen 6 mg/l or more  
• Biochemical Oxygen Demand 5 days 20°C 2 mg/l or less |
| B              | Outdoor bathing (Organized)                                                        | • Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5  
• Dissolved Oxygen 5mg/l or more  
• Biochemical Oxygen Demand 5 days 20°C 3 mg/l or less |
| C              | Drinking water source after conventional treatment and disinfection                 | • Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9  
• Dissolved Oxygen 4 mg/l or more  
• Biochemical Oxygen Demand 5 days 20°C 3 mg/l or less |
| D              | Propagation of Wild life and Fisheries                                              | • pH between 6.5 to 8.5  
• Dissolved Oxygen 4 mg/l or more  
• Free Ammonia (as N) 1.2 mg/l or less |
| E              | Irrigation, Industrial Cooling, Controlled Waste disposal                           | • pH between 6.0 to 8.5  
• Electrical Conductivity at 25°C micro mhos/cm Max.2250  
• Sodium absorption Ratio Max. 26  
• Boron Max. 2 mg/L |

**Observation on Surface water Quality:**

The baseline quality of water based on the results of the surface water quality monitoring within the study area, it is observed that,

- The pH and Chlorides are observed in limit.
- TDS and Turbidity generally observed in pond water are observed within the limit at all locations.
- As samples from pond were collected after monsoon water quality was found good overall.

**3.12 SOIL ENVIRONMENT**

Soil is our most important natural resource and a natural resource is anything that comes from the earth and is used by us. We depend on the soil for food, clothing, shelter, minerals, clay & water. Soil is the seat of many macro and micro flora like algae, fungi, earthworms, bacteria etc. These are very beneficial in promoting soil reactions and decomposing the organic matter by which essential nutrients for plants are liberated. Most of the soil is made-up of two main parts:
Tiny bits of mineral particles which come from larger rocks, and humus, which is dark brown in color and consists of decaying remains of plants and animals.

Soil also contains water, air and living organisms, such as fungi, bacteria, earthworms, roundworms, insects, etc. Actually more living organisms live in the soil than above it.

**Methodology**

The soil samples were collected from 8 selected locations during summer season. The samples collected were homogeneous representative of each sampling location. At random sub-locations were identified at each location and soil samples were collected from 5 to 15 cm below the surface. It was uniformly mixed before homogenizing the soil samples. The samples about 500-gms were packed in polythene bags labelled in the field with location, number and sent to the laboratory for the analysis of physicochemical parameters.

Date of sampling: 26-31 December, 2018.

**Soil Sampling Locations**

Soil sampling was conducted once during the study period of summer season. 8 soil samples were collected from selected locations in the vicinity of the proposed expansion project. For studying soil quality environment in the study area, sampling locations were selected to assess the existing soil conditions in and around the existing plant area representing various land use conditions. The homogenized samples were analyzed for physicochemical characteristics.

**Table 3.19: Soil Sampling Locations**

<table>
<thead>
<tr>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from site</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>S -1</td>
<td>Project Site</td>
<td>-</td>
<td>21.727643°,72.621961°</td>
</tr>
<tr>
<td>S -2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>21.730380°,72.633364°</td>
</tr>
<tr>
<td>S-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>21.752790°,72.643988°</td>
</tr>
<tr>
<td>S-4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>21.799577°,72.635975°</td>
</tr>
<tr>
<td>S-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>21.713240°,72.581973°</td>
</tr>
<tr>
<td>S-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>23.331782°,72.365852°</td>
</tr>
<tr>
<td>S-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>21.673330°,72.554134°</td>
</tr>
<tr>
<td>S-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>21.688085°,72.655569°</td>
</tr>
</tbody>
</table>
Analysis of Soil Samples

The soil samples were examined for various physicochemical parameters, to determine the existing soil characteristics of the study area. Physicochemical characteristics of soil are presented as follows:
## Chapter-3: Project Description

### Table 3.20: Physiochemical Characteristics of Soil

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parameters</th>
<th>Units</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>Reference Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Total Solid</td>
<td>%</td>
<td>92.55</td>
<td>92.41</td>
<td>97.07</td>
<td>92.88</td>
<td>87.59</td>
<td>91.67</td>
<td>94.32</td>
<td>92.75</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Temperature</td>
<td>°C</td>
<td>25.1</td>
<td>24.9</td>
<td>25.0</td>
<td>25.0</td>
<td>25.1</td>
<td>25.0</td>
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<td>mS/cm</td>
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<td>0.164</td>
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<td>6.</td>
<td>Bulk Density</td>
<td>gm/cm³</td>
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<td>1.27</td>
<td>1.17</td>
<td>1.24</td>
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<td>%</td>
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<td>51.52</td>
<td>57.96</td>
<td>55.64</td>
<td>51.91</td>
<td>53.96</td>
<td>43.47</td>
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<td>8.</td>
<td>Water Holding Capacity (WHC)</td>
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<td>71.06</td>
<td>73.75</td>
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<td>65.72</td>
<td>57.82</td>
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<td>Specific Gravity</td>
<td>--</td>
<td>2.51</td>
<td>2.49</td>
<td>2.45</td>
<td>2.41</td>
<td>2.45</td>
<td>2.34</td>
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<td>Calcium (as Ca⁺)</td>
<td>mg/kg</td>
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<td>215.8</td>
<td>244.9</td>
<td>183.7</td>
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<td>189.3</td>
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<td>Magnesium (as Mg²⁺)</td>
<td>mg/kg</td>
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<td>73.19</td>
<td>61.13</td>
<td>44.56</td>
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<td>79.31</td>
<td>67.38</td>
<td>97.52</td>
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<td>Chlorides (as Cl⁻)</td>
<td>mg/kg</td>
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<td>112.84</td>
<td>59.43</td>
<td>727.44</td>
<td>240.51</td>
<td>735.6</td>
<td>112.55</td>
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<td>13.</td>
<td>Phosphorus (as P)</td>
<td>mg/kg</td>
<td>6.383</td>
<td>4.103</td>
<td>5.923</td>
<td>5.354</td>
<td>5.09</td>
<td>2.51</td>
<td>9.88</td>
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<td>Available Phosphorus</td>
<td>mg/kg</td>
<td>2.38</td>
<td>2.02</td>
<td>2.39</td>
<td>3.12</td>
<td>1.93</td>
<td>0.98</td>
<td>3.28</td>
<td>4.09</td>
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<td>Organic Matter</td>
<td>%</td>
<td>2.41</td>
<td>1.09</td>
<td>0.61</td>
<td>0.56</td>
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<td>0.84</td>
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<td>1.35</td>
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<td>Total Alkalinity (as CaCO₃)</td>
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<td>1110.0</td>
<td>300.0</td>
<td>775.0</td>
<td>490.0</td>
<td>485.0</td>
<td>580.0</td>
<td>470.0</td>
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<td>17.</td>
<td>Total Nitrogen</td>
<td>mg/kg</td>
<td>291.1</td>
<td>207.2</td>
<td>249.8</td>
<td>268.7</td>
<td>282.4</td>
<td>245.3</td>
<td>290.2</td>
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<td>Available Nitrogen</td>
<td>mg/kg</td>
<td>21.20</td>
<td>15.02</td>
<td>18.07</td>
<td>19.49</td>
<td>20.11</td>
<td>20.02</td>
<td>17.81</td>
<td>30.52</td>
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### Rapid Environmental Impact Assessment Report
**Proposed Synthetic chemicals**

**Sanjivani Pharma**
GIDC Dahej - II
Ta.: Vagra, Dist.: Bharuch

#### Chapter-3: Project Description

<table>
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<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
<th>S7</th>
<th>S8</th>
<th>Reference Method</th>
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<td>Nitrate Nitrogen (as NO$_3^-N$)</td>
<td>mg/kg</td>
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<td>Sulphates (as SO$_4^{2-}$)</td>
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<td>572.0</td>
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<td>614.6</td>
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<td>1256.4</td>
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<td>Total Iron (as Fe)</td>
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<td>153.46</td>
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<td>mg/kg</td>
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<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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<td>22.</td>
<td>Nickel (as Ni)</td>
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<td>&lt;0.03</td>
<td>&lt;0.03</td>
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<td>Lead (as Pb)</td>
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<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<td>Arsenic (as As)</td>
<td>mg/kg</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
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<td>Organic Carbon</td>
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<td>0.68</td>
<td>0.49</td>
<td>0.77</td>
<td>0.78</td>
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<td>Sodium (as Na)</td>
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<td>980.0</td>
<td>238.18</td>
<td>186.80</td>
<td>191.3</td>
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<td>104.0</td>
<td>723.0</td>
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<td>Potassium (as K)</td>
<td>mg/kg</td>
<td>186.0</td>
<td>80.5</td>
<td>58.2</td>
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<td>112.6</td>
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<td>131.0</td>
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<td>Cadmium (as Cd)</td>
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<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
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<td>Permeability</td>
<td>Cm/sec</td>
<td>4.11×10$^{-3}$</td>
<td>4.38×10$^{-6}$</td>
<td>4.87×10$^{-4}$</td>
<td>6.61×10$^{-6}$</td>
<td>2.76×10$^{-6}$</td>
<td>3.32×10$^{-6}$</td>
<td>5.21×10$^{-5}$</td>
<td>4.96×10$^{-5}$</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<td>Coarse Sand</td>
<td>%</td>
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<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td></td>
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<td></td>
<td>Medium Sand</td>
<td>%</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>7</td>
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<td>7</td>
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<td>Silt-Clay</td>
<td>%</td>
<td>81</td>
<td>91</td>
<td>89</td>
<td>88</td>
<td>90</td>
<td>85</td>
<td>86</td>
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</table>

#### Chapter-3: Project Description

3.28
Observation on soil quality:
It is observed from the analysis report that;
Taxonomically soils are mostly sandy loam. pH ranges from 7.25 to 12.41. Organic matter ranges from 2.41 to 0.56 %. Total nitrogen ranges from 207.2 to 420.3 mg/kg. Available potassium ranges from 58.2 to 186 mg/kg.

3.13 BIOLOGICAL ENVIRONMENT

Biological resources of the area are an indicator of quality/health of the environment of the area. Therefore, the study of the same is an important aspect to minimize the distribution due to the intervention of the proposed expansion project to accept in a sustainable approach. To achieve the goal, EIA study was conducted during the month of October to December, 2018 to cover all the biological parameters.

Nature supports a great variety of living beings under a structural and functional unit called ecosystem. In any natural ecosystem, there are several components which exist in harmony and survive only by interdependence. These components may be either biotic or abiotic. Developmental activities often have great impacts on the biodiversity both ecosystems as well as species level. Present study has been carried out to inventories the biodiversity exist in the study area of present project, to evaluate the possible impacts on biodiversity due to project activities and suggest effective mitigation measures against the negative impacts.

The ecological study was undertaken to understand the present status of ecosystem of the area, to predict changes as a result of proposed activities and to suggest measures for maintaining the conditions. This carried through primary survey and secondary data collected from various Government agencies like Forest Department, Agriculture Department, Scientific literatures etc. The proposed expansion project area is located in the western edge of Deccan plateau which is a volcanic formation and underlain by the baseline lava flows. These flows are normally horizontally disposed over a wide stretch and give rise to table land type of topography also known a plateau. Biodiversity of this area is greatly influence by the mountain ranges of Western Ghats which block rainfall and hence the area receives relatively rainfall.

Floral Compositions
The floristic survey was carried out in and around the project site. Overall structure of the vegetation in this area was scattered forest patches intercepted with scrubland and grassland. Most of the study area is under human settlement and agricultural practice.

The floral composition of the study area is mostly tropical deciduous type. The various terrestrial plants available in the study area are reported in below table. Heavy rainfall, moderate and humid climatic condition favors the richness of flora in study area.
### Table 3.21: List of Flora in the Study Area

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<th>Scientific Name</th>
<th>Common Name</th>
<th>Family</th>
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<td>Ricinus Communis</td>
<td>Arand</td>
<td>Fabaceae</td>
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<td>Saccharum Officinarum</td>
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<td>Poaceae</td>
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<td>Sorghum Vulgai</td>
<td>Jowar</td>
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<td>Shrubs</td>
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<td>Spinosa Rekii</td>
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<td>Butea monosperma</td>
<td>Palas</td>
<td>Leguminosae</td>
</tr>
<tr>
<td>23</td>
<td>Callistemon lancealatus</td>
<td>Bottlebrush</td>
<td>Mytracaeae</td>
</tr>
<tr>
<td>24</td>
<td>Casuarina equisetifoliera</td>
<td>Sura</td>
<td>Casuarineae</td>
</tr>
<tr>
<td>25</td>
<td>Careya arborea</td>
<td>Kumbh</td>
<td>Mytracaeae</td>
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<td>Casearia elliptica</td>
<td>Manjo</td>
<td>Symydaeae</td>
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<td>27</td>
<td>Caesearia graveoiens</td>
<td>Dedak manio</td>
<td>Samidaceae</td>
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<td>28</td>
<td>Cassia fistula</td>
<td>Sunari</td>
<td>Leguminosae</td>
</tr>
<tr>
<td>29</td>
<td>Cestrum noctusnum</td>
<td>Ralkirani</td>
<td>Solana ceae</td>
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<td>30</td>
<td>Cochiospermum religiosum</td>
<td>Ganeri</td>
<td>Cochlospermaceds</td>
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<td>Cocas nicifera</td>
<td>Nariyal</td>
<td>Palmeae</td>
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<td>Cordia dichotoma</td>
<td>Gundi</td>
<td>Boranginaceae</td>
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<td>Dalbergia paniculata</td>
<td>Dhobin</td>
<td>Leguminosae</td>
</tr>
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<td>34</td>
<td>D. latifolia</td>
<td>Sisso</td>
<td>Leguminosae</td>
</tr>
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<td>Murraya koenigii</td>
<td>Karlilimb</td>
<td>Rata ceae</td>
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<td>Ixora parviflora</td>
<td>Kara</td>
<td>Rubiaceae</td>
</tr>
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<td>I. nigricans</td>
<td>Kukeri</td>
<td>Rubiaceae</td>
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<td>Gulmohar</td>
<td>Leguminosae</td>
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<td>Tendu</td>
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<td>Doliachandrone falcate</td>
<td>Mallar sing</td>
<td>Bignoniacae</td>
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<td>Elaeodendron roxburghii</td>
<td>Alinar</td>
<td>Ceiastracea</td>
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<td>Eucalyptus globules</td>
<td>Safeda</td>
<td>Eucalyptaceae</td>
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<td>43</td>
<td>Emblica officinalis</td>
<td>Aonla</td>
<td>Euphobiaceae</td>
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<td>44</td>
<td>Erithina uliginosa</td>
<td>Pungara</td>
<td>Leguminosae</td>
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<tr>
<td>45</td>
<td>Eramphis uliginosa</td>
<td>Almi</td>
<td>Rubiaceas</td>
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<td>46</td>
<td>Ficus. Religiosa</td>
<td>Pipal</td>
<td>Moraceae</td>
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<td>F. rumphii</td>
<td>Pilar</td>
<td>Moraceae</td>
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<tr>
<td>48</td>
<td>F. benghalensis</td>
<td>Bara</td>
<td>Moraceae</td>
</tr>
<tr>
<td>49</td>
<td>Flacourtia indica</td>
<td>Rankdi</td>
<td>Bixaceae</td>
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<tr>
<td>50</td>
<td>Garua pinnata</td>
<td>Kakad</td>
<td>Burseraceae</td>
</tr>
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<td>51</td>
<td>Griwia teliaefolia</td>
<td>Dhaman</td>
<td>Tiliaceae</td>
</tr>
<tr>
<td>52</td>
<td>Haidwickia bipinnata</td>
<td>Aniar</td>
<td>Caesalpiniacea</td>
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<td>Holoptelia intigrifolia</td>
<td>Valva</td>
<td>Uthicaceae</td>
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<td>Kydia calycina</td>
<td>Bhindi</td>
<td>Malvaceae</td>
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<td>55</td>
<td>Lagerstroemia lanceolata</td>
<td>Nano</td>
<td>Leguminosae</td>
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<td>56</td>
<td>L. parviflora</td>
<td>Sidha</td>
<td>Leguminosae</td>
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<td>57</td>
<td>Michellia champaca</td>
<td>Champa</td>
<td>Bignoneaceae</td>
</tr>
<tr>
<td>58</td>
<td>Lannea caromadalica</td>
<td>Modad</td>
<td>Anacardiaceae</td>
</tr>
<tr>
<td>59</td>
<td>Madhuca indica</td>
<td>Mahua</td>
<td>Sapotaceae</td>
</tr>
<tr>
<td>60</td>
<td>Mangifera indica</td>
<td>Ammu</td>
<td>Anacardiaceae</td>
</tr>
<tr>
<td>61</td>
<td>Miliusa tomentosa</td>
<td>Gulambh</td>
<td>Annonacea</td>
</tr>
<tr>
<td>62</td>
<td>Milligntonia hortensis</td>
<td>Indian Coral Tree</td>
<td>Bignoniacae</td>
</tr>
</tbody>
</table>
## Chapter-3: Project Description

### Sr. no | Scientific Name | Common Name | Family
--- | --- | --- | ---
63 | Mitragyna parvifolia | Kalam | Rubiaceae
64 | Michelia Champaca | Champa | Magnoliaceae
65 | Moringa oleifera | Shevga | Moringaceae
66 | Musa paradisiacea | Kela | Musaceae
67 | Oroxylum indicum | Tetu | Bignoniaceae
68 | Phoenix sylvestris | Shindi | Palmae
69 | Prospis juliflora | Babul | Mimoceae
70 | P. cinerarea | Babul | Mimoceae
71 | Pithecelobium dulce | Chisbalai | Leguminosae
72 | Pongamia pinnata | Karanja | Leguminosae
73 | Pisum guajava | Guava | Mutraceae
74 | Pterocarpus marsupium | Bija | Leguminosae
75 | Punica grantalum | Anar | Pomegrannatae
76 | Sapindus emerginatus | Aritha | Sapindaceae
77 | Soymida febrifuga | Rohan | Meliaceae
78 | Poleathia langifolia | Ashok | Apocynaceae
79 | Saraca indica | Ashok | Apocynaceae
80 | Thevetia neirifolia | Pilakanton | Apocynaceae
81 | Sterculia urens | Kodaya | Sterculiaceae
82 | Syzygium cuminii | Jamun | Myrtaceae
83 | Terminalia crenulata | Sadad | Leguminosae
84 | T. bellirica | Behada | Combretaceae
85 | T. arjuna | Arjun | Combretaceae
86 | T. caltapa | Jangli badam | Combretaceae
87 | Tamarindus indica | Tentuli | Leguminosae
88 | Tecoma stans | Nellow bell | Bignonia ceae
89 | Tectona grandis | Sag | Verbanaceae
90 | Trema orientalis | Gol | Ulmaceae
91 | Wrightia tinctoria | Kudo | Apocynaceae
92 | Zizyphus xylocarpus | Ghatbor | Rhamnaceae

#### Bamboos
1. Dendrocalamus Strictus | Manvel | Grammineae
2. Abrus Precatorius | Gunj | Leguminosae
3. Capparis Sepiraria | Lamtjar | Cappariaceae
4. Cocculus Hirrutus | Asanwel | Menispermacae
5. Combretum Ovalifolium | Jal | Combretaceae
6. Cayratia Carnosa | Khatumbo | Vitaceae

#### Grasses
1. Andropogon Pumilus | Kusal | Gramineae
2. Cenchrus Setgerus | Dhramnu | Gramineae
3. Cynodon Dactylon | Durva | Gramineae
4. Cymbopogen Marinal | Rosha | Gramineae
5. Heteropogon Contortus | Gawat | Gramineae
6. Sorghum Halepense | Baru | Gramineae
7. Themeda Triandra | Bhathdu | Gramineae
Fauna

Faunal diversity found in study area with zoological name and common name is given in Table 3.22.

Table 3.22: List of Fauna in the study area

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Scientific name</th>
<th>Common Name</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acridotheres tristis</td>
<td>Common myna</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A. ginginianus</td>
<td>Bank myna</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Athene brama</td>
<td>Spotted owlet</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Aegithina tithia</td>
<td>Common Lora</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ardeola grayee</td>
<td>Pond Heron</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Amaurornis phoenicurus</td>
<td>Whitebreasted Waterhen</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Babulcus ibis</td>
<td>Cattle Egret</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Centropus cinensis</td>
<td>Crow-phesant</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Columba livia</td>
<td>Blue Rock Pigeon</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Corvus splendens</td>
<td>House Crow</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Coracias benghalensis</td>
<td>Indian Roller</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Dicurus adsimilis</td>
<td>Black Drongo</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dinophum benghalense</td>
<td>Goldenbacked Woodpecker</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Eudynamys scolopacea</td>
<td>Koel</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Fracolinus francolinus</td>
<td>Black partiridge</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Halcyon rustica</td>
<td>Whitebreasted Kingfisher</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Hirundo rustica</td>
<td>Common swallow</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Lanius exubitor</td>
<td>Grey Shrike</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Launuchura malabarica</td>
<td>Whithethroated munia</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Megalaima rubricapilla</td>
<td>Smallgreen barbet</td>
<td></td>
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<tr>
<td>21</td>
<td>M. malabarica</td>
<td>Crimsonbrestwd Barbet</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Merops orientalis</td>
<td>Littlegreen Bea-eater</td>
<td></td>
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<td>23</td>
<td>Milvus migrans</td>
<td>Patih Kite</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Motacilla maderatensis</td>
<td>Large pied wagtail</td>
<td></td>
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<tr>
<td>25</td>
<td>Nectaria asiatica</td>
<td>Purplepumpled sunbird</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Nectaria minima</td>
<td>Small sunbird</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Oriolus oriolus</td>
<td>Golden Oriole</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Orthotomus sutorius</td>
<td>Tailor Bird</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Passer domesticus</td>
<td>House Sparrow</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Psittacula cyanocephala</td>
<td>Blossamheaded parakeet</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Pycnonotus caffer</td>
<td>Redvented bulbul</td>
<td></td>
</tr>
</tbody>
</table>
3.14 SOCIOECONOMIC ENVIRONMENT

Reconnaissance
Reconnaissance has been done to assess socio-economic status in the study area. The study area is rural however basic amenities were observed.

Methodology
Detailed socio-economic data were collected within 10 km radius of the existing Project site. Preliminary information was collected during field investigation followed by secondary data from the census of India 2011.

Socioeconomic Assessment
Socio economic status of the population is the indicator of the change in the life style due to the developmental activities taking place in the region. The villages which appears within the 10 km radius from the centre of the proposed Project site are considered for socioeconomic study.

Demography
The study there is 21 villages in the study area. The demographic pattern of all the settlements as per 2011 census is given in below table. As per the Census 2011, the average family size in the study area is 5 persons per family.
**Figure 3.12: List of villages within 5 km & 10 km radius**

![Map showing villages within 5 km & 10 km radius.]

**Table 3.23: List of villages present in the study area**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the village</th>
<th>Direction</th>
<th>Distance, Km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dahej</td>
<td>WSW</td>
<td>3.97</td>
</tr>
<tr>
<td>2</td>
<td>Kadodara</td>
<td>NNE</td>
<td>4.68</td>
</tr>
<tr>
<td>3</td>
<td>Vav</td>
<td>NNE</td>
<td>3.29</td>
</tr>
<tr>
<td>4</td>
<td>Vadadla</td>
<td>ENE</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>Jolva</td>
<td>ESE</td>
<td>3.34</td>
</tr>
<tr>
<td>6</td>
<td>Lakhigam</td>
<td>WSW</td>
<td>7.76</td>
</tr>
<tr>
<td>7</td>
<td>Luvara</td>
<td>SW</td>
<td>8.94</td>
</tr>
<tr>
<td>8</td>
<td>Jageshwar</td>
<td>SSW</td>
<td>7.43</td>
</tr>
<tr>
<td>9</td>
<td>Ambetha</td>
<td>SSW</td>
<td>5.32</td>
</tr>
<tr>
<td>10</td>
<td>Suva</td>
<td>SE</td>
<td>5.37</td>
</tr>
<tr>
<td>11</td>
<td>Rahiad</td>
<td>ESE</td>
<td>5.61</td>
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</table>
**Table 3.24: Demographic details**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Village</th>
<th>Total Population</th>
<th>Male</th>
<th>Female</th>
<th>Total Household</th>
<th>Population Density (Person Per Sq Km)</th>
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<tr>
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<td>8345</td>
<td>5150</td>
<td>3426</td>
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<tr>
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<td>Kadodara</td>
<td>1995</td>
<td>1018</td>
<td>997</td>
<td>420</td>
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</tr>
<tr>
<td>3</td>
<td>Vadadla</td>
<td>822</td>
<td>419</td>
<td>403</td>
<td>201</td>
<td>1.2</td>
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<tr>
<td>4</td>
<td>Jolva</td>
<td>1442</td>
<td>807</td>
<td>635</td>
<td>338</td>
<td>1.6</td>
</tr>
<tr>
<td>5</td>
<td>Lakhigam</td>
<td>4938</td>
<td>3144</td>
<td>1794</td>
<td>1217</td>
<td>4.6</td>
</tr>
<tr>
<td>6</td>
<td>Luvara</td>
<td>1663</td>
<td>873</td>
<td>790</td>
<td>385</td>
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<tr>
<td>7</td>
<td>Jageshwar</td>
<td>1571</td>
<td>818</td>
<td>753</td>
<td>383</td>
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<tr>
<td>8</td>
<td>Ambetha</td>
<td>1552</td>
<td>807</td>
<td>745</td>
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<td>Suva</td>
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<td>973</td>
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<td>Rahiad</td>
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<td>862</td>
<td>832</td>
<td>355</td>
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<td>321</td>
<td>355</td>
<td>152</td>
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<td>Atali</td>
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<td>612</td>
<td>538</td>
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<td>Galendra</td>
<td>611</td>
<td>314</td>
<td>297</td>
<td>120</td>
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<tr>
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<td>Akhod</td>
<td>831</td>
<td>435</td>
<td>396</td>
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<td>15</td>
<td>Samatpot</td>
<td>367</td>
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<td>185</td>
<td>79</td>
<td>1.2</td>
</tr>
<tr>
<td>16</td>
<td>Sambhiti</td>
<td>416</td>
<td>226</td>
<td>190</td>
<td>82</td>
<td>1.2</td>
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<tr>
<td>17</td>
<td>Janiadara</td>
<td>729</td>
<td>361</td>
<td>368</td>
<td>150</td>
<td>0.7</td>
</tr>
<tr>
<td>18</td>
<td>Narnavi</td>
<td>692</td>
<td>349</td>
<td>343</td>
<td>151</td>
<td>1.0</td>
</tr>
<tr>
<td>19</td>
<td>Paniadara</td>
<td>2563</td>
<td>1360</td>
<td>1203</td>
<td>514</td>
<td>0.6</td>
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<tr>
<td>20</td>
<td>Padariya</td>
<td>647</td>
<td>340</td>
<td>307</td>
<td>131</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40501</strong></td>
<td><strong>22944</strong></td>
<td><strong>17577</strong></td>
<td><strong>9432</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 3.13: Population of the study area

![Population Pie Chart]

**Literacy**

The overall percentage of literate in the area is 74.35%. Total literate population is 40521. The literacy rate of female is only 19% while literacy rate in male is 31%. Amongst the total population 50% are illiterate.

**Table 3.25: Literacy Rate**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Village</th>
<th>Male Literates</th>
<th>% Literacy</th>
<th>Female Literates</th>
<th>% Literacy</th>
<th>Total Literates</th>
<th>% Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dahej</td>
<td>6704</td>
<td>67.2</td>
<td>3266</td>
<td>32.8</td>
<td>9970</td>
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</tr>
<tr>
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<td>568</td>
<td>41.5</td>
<td>1369</td>
<td>67.9</td>
</tr>
<tr>
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<td>Vav</td>
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<td>56.3</td>
<td>251</td>
<td>43.7</td>
<td>575</td>
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<tr>
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<td>331</td>
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<td>271</td>
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<td>602</td>
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<tr>
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<td>Jolva</td>
<td>661</td>
<td>61.5</td>
<td>414</td>
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</tr>
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<td>1300</td>
<td>82.7</td>
</tr>
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<td>Ambetha</td>
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<td>537</td>
<td>44.2</td>
<td>1214</td>
<td>78.2</td>
</tr>
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<td>Suva</td>
<td>783</td>
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<td>644</td>
<td>45.1</td>
<td>1427</td>
<td>74.3</td>
</tr>
<tr>
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<td>Rahiad</td>
<td>690</td>
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<td>620</td>
<td>47.3</td>
<td>1310</td>
<td>77.3</td>
</tr>
<tr>
<td>12</td>
<td>Koliad</td>
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<td>55.3</td>
<td>205</td>
<td>44.7</td>
<td>459</td>
<td>67.9</td>
</tr>
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<td>Atali</td>
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<td>363</td>
<td>42.4</td>
<td>857</td>
<td>74.5</td>
</tr>
<tr>
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<td>243</td>
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<td>219</td>
<td>47.4</td>
<td>462</td>
<td>75.6</td>
</tr>
<tr>
<td>15</td>
<td>Akhod</td>
<td>340</td>
<td>58.7</td>
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<td>41.3</td>
<td>579</td>
<td>69.7</td>
</tr>
<tr>
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<td>Samatpot</td>
<td>154</td>
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<td>110</td>
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<td>264</td>
<td>71.9</td>
</tr>
<tr>
<td>17</td>
<td>Sambheti</td>
<td>188</td>
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<td>128</td>
<td>40.5</td>
<td>316</td>
<td>76.0</td>
</tr>
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<td>Janiadara</td>
<td>273</td>
<td>53.4</td>
<td>238</td>
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<td>511</td>
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</tr>
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<td>Narnavi</td>
<td>283</td>
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<td>227</td>
<td>44.5</td>
<td>510</td>
<td>73.7</td>
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<tr>
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<td>Paniadara</td>
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<td>60.6</td>
<td>652</td>
<td>39.4</td>
<td>1655</td>
<td>64.6</td>
</tr>
<tr>
<td>21</td>
<td>Padariya</td>
<td>293</td>
<td>58.8</td>
<td>205</td>
<td>41.2</td>
<td>498</td>
<td>77.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18530</strong></td>
<td></td>
<td><strong>11586</strong></td>
<td></td>
<td></td>
<td><strong>30116</strong></td>
<td></td>
</tr>
</tbody>
</table>
Social Structure

In the study area about 80% of the population belongs to the 4% schedule caste and 16% to schedule tribes. The population social structure is given in below table.

**Table 3.26: Social Structures**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Village</th>
<th>Total Population</th>
<th>SC Population</th>
<th>% SC</th>
<th>ST Population</th>
<th>% ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dahej</td>
<td>13495</td>
<td>542</td>
<td>4.02</td>
<td>2090</td>
<td>15.49</td>
</tr>
<tr>
<td>2</td>
<td>Kadodara</td>
<td>2015</td>
<td>48</td>
<td>2.38</td>
<td>511</td>
<td>25.36</td>
</tr>
<tr>
<td>3</td>
<td>Vav</td>
<td>727</td>
<td>28</td>
<td>3.85</td>
<td>163</td>
<td>22.42</td>
</tr>
<tr>
<td>4</td>
<td>Vadadla</td>
<td>822</td>
<td>76</td>
<td>9.25</td>
<td>341</td>
<td>41.48</td>
</tr>
<tr>
<td>5</td>
<td>Jolva</td>
<td>1442</td>
<td>239</td>
<td>16.57</td>
<td>199</td>
<td>13.80</td>
</tr>
<tr>
<td>6</td>
<td>Lakhigam</td>
<td>4938</td>
<td>87</td>
<td>1.76</td>
<td>584</td>
<td>11.83</td>
</tr>
<tr>
<td>7</td>
<td>Luvara</td>
<td>1663</td>
<td>109</td>
<td>6.55</td>
<td>963</td>
<td>57.91</td>
</tr>
<tr>
<td>8</td>
<td>Jageshwar</td>
<td>1571</td>
<td>18</td>
<td>1.15</td>
<td>146</td>
<td>9.29</td>
</tr>
<tr>
<td>9</td>
<td>Ambetha</td>
<td>1552</td>
<td>67</td>
<td>4.32</td>
<td>261</td>
<td>16.82</td>
</tr>
<tr>
<td>10</td>
<td>Suva</td>
<td>1920</td>
<td>63</td>
<td>3.28</td>
<td>354</td>
<td>18.44</td>
</tr>
<tr>
<td>11</td>
<td>Rahiad</td>
<td>1694</td>
<td>105</td>
<td>6.20</td>
<td>104</td>
<td>6.14</td>
</tr>
<tr>
<td>12</td>
<td>Koliad</td>
<td>676</td>
<td>57</td>
<td>8.43</td>
<td>323</td>
<td>47.78</td>
</tr>
<tr>
<td>13</td>
<td>Atali</td>
<td>1150</td>
<td>117</td>
<td>10.17</td>
<td>381</td>
<td>33.13</td>
</tr>
<tr>
<td>14</td>
<td>Galendra</td>
<td>611</td>
<td>5</td>
<td>0.82</td>
<td>91</td>
<td>14.89</td>
</tr>
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<td>15</td>
<td>Akhod</td>
<td>831</td>
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<td>8.30</td>
<td>305</td>
<td>36.70</td>
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<tr>
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<td>Samatpot</td>
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<td>1.09</td>
<td>49</td>
<td>13.35</td>
</tr>
<tr>
<td>17</td>
<td>Sambheti</td>
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<td>2.88</td>
<td>37</td>
<td>8.89</td>
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<td>18</td>
<td>Janiadara</td>
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<td>140</td>
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</tr>
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<td>Paniadara</td>
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<td>31</td>
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<td>790</td>
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<td>131</td>
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</tr>
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<td><strong>Total</strong></td>
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<td><strong>13647</strong></td>
<td><strong>3747</strong></td>
<td></td>
<td><strong>3747</strong></td>
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</tr>
</tbody>
</table>
Occupational Pattern

The Occupational profile has been classified based on the India census 2011 classification.

**Table 3.27: Occupational patterns of the Villages in the Study area**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Village</th>
<th>Cultivators</th>
<th>Agricultural Labourers</th>
<th>Workers in household industries</th>
<th>Other workers</th>
<th>Total workers</th>
<th>Main workers</th>
<th>Marginal workers</th>
<th>Non workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dahej</td>
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<td>14</td>
<td>12</td>
<td>4337</td>
<td>5163</td>
<td>4476</td>
<td>687</td>
<td>8332</td>
</tr>
<tr>
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<td>Kadodara</td>
<td>225</td>
<td>107</td>
<td>6</td>
<td>241</td>
<td>887</td>
<td>579</td>
<td>308</td>
<td>1108</td>
</tr>
<tr>
<td>3</td>
<td>Vav</td>
<td>126</td>
<td>23</td>
<td>0</td>
<td>89</td>
<td>257</td>
<td>238</td>
<td>19</td>
<td>470</td>
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<td>76</td>
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<td>337</td>
<td>303</td>
<td>34</td>
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<td>60</td>
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<td>489</td>
<td>80</td>
<td>873</td>
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<td>2309</td>
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<td>0</td>
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<td>234</td>
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<td>1</td>
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<td>142</td>
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<td>332</td>
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</tr>
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<td>0</td>
<td>23</td>
<td>116</td>
<td>74</td>
<td>42</td>
<td>23</td>
</tr>
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<td>0</td>
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<td>75</td>
<td>0</td>
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<td>413</td>
<td>226</td>
<td>187</td>
<td>279</td>
</tr>
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<td>264</td>
<td>1391</td>
<td>619</td>
<td>772</td>
<td>1172</td>
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<tr>
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<td>0</td>
<td>90</td>
<td>229</td>
<td>235</td>
<td>64</td>
<td>348</td>
</tr>
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<td><strong>1057</strong></td>
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<td><strong>9838</strong></td>
<td><strong>15913</strong></td>
<td><strong>12583</strong></td>
<td><strong>3400</strong></td>
<td><strong>22042</strong></td>
<td><strong>22042</strong></td>
</tr>
</tbody>
</table>

**Figure 3.22: Social profile of the study area**
Figure 3.16: Occupational pattern of the study area

Infrastructure Availability
The data regarding the public utilities with regards to educational facilities, health, transport and communication, water supply and electricity are collected from the secondary sources. The details are given below.

- School
- Health Centre
- Roads
- Shops for Medicines, Books and provisional items
- Post Office
- Bus Stand

3.15 TRAFFIC STUDY
Traffic counts are important to calculate the existing and proposed load on the existing Road for Project.

Project site is to be located in GIDC Dahej - II. Unit will use the road passing at the project site from internal road of GIDC Dahej - II which is connected to the GIDC main road. Thus, traffic survey has been carried out for the stated route from internal road of GIDC Dahej to GIDC main Road. Studied route is shown in figure below:
Surveyed Route: Road from internal road of GIDC Dahej-II to GIDC main road.

Details regarding the traffic survey are:

- Traffic counts were collected and recorded in 4 hours intervals.
- Morning period (pick hours) survey was carried out from 8:00 to 12:00 hrs.
- Evening period (pick hours) survey was carried out from 16:00 to 20:00 hrs.

Traffic counts observed during the above survey are tabulated below;

**Table 3.28: Traffic Count Table**

<table>
<thead>
<tr>
<th>Type of Vehicles</th>
<th>At Project site: Road from internal road of GIDC Dahej to GIDC main road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Timings of Survey (hrs)</td>
</tr>
<tr>
<td></td>
<td>08.00-12.00 (4 hr)</td>
</tr>
<tr>
<td>Large Trailer</td>
<td>0</td>
</tr>
<tr>
<td>Heavy (Bus, Truck, etc)</td>
<td>2</td>
</tr>
<tr>
<td>Medium (Tractors, light commercial vehicles etc)</td>
<td>3</td>
</tr>
<tr>
<td>Light (Car, Jeep, Pickup Van etc.)</td>
<td>9</td>
</tr>
<tr>
<td>3 Wheeler (Rickshaw, loading)</td>
<td>7</td>
</tr>
<tr>
<td>2 Wheeler (Scooter, motorcycle, cycle etc)</td>
<td>15</td>
</tr>
</tbody>
</table>
### Table 3.30: Assessment of proposed Traffic Load

<table>
<thead>
<tr>
<th>Type of Vehicles</th>
<th>Road from internal road of GIDC Dahej to GIDC main road; two way single road</th>
<th>PCU factor as per Indian Road Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Vehicles Per Hour (Worst Case)</td>
<td>Equivalent PCU (Passenger Car Unit) per hour</td>
</tr>
<tr>
<td>Large Trailer</td>
<td>0.5</td>
<td>2.25</td>
</tr>
<tr>
<td>Heavy (Bus, Truck, etc)</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Medium (Tractors, light commercial vehicles etc)</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Light (Car, Jeep, Pick up Van etc.)</td>
<td>9.5</td>
<td>9.5</td>
</tr>
<tr>
<td>3 Wheeler (Rickshaw)</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2 Wheeler (Scooter, motorcycle, cycle etc)</td>
<td>16.5</td>
<td>8.25</td>
</tr>
<tr>
<td><strong>Total PCU/hr</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Width of Road (m)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Design PCU per hour</strong></td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td><strong>Existing PCU per hour</strong></td>
<td></td>
<td>44</td>
</tr>
<tr>
<td><strong>Proposed Load (light vehicle/day)</strong></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td><strong>Proposed PCU per day</strong></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td><strong>As a Worst Scenario taken</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Proposed PCU per day as PCU per hour</strong></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td><strong>Total PCU per hour after the Proposed Project</strong></td>
<td></td>
<td>53</td>
</tr>
</tbody>
</table>

Traffic survey has been carried out on road from internal road of GIDC Dahej-II to GIDC main road. Based on the traffic survey hourly vehicular traffic has been calculated. Considering worst case scenario, average number of vehicles observed during 4 hours has been taken as hourly counts. Passenger Car Unit (PCU) has been calculated by applying PCU factor. Proposed load of trucks due to the movement of raw materials, fuel and products has been calculated. A design capacity of road has been taken from the Indian Road Code. Assessment of proposed traffic load is given in below table. From the above table, it can be concluded that even for considering the worst case; there will be minor increase in vehicular load due to the proposed project. However, the total traffic load even after the proposed project will be very low compare to the design capacity of roads. Adequate parking arrangements will be provided within the industrial premises.

As no major increase in traffic due to the proposed project, there will be less chance in increase in vehicular pollution. However, unit will take adequate measures by instructing transporter for using only PUC certified trucks/vehicles and carrying out regular service and maintenance of them.
CHAPTER – 4 ANTERIATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 IDENTIFICATION OF IMPACT

This chapter identifies and predicts the potential impacts on different environmental components due to the construction and operation of the proposed project. It details all the potential impacts on biophysical and socio-economic components of the local environment due to the proposed activities and sub-activities.

Prediction of impacts is the most important component in the Environmental Impact Assessment studies. Several qualitative and quantitative techniques and methodologies are used to conduct analysis of the potential impacts likely to build up as a result of the proposed development activities on physico-chemical, ecological and socio-economic environments. Such predictions are superimposed over the baseline (pre-project) status of the environmental quality to derive at the ultimate (post-project) scenario of environmental conditions. The prediction and identification of impacts helps to minimize the adverse impacts and maximize the beneficial impacts on environmental quality during pre and post project execution.

4.2 VALUED ENVIRONMENTAL COMPONENTS

The project activities will interact with various valued Environmental Components viz.,

- Air Environment
- Noise Environment
- Water Environment
- Land Environment
- Terrestrial Ecology
- Socio-economic Environment

Proposed project is located in notified industrial area of Dahej. Potential impacts that may occur due to the proposed project activities in both construction and operation phase have been identified and evaluated and are summarized in the following sections.

4.3 POTENTIAL IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION PHASE

Proposed project related various activities during construction phase have been identified as sources having potential to cause impact upon various environmental attributes;

- Site cleaning
- Leveling and road laying
- Earthwork comprising of excavation, grading, trenching
- Transportation of construction materials
- Civil construction
- Water requirement and wastewater generation
- Mechanical erection
- Employment
- Greenbelt development

The key problem anticipated would be increase in dust contamination and noise. However, these impacts would be for a limited period of time i.e. up to construction period only. Potential impacts due to above construction activities and its mitigation measures are given below.

**Table 4.1: Construction phase–impacts and mitigation measures**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Environmental Component</th>
<th>Potential Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Air</td>
<td>Short term negative impact</td>
</tr>
<tr>
<td></td>
<td><strong>Mitigation Measures:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The emissions will be temporary and limited within project boundary. So, it is not expected to contribute significantly to the ambient air quality. However, unit will take following measures for control of dust emissions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- All transportation vehicles will be suitably covered with tarpaulin &amp; overloading of the vehicles will be avoided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Storage of sand and other such dispersible material by covering with tarpaulin sheet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Keeping minimum inventory/stock of sand and other such dispersible material at site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The heights, from which materials will be dropped, will be the minimum practical height to limit fugitive dust generation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Use of water sprinkling system at site for dust suppression</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Provision of barricade sheet of steel sheet/ tin sheet of minimum 3 m heights to protect the surrounding area from the dust</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Upwind portion of the project will be constructed first</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- PUC certified vehicles will be used to avoid the exhaust emission</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The construction activity will be carried out during day time only.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Greenbelt development will be started with construction phase</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Noise</td>
<td>Short term negative impact</td>
</tr>
<tr>
<td></td>
<td><strong>Mitigation Measures:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The impacts will be temporary and limited within project boundary and some extent to adjacent plots. So, it is not expected to contribute significantly to the ambient noise. However, unit will take following measures for control of noise:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The noise generated from construction machinery will be kept low by keeping the moving parts serviced and properly lubricated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Adequate PPE’s (ear plugs, ear muffs, helmet, mask etc) will be provided to the workers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The construction activity will be carried out during day time only.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- All transportation vehicles will be suitably covered with tarpaulin &amp; overloading of the vehicles will be avoided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Vehicular movement carrying raw materials will be avoided during night time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The vehicles will be regularly maintained and optimum use of the same will be made.</td>
<td></td>
</tr>
</tbody>
</table>
### Chapter-4: Anticipated Environment Impacts And Mitigation Measures

#### 4.3 Water

<table>
<thead>
<tr>
<th>Mitigation Measures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Water requirement for construction phase will be not much and for short period and the same will be fulfilled by GIDC water supply.</td>
</tr>
<tr>
<td>▪ The wastewater generation will be from the domestic activities which will be disposed of into soak pit through septic tank.</td>
</tr>
<tr>
<td>▪ Thus, there will not be any adverse impact on water environment. However, unit will take following measures:</td>
</tr>
<tr>
<td>▪ Adopting good construction and engineering practices will help in fresh water conservation and reducing the water pollution. The construction activity will be carried out during day time only.</td>
</tr>
<tr>
<td>▪ Measures will be implemented to prevent seepage of liquid materials into ground where it could contaminate groundwater and soil like Ensure prompt cleaning up of accidental spillages; Measures will be followed to prevent the contamination of hydrological features by diesel, grease, oil, etc. derived from the working area; The machinery / equipment will be maintained in a good operating condition; Specially designated areas will be created for vehicle maintenance.</td>
</tr>
</tbody>
</table>

#### 4.4 Land

<table>
<thead>
<tr>
<th>Mitigation Measures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Project will be established on GIDC allotted non-agriculture plot.</td>
</tr>
<tr>
<td>▪ Therefore no change will occur in land use pattern as well as there will not be any significant topographical change. However, temporary change in top layer of soil will be occurred but the construction activity will help in fixation of soil, thereby reducing the soil erosion.</td>
</tr>
<tr>
<td>▪ Top soil to be generated during construction activity will be preserved and used for the green belt development. Other excavated earth from the construction activity will be used for the backfilling and leveling in low laying area.</td>
</tr>
<tr>
<td>▪ Greenbelt development will have significant impact in reduction of the soil erosion.</td>
</tr>
</tbody>
</table>

#### 4.5 Ecology

Unit will start developing greenbelt area from construction phase which will have positive impact on local flora & fauna.

#### 4.6 Socio-economic environment

Temporary employment will be generated due to construction activities and related services like transportation of construction materials, mechanical erections etc.

---

### 4.4 POTENTIAL IMPACTS AND MITIGATION MEASURES DURING OPERATION PHASE

Proposed project related various activities during operation phase have been identified as sources having potential to cause impact upon various environmental attributes;

| ▪ Raw material and product storage & handling |

---
Potential Environmental Impact Matrix

This methodology incorporates a list of project activities with a checklist of environmental components that might be affected. Matrix methods incorporate environmental conditions on one axis and proposed actions on the other.

The interaction between project activities and environmental parameters described above are shown in the impact matrix in the below table. The matrix points out each activity and its impact on specific environmental parameters. This is a qualitative work and does not indicate quantitative impact. Some of the impacts are temporary and localized and some impacts are short term and long term in the matrix.

**Table 4.2: Potential Environmental Impact Matrix**

<table>
<thead>
<tr>
<th>Env. Attributes</th>
<th>Air</th>
<th>Water</th>
<th>Land</th>
<th>Noise</th>
<th>Flora &amp; Fauna</th>
<th>Health (Individual/Community, Occupational)</th>
<th>Socio economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production Activity</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>LT -ve</td>
<td>-</td>
</tr>
<tr>
<td>Material Storage, Transportation and handling</td>
<td>ST -ve</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ST -ve</td>
<td>-</td>
</tr>
<tr>
<td>Solvent handling</td>
<td>ST -ve</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ST -ve</td>
<td>-</td>
</tr>
<tr>
<td>Gaseous Emissions</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>-</td>
<td>ST -ve</td>
<td>ST -ve</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Effluent generation</td>
<td>-</td>
<td>ST -ve</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Green belt Development</td>
<td>LT +ve</td>
<td>LT +ve</td>
<td>LT +ve</td>
<td>LT +ve</td>
<td>LT +ve</td>
<td>LT +ve</td>
<td>--</td>
</tr>
<tr>
<td>Employment</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>LT +ve</td>
<td>LT +ve</td>
</tr>
</tbody>
</table>

Potential impacts due to proposed plant operation w.r.t. environmental components are discussed with the mitigation measures here below;
4.4.1. Air Environment

Long term impacts on the air quality are anticipated due to operational activities mainly manufacturing of API. Main source of air pollution will be flue gas emission due to occasional use of D. G. Set (Stand-by) and process emission. The significant pollutants are PM, SO$_2$ & NO$_x$ in flue gas emission and HCl in process gas emission. There will be chances of fugitive emission due to manufacturing activities and chemical handing & transportation.

The baseline ambient air quality status in the study area during monitoring season indicates that pollutants are well within the prescribed National Ambient Air Quality Standards. Impact of a source or a group of sources on air quality has been evaluated using mathematical models as described in following topic.

Air Quality Modelling

AERMOD View-Lake Environmental Software, which is a Gaussian-Plume atmospheric dispersion algorithm for estimating concentration of pollutant, has been used to predict the Ground Level Concentrations (GLC’s) of PM$_{10}$, SO$_2$, NO$_x$ and HCl due to plant activity. The GLC’s were predicted on 24 hourly average bases keeping in view the prescribed national ambient air quality standards (NAAQS).

Data used for Modelling

The hourly meteorological data along as summarized in chapter-with emission rate for individual pollutants used for prediction of air quality impacts as given in chapter 2 has been taken into consideration.

Particulate matter (PM)

The predicted concentrations of PM are shown in the form of isopleths in Figure 4.1 and Table 4.3.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from Project Site</th>
<th>Predicted GLC (Avg.) µg/m$^3$</th>
<th>Baseline result (Avg.) µg/m$^3$</th>
<th>Incremental result after development of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AAQ-1</td>
<td>Project Site</td>
<td>-</td>
<td>0.0</td>
<td>78.94</td>
<td>78.94</td>
</tr>
<tr>
<td>2</td>
<td>AAQ-2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>0.01125</td>
<td>77.79</td>
<td>77.80125</td>
</tr>
<tr>
<td>3</td>
<td>AAQ-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>0.00186</td>
<td>73.14</td>
<td>73.14186</td>
</tr>
<tr>
<td>4</td>
<td>AAQ-4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>0.00051</td>
<td>71.45</td>
<td>71.45051</td>
</tr>
<tr>
<td>5</td>
<td>AAQ-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>0.00228</td>
<td>84.85</td>
<td>84.85228</td>
</tr>
<tr>
<td>6</td>
<td>AAQ-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>0.00080</td>
<td>81.02</td>
<td>81.02080</td>
</tr>
<tr>
<td>7</td>
<td>AAQ-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>0.00131</td>
<td>80.88</td>
<td>80.88131</td>
</tr>
<tr>
<td>8</td>
<td>AAQ-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>0.00080</td>
<td>75.38</td>
<td>75.38080</td>
</tr>
</tbody>
</table>
Figure 4.1: Ground Level Concentration of PM
**Sulphur dioxide (SO$_2$)**

The predicted concentrations of SO$_2$ for study period are shown in the form of isopleths in Figure 4.2 and Table 4.4.

**Table 4.4: Ground level Concentration of SO$_2$ in $\mu g/m^3$**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from Project Site</th>
<th>Predicted GLC $\mu g/m^3$</th>
<th>Baseline result (Avg.) $\mu g/m^3$</th>
<th>Incremental result after development of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AAQ-1</td>
<td>Project Site</td>
<td>-</td>
<td>0.0</td>
<td>13.50</td>
<td>13.5</td>
</tr>
<tr>
<td>2</td>
<td>AAQ-2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>0.01635</td>
<td>14.46</td>
<td>14.47635</td>
</tr>
<tr>
<td>3</td>
<td>AAQ-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>0.00270</td>
<td>12.58</td>
<td>12.58270</td>
</tr>
<tr>
<td>4</td>
<td>AAQ-4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>0.00074</td>
<td>11.98</td>
<td>11.98074</td>
</tr>
<tr>
<td>5</td>
<td>AAQ-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>0.00331</td>
<td>15.02</td>
<td>15.02331</td>
</tr>
<tr>
<td>6</td>
<td>AAQ-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>0.00117</td>
<td>13.44</td>
<td>13.44117</td>
</tr>
<tr>
<td>7</td>
<td>AAQ-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>0.00191</td>
<td>12.99</td>
<td>12.99191</td>
</tr>
<tr>
<td>8</td>
<td>AAQ-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>0.00116</td>
<td>13.41</td>
<td>13.41116</td>
</tr>
</tbody>
</table>
Figure 4.2: Ground Level Concentration of SO$_2$
Oxides of Nitrogen (NO\textsubscript{x})

The predicted concentrations of NO\textsubscript{x} for study period are shown in the form of isopleths in Figure 4.3 and Table 4.5.

**Table 4.5: Ground level Concentration of NO\textsubscript{X} in \(\mu g/m^3\)**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from Project Site</th>
<th>Predicted GLC (\mu g/m^3)</th>
<th>Baseline result (Avg.) (\mu g/m^3)</th>
<th>Incremental result after development of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AAQ-1</td>
<td>Project Site</td>
<td>-</td>
<td>0.0</td>
<td>15.19</td>
<td>15.19</td>
</tr>
<tr>
<td>2</td>
<td>AAQ-2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>0.00616</td>
<td>16.04</td>
<td>16.04616</td>
</tr>
<tr>
<td>3</td>
<td>AAQ-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>0.00104</td>
<td>14.42</td>
<td>14.42104</td>
</tr>
<tr>
<td>4</td>
<td>AAQ-4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>0.00028</td>
<td>13.99</td>
<td>13.99028</td>
</tr>
<tr>
<td>5</td>
<td>AAQ-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>0.00125</td>
<td>16.90</td>
<td>16.90125</td>
</tr>
<tr>
<td>6</td>
<td>AAQ-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>0.00044</td>
<td>15.66</td>
<td>15.66044</td>
</tr>
<tr>
<td>7</td>
<td>AAQ-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>0.00072</td>
<td>15.10</td>
<td>15.10072</td>
</tr>
<tr>
<td>8</td>
<td>AAQ-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>0.00044</td>
<td>15.53</td>
<td>15.53044</td>
</tr>
</tbody>
</table>
Chapter-4: Anticipated Environment Impacts And Mitigation Measures
Hydrochloric Acid (HCl)

The predicted concentrations of HCl for study period are shown in the form of isopleths in Figure 4.4 and Table 4.6.

**Table 4.6: Ground level Concentration of HCl in µg/m³**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Location Code</th>
<th>Name of Location</th>
<th>Distance &amp; Direction from Project Site</th>
<th>Predicted GLC µg/m³</th>
<th>Baseline result (Avg.) µg/m³</th>
<th>Incremental result after development of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AAQ-1</td>
<td>Project Site</td>
<td>-</td>
<td>0.0</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>2</td>
<td>AAQ-2</td>
<td>Vadadla</td>
<td>1.04, ENE</td>
<td>0.00228</td>
<td>1.5</td>
<td>1.50228</td>
</tr>
<tr>
<td>3</td>
<td>AAQ-3</td>
<td>Vav</td>
<td>3.29, NNE</td>
<td>0.00045</td>
<td>1</td>
<td>1.00045</td>
</tr>
<tr>
<td>4</td>
<td>AAQ-4</td>
<td>Paniadara</td>
<td>7.94, NNE</td>
<td>0.00014</td>
<td>1</td>
<td>1.00014</td>
</tr>
<tr>
<td>5</td>
<td>AAQ-5</td>
<td>Dahej</td>
<td>3.97, WSW</td>
<td>0.00071</td>
<td>1.2</td>
<td>1.20071</td>
</tr>
<tr>
<td>6</td>
<td>AAQ-6</td>
<td>Luvara</td>
<td>8.95, WSW</td>
<td>0.00032</td>
<td>1.5</td>
<td>1.50032</td>
</tr>
<tr>
<td>7</td>
<td>AAQ-7</td>
<td>Ambetha</td>
<td>5.30, SW</td>
<td>0.00045</td>
<td>1</td>
<td>1.00045</td>
</tr>
<tr>
<td>8</td>
<td>AAQ-8</td>
<td>Suva</td>
<td>5.31, SSE</td>
<td>0.00018</td>
<td>1</td>
<td>1.00018</td>
</tr>
</tbody>
</table>
**Figure 4.4: Ground Level Concentration of HCl**

![Wind Rose Plot](image)

**Comments:**

- Company: Envirolab Consultants
- Name: Nikunj Makwana
- Start Date: 01/Oct/18 - 06:00
- End Date: 31/Oct/18 - 23:00
- Average Wind Speed: 3.12 m/s
- Total Count: 2257 hrs.
- Company Name: Envirolab Consultants

**Environmental Impacts and Mitigation Measures:**

Chapter 4: Anticipated Environment Impacts And Mitigation Measures 4.12

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Sanjivani Pharma
GIDC Dahej - II
Ta.: Vagra, Dist.: Bharuch
The prediction results corresponding to PM, SO₂, NOₓ and HCl as shown above indicate that the air quality impacts with respect to pollutants exclusively from the proposed projects would be insignificant and the post-project status shall remain under prescribed NAAQS for Industrial, Residential and other areas.

Also, during the operation phase of the project, the impacts on air quality due to vehicular emissions will be very less. Considering the nature of activities, which the proposed project will be result, less number of vehicular movements within the site and low threshold values, air pollution is not expected to be a major concern. It is for these reasons that the ambient air quality predictions using models have not been carried out for fugitive emissions from vehicles.

**Mitigation measures:**
- For D.G. set, as the same will be kept as standby and diesel will be used as fuel, adequate stack height will be provided.
- For HCl emission, water scrubber will be provided with adequate stack height for proper dispersion of pollutant.
- Unit will take care of fugitive emission also and will provide following measures;
  - The entire manufacturing activity will be carried out in closed reactors/vessels and regular checking and maintenance of the same will be carried out to avoid any leakages.
  - Solvent recovery plant equipped with two stage condenser having sufficient heat transfer area will be installed and operated efficiently.
  - Quarterly monitoring will be carried out by NABL approved laboratory for work area.
  - All the motors of pumps for the handling of hazardous chemicals will be flame proof and provided with suitable mechanical seal with stand-by arrangement.
  - Monitoring and control of all parameters on a continuous basis will be done by adequate control valves, pressure release valves and safety valves etc.
  - All the flange joints of the pipe lines will be covered with flange guards.
  - All the raw materials will be stored in isolated storage area and containers will be tightly closed.
  - Usage of closed handling system for odorous chemicals /solvents as far as possible.
  - Transfer of odorous chemicals to be done preferably during day time. Avoid transfer during odd hours.
  - There will be a provision of adequate ventilation system in process plant and hazardous chemical storage area.
  - A regular preventive maintenance will be carried out to replace or rectify all gaskets, joints etc.
  - Precautionary measures will also be taken while handling various hazardous chemicals although in case of any accidental spillage, attended immediately and properly by collecting, absorbing, neutralizing, etc as applicable
  - Carry out work area monitoring regularly to measure VOC / hazardous chemicals.
  - The unit will develop green belt within the factory premises which will control the fugitive emissions from spreading into surrounding environment.
Thus, there will not be any significant adverse impact on ambient air due to provision of adequate pollution control facilities and measures to be taken.

4.4.2. Noise Level

Operational phase impacts on noise level will mainly result from the operation of plant machineries and D.G set. However, there will not be any larger types of machineries will be provided which generate high magnitude noise. Noise level where predicted to exceed 75 dB(A), workers there shall be provided with personal protective equipments (PPEs). Noise may also be generated due to movement of heavy vehicles, medium vehicles and automobiles during operational phase. However, it has been envisaged that increase in noise impacts due to vehicular movement will be temporary and marginal to be considered for their impacts on nearby human settlement.

Mitigation measures:
- Employees should be provided with Personal Protective Equipment like earplugs or earmuffs, wherever required.
- Periodic maintenance of machinery and vehicles should be undertaken to reduce the noise impact.
- Noise suppression measures such as enclosures, buffers and/or protective measures should be provided (wherever noise level is more than 75 dB (A)).

Thus, there will not be any significant adverse impact on ambient noise due to proposed activities.

4.4.3. Water Environment

Total water requirement for the proposed project will be 17 KLD, out of which 5.0 KLD will be used for domestic purposes, 3.7 KLD for industrial purposes and 8.3 KLD for gardening use. Water requirement will be fulfilled through GIDC water supply. No bore well will be dug in premises. There will a sewage generation of 4 KLD and industrial effluent generation will be 1.45 KLD.

Mitigation measures:
- Wastewater generated @ 1 KLD from washing, Cooling, Scrubbing and Equipment Cleaning will be collected and treated in in-house Effluent treatment plant having primary followed by tertiary treatment. Treated water will be discharged to CETP.
- Wastewater generated from process @ 0.45 KLD will be collected and sent to Common MEE for further treatment.
- Wastewater generation from domestic activity will be disposed of by soak pit via septic tank.
- Flow meters will be provided at water intake and ETP inlet and outlet. Records of water consumption, wastewater generation and discharge will be maintained.
- Water conservation practices will be adopted and latest technologies will be adopted for optimum resources consumption with minimum waste generation.
Thus, the proposed project will not have any significant impact on surface as well as ground water environment.

4.4.4. Land Environment

Proposed project plot is located in GIDC so there will not any change in land cover and land use due to proposed project. Due to GIDC plot no major area grading will be required. Also out of total area of the project site is 5000 m², 1663 m² (33.3%) area has been earmarked for the green area development. The green area development and tree plantation will help in enhancing the aesthetics of the plant and help in reducing soil erosion.

Discarded drums/Containers & used/spent oil are the hazardous waste to be generated from raw material packing and storage and plant & Machineries. Process waste, spent carbon and spent solvents will be generated from the manufacturing process. Distillation residue will be generated from solvent recovery and spent HCl will be generated from water scrubber provided to reaction vent. Chemical sludge will be generated from effluent treatment plant.

Mitigation Measures:
Designated hazardous waste storage area having separate storage part for each waste will be provided with leachate collection system and top cover.

Empty drums and bags will be sent to authorized vendors for further recycle purpose, while used oil will be reused as lubricant within the premises and excess, if any, will be sold to authorized re-processors. Process waste and ETP sludge will be sent to TSDF site. Spent solvent recovery will be carry out in in-house distillation assembly. Recovered solvents will be reused in next batch. Distillation residue and spent carbon will be sent to common incineration facility. Unit has already taken membership of hazardous waste disposal facilities.

Hazardous waste generated from the facility shall be disposed off in suitable manner as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Proper housekeeping practices will adopt to avoid any kind of land contamination. The record of all the hazardous wastes generation and disposal shall be maintained.

Hazardous chemicals will be stored in isolated storage with all the precautionary measures. So, there will be no chance of any kind of land contamination from chemical or waste spillage.

4.4.5. Socio-Economic Environment

The proposed project will have some positive impact on the industrial growth in the region. It is anticipated that during the operation phase, the proposed project will generate direct employment as well as indirect employment due to sales / transportation etc.

Mitigation Measures:
The overall project will have a long term benefit and hence no mitigation measure will be required. However, as per the skills, preference to local people shall be given in employment.

### 4.4.6. Ecology and Biodiversity

The project activity does not require tree cutting during land clearing also, the study zone does not have any ecologically sensitive location and hence, the plant activities are not expected to have any impact on the ecology and biodiversity.

**Mitigation Measures:**
A total of 1663 m$^2$ area has been earmarked for greenbelt development, which will help in development of biodiversity. The indigenous plants shall be planted along with ornamental trees/shrubs to provide an aesthetic environment within and around the plant. The maintenance of the greenbelt developed shall be ensured and survival rate of the plants shall also be studied every half yearly.

### 4.4.7. Odour Problem

Some of the processes and wastes generated from the plant may release high odour. Undesirable odour contributes to air quality concerns and affect human lifestyles. On the economic front, loss of property value near odour-causing operations/industries and odorous environment is partly a consequence of offensive odour. Odour is undoubtedly the most complex of all the air pollution problems. Mainly odour generated by the industries varies enormously since they can be generated during the production, processing, or even in the waste water treatment areas of the plants.

**Mitigation Measures:**
- Odour causing raw materials will be charged in closed chambers with exhaust of chambers connected to ducting system.

**Additional Measures**
- Odour rounds by non-plant personnel will hold regular meetings and “odour rounds” in the factory premises for ensuring effective implementation of odour control measures.
- As a long term measure to improve the environment, plantation of trees within factory premises as well as along the nearby roads is proposed.
- De-odorizer solution will be sprayed through special network, which will be laid around the plant. It will help in neutralizing the fugitive emissions.
- Beneath all sample points/ drain points, spill control powder containing trays will be kept so as to adsorb even slightest of leakage, if at all arises from these points.

### 4.4.8. Overall Impact Analysis

Critical analysis of the existing physical and socio-economic profile of the area vis-à-vis its scenario with proposed project activities, identifies the following impacts:
**Positive Impacts**

The positive impacts of the proposed project are as given below:

- The proposed project would enhance employment opportunities for the local people.
- There will not be any adverse impact on communication and transportation.
- Residential/Built up will not be acquired for the proposed project and hence there is no displacement of population.

**Negative Impacts**

There will be temporary negative impacts of the proposed project:

- Air emissions and its impacts shall be properly minimize and taken care off.

Thus, no adverse impact is expected on surrounding environment and community health.
CHAPTER – 5 ANALYSES OF ALTERNATIVES (SITE & TECHNOLOGY)

5.1 ALTERNATIVE FOR SITE

This is a new proposed unit for manufacturing of synthetic organic chemicals within the GIDC allotted plot. Considering the availability of following supporting features at selected plot, no other sites were analysed;

- Availability of all basic facilities like infrastructure, communication, Transportation, medical facilities, fuel, water, power, unskilled & skilled manpower, raw materials, road network etc.
- Proximity of market;
- Nearest town Dahej are 3.5 km away from the project site which is very well connected with other parts of the country by road & rail;
- No R & R will be required;
- Easy availability of manpower for proposed project activities;

5.2 ALTERNATIVE FOR TECHNOLOGIES

The unit will manufacture active Pharmaceutical Ingredients (API) products which will involve various chemical reactions and physical operations and for the same unit will adopt latest and best technology available so far in the market for the manufacturing of such products. Moreover, the unit is very concerns and conscious about the product quality and equally about the environmental protection and resource conservation; and hence will continuously put efforts for upgrading plant and machineries from time to time with the best available technology for the pharmaceutical industry.
CHAPTER – 6 ENVIRONMENT MONITORING PROGRAM

6.1 ENVIRONMENTAL MONITORING PROGRAM

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment. Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. All monitoring strategies and program have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters. Environmental Monitoring program will be designed for operation phase of the project for monitoring of various environmental parameters like air, water, noise, soil etc.

6.2 OBJECTIVES OF MONITORING

- To comply with the statutory requirements of monitoring for compliance with conditions of EC, NOC and CC&A.
- To comply with the provision of factory Act.
- To verify the result of the impact assessment study in particular with regards to new development.
- Identification of any significant adverse transformation in environmental condition to plan additional mitigation measures; if & as required.
- To check or assess the efficiency of the controlling measures.
- To ensure that new parameters, other than those identified in the impact assessment study, do not become critical through the commissioning of new project.
- To establish a data base for future impact assessment studies for new project.

6.3 ENVIRONMENTAL MONITORING PROGRAM

Environmental Monitoring will be carried out on regular basis during operation phase of the project. Environmental Monitoring plan for the proposed project is given in Table 6.1.

Table 6.1: Environmental Monitoring Plan (During Operational Phase)

<table>
<thead>
<tr>
<th>Component</th>
<th>Parameters</th>
<th>Location</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Air Quality</td>
<td>PM$<em>{10}$, PM$</em>{2.5}$, SO$_2$, NOx, HCl</td>
<td>Two within premises and one outside gate</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Point Source Emissions</td>
<td>Particulates, SO$_2$, NOx, HCl</td>
<td>Each stack</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Work area</td>
<td>HCl, VOC and as</td>
<td>4 locations</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Component</td>
<td>Parameters</td>
<td>Location</td>
<td>Frequency</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------</td>
<td>---------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Water quantity</td>
<td>Stream-wise consumption</td>
<td>Intake source and individual main usage area</td>
<td>Regularly</td>
</tr>
<tr>
<td>Water quality</td>
<td>As per IS 10500</td>
<td>Intake source</td>
<td>Twice in a year</td>
</tr>
<tr>
<td>Wastewater quantity</td>
<td>Stream-wise generation</td>
<td>Individual generation sources</td>
<td>Regularly</td>
</tr>
<tr>
<td>Wastewater quality</td>
<td>pH, TDS, COD</td>
<td>Treated and untreated</td>
<td>Regularly</td>
</tr>
<tr>
<td></td>
<td>General parameters</td>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td>Noise level</td>
<td>Noise levels</td>
<td>At prominent places in the premises</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Occupational Health</td>
<td>All relevant parameters</td>
<td>All workers</td>
<td>Regularly check ups</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>General parameters</td>
<td>ETP sludge</td>
<td>Annually</td>
</tr>
</tbody>
</table>

### 6.4 INFRASTRUCTURAL REQUIREMENT FOR MONITORING

Unit will establish a small scale laboratory for regular wastewater monitoring as proposed above. Flow meters will be provided at fresh water intake and main usage lines and at the inlet and outlet of ETP. Record will be maintained of all this meters as well as wastewater to be sent to common MEE. In addition to this, regular monitoring will be carried out by NABL approved laboratory as proposed in monitoring plan. Unit will develop occupational health center inside the plant premises with first aid box, antidotes and general medicines. Doctor will be appointed for regular check up. All medical records will be maintained as per the Factory Act in Form No. 33. The unit will also made necessary tie-up with nearby hospitals for the medical assistance in case of any emergency.

### 6.5 ENVIRONMENTAL MANAGEMENT CELL

For effective implementation of the monitoring program, it is necessary to have a permanent organizational set-up. Thus, unit will set-up permanent environmental management cell (EMC) for the effective implementation and monitoring of environmental management system as given below.

EMC will monitor all project activities to ensure the appropriate implementation of all environmental mitigation activities and to identify areas where environmental management plan compliance is not satisfied. Responsibilities will be assigned to officer from various disciplines to perform and co-ordinate the activities concerned with management and implementation of environmental.
control measures. Managing Partner of the company will be responsible for overall environmental management. Manager will inform all the matter regarding environmental management including reporting of non-compliances / violations of environmental norms.

**Figure 6.1: Environmental Management Cell**

```
Managing Partner
  ↓
Manager
  ↓
EHS Officer
```

### 6.6 DATA ANALYSIS, DOCUMENTATION & REPORTING

All environmental monitoring data will be stored as computer database by the Environmental Management Cell (EMC) for proper storage, retrieval and interpretation of the same. A regular database format will be maintained to keep a track of monitored parameters and causes will be identified in case of non-conformity with the permissible limits.

Reporting of environmental performance with reference to EMP will be carried out. The EHS officer will co-ordinate all monitoring programs and data to be generated will be submitted regularly to the manager and ultimately to statutory agencies. Frequency of reporting will be as per the proposed monitoring plan and as per the requirement of GPCB and SEIAA.
7.1 RISK ASSESSMENT

A three 'levels' risk assessment approach has been adopted for Sanjivani Pharma at Plot No. D-2-CH-105, GIDC Dahej-II, Taluka: Vagra, District: Bharuch, Gujarat. Unit proposes to manufacture 1350 Kg/month of various API products. The risk assessment levels are generally consistent with the practices encountered through various assignments for medium and large chemical complexes. The brief outline of the three tier approach is given below:

- **Level 1–Risk Screening**
  This is top-down review of worst-case potential hazards/risks, aimed primarily at identifying plant sites or areas within plant, which pose the highest risk. Various screening factors considered include:
  - Inventory of hazardous materials;
  - Hazardous Materials properties;
  - Storage conditions (e.g. temperature and pressure);
  - Location sensitivity (distance to residential areas/populace).
  The data/information is obtained from plant. The results provide a relative indication of the extent of hazards and potential for risk exposure.

- **Level 2–Major Risk Survey** (Semi - Quantitative)
  The survey approach combines the site inspection with established risk assessment techniques applied both qualitative as well quantitative mode. The primary objective is to identify and select major risks at a specific location in the plant considering possible soft spots/weak links during operation/maintenance. Aspects covered in the risk usually include:
  - Process Hazards;
  - Process Safety Management Systems;
  - Fire Protection and Emergency response equipment and programs.
  - Security Vulnerability;
  - Impact of hazards consequences (equipment damage, business interruption, injury, fatalities);
  - Qualitative risk identification of scenarios involving hazardous materials;
  - Risk reduction measures.

- **Level 3–Quantitative Risk Assessment** (Deterministic)
  This is the stage of assessment of risks associated with all credible hazards (scenarios) with potential to cause an undesirable outcome such as human injury, fatality or destruction of property. The four basic elements include:
  - Hazards identification utilizing formal approach (Level 2, HAZOP etc.);
  - Frequency Analysis. Based on past safety data (incidents / accidents); identifying likely pathway of failures and quantifying the toxic / inflammable material release;
• Hazards analysis to quantify the consequences of various hazards scenarios (fire, explosion, BLEVE, toxic vapour release etc.). Establish minimum value for damage (e.g. IDLH, over pressure, radiation flux) to assess the impact on environment.

• Risk Quantification: Quantitative techniques are used considering effect/impact due to weather data, population data, and frequency of occurrences and likely hood of ignition/toxic release. Data are analyzed considering likely damage (in terms of injury/fatality, property damage) each scenarios is likely to cause.

QRA provides a means to determine the relative significance of a number of undesired events, allowing analyst and the team to focus their risk reduction efforts where they will be beneficial most.

7.1.1 Objective of the Study

The objective of the risk analysis includes the following:

➢ Identification of hazards
➢ Selection of credible scenarios.
➢ Consequence analysis of selected accidents scenarios.
➢ Risk mitigation Measures.

Accidental risk involves the occurrence or potential occurrence of some accident consisting of an event or sequence of events resulting into fire, explosion or toxic hazards to human health and environment.

The hazard potential and estimation of consequences in case of its accidental release are the issues of immediate relevance to be considered. It is therefore, imperative to carry out Maximum Credible Accident (MCA) analysis at the first stage, which identifies vulnerable areas around the facility and suggests a set of recommendations to improve safety.

The work undertaken consists of the following stages:

Collection of relevant data on project description and proposed activities.

7.1.2 Hazard identification

Mapping the process by step by step in a specific workplace area, tasks in process or activities making up a task by utilizing the existing company documentation. The actual hazard likely to be encountered will vary depending upon equipment and structured being design. A selection of principal hazard to be considered would include trapped by something collapsing or overturning, stuck by moving vehicle, contact with electricity or an electric discharge, stuck by falling/ flying objects, Contact with moving machinery, leakage slippage of waste or raw material.
7.1.3 Ways to minimize the manual handling of the hazardous chemicals

1. Forklifts are used for unloading chemical barrels/carboys, their movements within plant, handling carboys, bulk chemical bags, etc.
2. Cranes, hoists, pallet trucks, conveyors, etc. are used as per the requirement, to eliminate manual handling.
3. Lifting tools & tackles are used, wherever required.
4. SOPs, work instructions are prepared and followed.
5. Trainings are provided to relevant staff, operators, workers for the risk associated with manual handling of hazardous chemicals, ways to overcome those risk, etc.

7.1.4 Action Plan for Consumption, Storage & Transportation of Hazardous Chemicals

Flammable chemicals will be stored in open area outside the process plant with all the safety measures. Hazardous chemicals will be stored and handle in dispensing room for taking out sample from the container for quality check-up purpose or for the partial use. This activity for Hazardous material handling will be carried out by using all PPEs with proper ventilation & under supervision.

a) Storage of Hazardous Chemicals
   - The drums should never be filled full with the liquid chemical. There should be sufficient space to take care of thermal Greenfield. The drums should preferably be stored in a well-ventilated shed (preferably away from process units) with impermeable floor sloping away from drums.
   - The storage area should be declared as a prohibited area and should be provided with fencing having at least two exits. “No Smoking” and/or “Prohibited Area” display boards, as applicable should be provided at site.
   - The storage foundation should be of suitable material of construction to prevent corrosion.
   - The inventory of all hazardous chemicals for that matter must be kept as minimum as possible.
   - All cables and electric fittings shall be constructed, installed, protected, operated and maintained in such a manner so as to prevent risk of open sparking.
   - Periodic site inspection should be carried.

b) Process of Hazardous Chemicals
   - Any reaction upsets will be confined to the reaction vessel itself as defined quantity of raw materials will be issued to the reaction vessel by metering pumps/load cells.
   - Process parameters control will be provided as per SOP- Standard Operating Procedures. Materials will be transferred by pumping through pipeline or by vacuum from drums.
   - Trained person will be engaged for handling of hazardous materials. Proper safety precautions will be taken during handling of hazardous materials.
- All solvents and flammable material with required quantity will be charge in reactor by pump or by gravity. All the vessels will be examined periodically by a recognized competent person.
- All the vessels and equipments will be well earthed appropriately and well protected against Static Electricity.

c) Handling of Hazardous Chemicals
- All Hazardous and flammable chemicals will store separately and away from the strong oxidant & kept it in well ventilated room. Adequate fire-fighting system will be installed. Safety shower and eye washer will be installed near storage area. Flame proof light fitting will be provided at storage area.
- Sprinkler system will be installed near storage area. Safety permit system will be followed for loading and unloading. Isolate storage will be provided with wire fencing under lock and key.
- Caution note, hazardous identification board will be provided. Only authorized person will be permitted in storage area and register will be maintained. Wind Indicator and siren will be provided.

d) Transportation of Hazardous chemicals
It will be ensure that during the transportation contents are not spilled, packaging is not damaged and personnel are properly trained to generate, transport and receive such materials. Vehicle used for transportation shall be in accordance with the provisions under the Motor Vehicles Act, 1988, and rules made there under.
- Training will be provided to driver and cleaner regarding the safe driving, hazards of chemicals, emergency handling.
- Transporter should have valid "Pollution Under Control Certificate" (PUCC) during the transportation of HM and shall be properly displayed.
- The design of the trucks shall be such that there is no spillage during transportation.
- Vehicle should be fitted with mechanical handling equipment as may be required for safe handling and transportation.
- "HAZARDOUS SYMBOL" shall be displayed on all sides of the vehicle in Vernacular Language, Hindi and English.
- Colour code is to be provided to the tanker to indicate the type of material present in that.
- Each vehicle shall carry first-aid kit, spill control equipment and fire extinguisher.
- Appropriate PPEs will be kept.

The occupier of hazardous substance shall prepare seven copies of the manifest (transporting documents) in Form 10(rule 19 (1)) comprising of colour code indicated below (all six copies to be signed by the transporter):
- **Copy 1 (White):** To be forwarded by the sender to the State Pollution Control Board after signing all the seven copies.
- **Copy 2 (Yellow):** To be retained by the sender after taking signature on it from the transporter and the rest of the five signed copies to be carried by the transporter.
- **Copy 3 (Pink):** To be retained by the receiver (actual user or treatment storage and disposal facility operator) after receiving the waste and the remaining four copies are to be duly signed by the receiver.
- **Copy 4 (Orange):** To be handed over to the transporter by the receiver after accepting waste.
- **Copy 5 (Green):** To be sent by the receiver to the State Pollution Control Board.
- **Copy 6 (Blue):** To be sent by the receiver to the sender.
- **Copy 7 (Grey):** To be sent by the receiver to the State Pollution Control Board of the sender in case the sender is in another State.

**Table 7.1: Characteristic of Raw Materials**

<table>
<thead>
<tr>
<th>Name of the Raw Material</th>
<th>B.P. °C Boiling Point</th>
<th>F.P. °C Flash Point</th>
<th>LEL UEL %</th>
<th>TLV ppm</th>
<th>LD&lt;sub&gt;50&lt;/sub&gt; mg/Kg</th>
<th>LC&lt;sub&gt;50&lt;/sub&gt; mg/l</th>
<th>Specific Gravity</th>
<th>Vapor Density</th>
<th>Vapor Pressure @ 25°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 Alpha-Hydroxy Progesterone</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>118</td>
<td>40</td>
<td>4 to 19.9</td>
<td>10</td>
<td>3310</td>
<td>100</td>
<td>1.05</td>
<td>2.1</td>
<td>2.09 kPa</td>
</tr>
<tr>
<td>N-Caproic Anhydride</td>
<td>278-282</td>
<td>&gt;112</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>0.917</td>
<td>8.36</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Methylene Dichloride</td>
<td>40</td>
<td>NA</td>
<td>13 to 23</td>
<td>-</td>
<td>985</td>
<td>50</td>
<td>1.33</td>
<td>-</td>
<td>350 mm Hg @ 20°C</td>
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<tr>
<td>Alumina Oxide</td>
<td>2980</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>4</td>
<td>NA</td>
<td>Negligible</td>
<td></td>
</tr>
<tr>
<td>Di iso Propyl ether</td>
<td>154</td>
<td>0-28</td>
<td>1.4 to 7.9</td>
<td>250</td>
<td>-</td>
<td>0.72</td>
<td>3.52</td>
<td>149.262</td>
<td></td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>Decomposes</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>8000</td>
<td>1000</td>
<td>-</td>
<td>NA</td>
<td>1 mm Hg @ 3586</td>
</tr>
<tr>
<td>Nandrolone Base</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Acetone</td>
<td>56</td>
<td>-18</td>
<td>2 to 12.8</td>
<td>500</td>
<td>5800</td>
<td>71-4hr</td>
<td>786</td>
<td>2</td>
<td>247</td>
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<tr>
<td>Pyridine</td>
<td>115</td>
<td>17</td>
<td>1.8 to 12.4</td>
<td>-</td>
<td>1500</td>
<td>28500</td>
<td>9780</td>
<td>2.73</td>
<td>18 mm Hg @ 20 °C</td>
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<tr>
<td>Sodium Hydroxide</td>
<td>1.39</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>125</td>
<td>1.38</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>n-Prantane</td>
<td>35-36</td>
<td>-49</td>
<td>1.4 to 8.3</td>
<td>-</td>
<td>5</td>
<td>364</td>
<td>-</td>
<td>NA</td>
<td>579.2</td>
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<tr>
<td>3-Phenyl propionyl Chloride</td>
<td>107</td>
<td>108</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>1.135</td>
<td>-</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>4220</td>
<td>2.159</td>
<td>NA</td>
<td>NA</td>
<td></td>
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</table>

**Chapter-7: Additional Studies** 7.5
<table>
<thead>
<tr>
<th>Name of the Raw Material</th>
<th>B.P. °C Boiling Point</th>
<th>F.P. °C Flash Point</th>
<th>LEL UEL %</th>
<th>TLV ppm</th>
<th>LD50 mg/Kg</th>
<th>LC50 mg/l</th>
<th>Specific Gravity</th>
<th>Vapor Density</th>
<th>Vapor Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Carbonate</td>
<td>1600 deg °C @ 760 mmHg</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>6600</td>
<td>1200</td>
<td>2.53</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Medroxy Progesterone</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>&gt;6400</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>Acetic Anhydride</td>
<td>138-140</td>
<td>49</td>
<td>2.7 to 10.3</td>
<td>5</td>
<td>1780</td>
<td>1000</td>
<td>1.08</td>
<td>3.52</td>
<td>4 mm Hg @20°C</td>
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<tr>
<td>Chloroform</td>
<td>61</td>
<td>NA</td>
<td>NA</td>
<td>10</td>
<td>695</td>
<td>18.2</td>
<td>1.49</td>
<td>4.1</td>
<td>209.5 hP</td>
</tr>
<tr>
<td>1-Piperidino Cyclohexane</td>
<td>120-122</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.98</td>
<td>NA</td>
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<tr>
<td>Acetonitrile</td>
<td>81.6</td>
<td>2</td>
<td>3-16</td>
<td>-</td>
<td>269</td>
<td>2693</td>
<td>7.81</td>
<td>1.42</td>
<td>88.8 mm Hg @ 25°C</td>
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<tr>
<td>Cuprous Chloride</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>336</td>
<td>1008</td>
<td>-</td>
<td>NA</td>
<td>1.3 mm Hg @ 546°C</td>
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<tr>
<td>Methanol</td>
<td>64.5</td>
<td>11</td>
<td>6 to 36</td>
<td>200</td>
<td>7300</td>
<td>64000</td>
<td>0.791-0.793</td>
<td>1.11</td>
<td>12.8</td>
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<tr>
<td>HCl 35 %</td>
<td>50.5</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>240</td>
<td>3124</td>
<td>1.18</td>
<td>1.3</td>
<td>25</td>
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<td>Testosterone base</td>
<td>NA</td>
<td>93.3</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Acetyl Chloride</td>
<td>52</td>
<td>5</td>
<td>7.3 to 19</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.71</td>
<td>604.373</td>
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<td>69</td>
<td>-22</td>
<td>1 to 8.1</td>
<td>-</td>
<td>16000</td>
<td>172</td>
<td>-</td>
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<td>160 hPa @ 20°C</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Benzoyl Chloride</td>
<td>198</td>
<td>93</td>
<td>2.5 to 27</td>
<td>-</td>
<td>1900</td>
<td>1870</td>
<td>1.21</td>
<td>-</td>
<td>0.5 hPa @ 20°C</td>
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<tr>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>333</td>
<td>80</td>
<td>2.044</td>
<td>NA</td>
<td>&lt;0.1 hPa @ 20°C</td>
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<tr>
<td>n-Valeryl Chloride</td>
<td>125-127</td>
<td>32</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>2.07</td>
<td>0.990</td>
<td>4.16</td>
<td>11.4</td>
</tr>
<tr>
<td>Betamethasone</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tri methyl ortho propionate</td>
<td>121-122</td>
<td>19</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>0.944</td>
<td>NA</td>
<td>NA</td>
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<td>P toluene sulphonic</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NA</td>
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<td>NA</td>
</tr>
<tr>
<td>Name of the Raw Material</td>
<td>B.P. °C Boiling Point</td>
<td>F.P. °C Flash Point</td>
<td>LEL UEL %</td>
<td>TLV ppm</td>
<td>LD₅₀ mg/Kg</td>
<td>LC₅₀ mg/l</td>
<td>Specific Gravity</td>
<td>Vapor Density</td>
<td>Vapor Pressure</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>--------</td>
<td>-------------</td>
<td>-----------</td>
<td>-----------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>acid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Propionyl chloride</td>
<td>77-79</td>
<td>6</td>
<td>NA</td>
<td>-</td>
<td>823</td>
<td>-</td>
<td>3.19</td>
<td>NA</td>
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<tr>
<td>Methyl sulphonyl chloride</td>
<td>161</td>
<td>110</td>
<td>NA</td>
<td>-</td>
<td>250</td>
<td>22.3-27.7</td>
<td>1.48</td>
<td>4</td>
<td>2.6</td>
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<td>NA</td>
<td>-</td>
<td>4340</td>
<td>860</td>
<td>3.667</td>
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<td>&lt; 0.0000001 kPa 25°C</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>8290</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>IPA</td>
<td>82</td>
<td>12</td>
<td>2 to 13</td>
<td>200</td>
<td>12870</td>
<td>73</td>
<td>0.785</td>
<td>2.1</td>
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<tr>
<td>Trimethyl ortho valerate</td>
<td>164</td>
<td>42</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>NA</td>
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</tr>
<tr>
<td>N Chloro succanamide</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>1212</td>
<td>-</td>
<td>NA</td>
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<tr>
<td>Deflazacort intermediate</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>5200</td>
<td>NA</td>
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<tr>
<td>Iodine</td>
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<td>NA</td>
<td>1</td>
<td>14000</td>
<td>4.93</td>
<td>NA</td>
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<tr>
<td>Potassium Acetate</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>3250</td>
<td>&gt;=1.32</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Calcium chloride</td>
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<td>-</td>
<td>NA</td>
<td>-</td>
<td>1000</td>
<td>-</td>
<td>2.2</td>
<td>NA</td>
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</tr>
<tr>
<td>Tri ethyl Butyrate</td>
<td>119-121</td>
<td>26</td>
<td>NA</td>
<td>-</td>
<td>13000</td>
<td>35</td>
<td>4.01</td>
<td>NA</td>
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<td>Chromium Trioxide</td>
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<td>NA</td>
<td>0.05</td>
<td>50</td>
<td>0.217</td>
<td>2.7</td>
<td>NA</td>
<td>&lt; 0.1 hPa @ 20°C</td>
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<tr>
<td>DMF</td>
<td>153</td>
<td>57.77</td>
<td>2.2 to 15.2</td>
<td>10</td>
<td>2800</td>
<td>9400</td>
<td>0.949</td>
<td>2.51</td>
<td>0.3 kPa @ 20°C</td>
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<tr>
<td>Lithium chloride</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.06</td>
<td>NA</td>
<td>1.33 hPa @ 547°C</td>
</tr>
<tr>
<td>Methyl ethyl ketone</td>
<td>79</td>
<td>-4</td>
<td>1.8 to 11.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&gt;1 @ 101 kPa</td>
<td>9.3 kPa</td>
<td></td>
</tr>
<tr>
<td>Betamethasone Acetate</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>2-Furoyl Chloride</td>
<td>173-174</td>
<td>85</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
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</table>
### Chapter-7: Additional Studies

#### 7.2 DISASTER MANAGEMENT PLAN

##### 7.2.1 Disasters

A disaster is a catastrophic situation in which suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, ---

<table>
<thead>
<tr>
<th>Name of the Raw Material</th>
<th>B.P. °C</th>
<th>F.P. °C</th>
<th>LEL %</th>
<th>TLV ppm</th>
<th>LD50 mg/Kg</th>
<th>LC50 mg/l</th>
<th>Specific Gravity</th>
<th>Vapor Density</th>
<th>Vapor Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-DMAP</td>
<td>162</td>
<td>110</td>
<td>NA</td>
<td>-</td>
<td>250</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td>Methylprednisolone</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>2292</td>
<td>NA</td>
<td>NA</td>
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<td>Prednisolone</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>147</td>
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<td>NA</td>
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<td>Hydrocortisone</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>150</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Dexamethasone</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>54</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>Tetrahydrofuran</td>
<td>65-67</td>
<td>-17</td>
<td>1.8 to 11.8</td>
<td>-</td>
<td>1650 14.7</td>
<td>-</td>
<td>2.5 @ 25°C</td>
<td>170 hPa @ 20°C</td>
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</tr>
<tr>
<td>Pyro phosphryl chloride</td>
<td>101</td>
<td>-</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>77</td>
<td>-4</td>
<td>2 to 11.5</td>
<td>400</td>
<td>5620 200</td>
<td>0.902</td>
<td>3</td>
<td>76 @ 20 °C</td>
<td></td>
</tr>
<tr>
<td>Cynocabalamine</td>
<td>&gt;300</td>
<td>NA</td>
<td>NA</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>TMSI</td>
<td>106</td>
<td>-31</td>
<td>NA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.4</td>
<td>NA</td>
<td>NA</td>
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<td>Sodium Borohydrate</td>
<td>NA</td>
<td>NA</td>
<td>3.02 to -</td>
<td>-</td>
<td>162 5600</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<td>Phenol</td>
<td>182</td>
<td>79</td>
<td>1.7 to 8.6</td>
<td>-</td>
<td>317 900</td>
<td>-</td>
<td>NA</td>
<td>6.3 hPa @ 55°C</td>
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<td>Ferrous Sulphate</td>
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<td>NA</td>
<td>NA</td>
<td>-</td>
<td>1520</td>
<td>-</td>
<td>NA</td>
<td>14.6 hPa @ 25°C</td>
<td></td>
</tr>
</tbody>
</table>

---
sea, rail and road transport accidents which can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract since this depends to a large extent on the physical, economic and social environment in which it occurs. However, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re-establishment of essential services.

7.2.2 Objectives of Disaster Management Plan

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel trained through rehearsals/drills.

The Disaster Management Plan should reflect the probable consequential severalties of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of outside agencies.

To tackle the consequences of a major emergency inside the plant or in the immediate vicinity of the plant, a Disaster Management Plan has to be formulated and this planned emergency document is called "Disaster Management Plan". The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the Emergency.

In effect, it is to optimize operational efficiency to rescue, rehabilitate and render medical help and to restore normalcy.
7.2.3 Emergencies

a) General, Industrial, Emergencies
The emergencies that could be envisaged in the plant and fuel storage are as follows:

1. A situation of fire at the process plant;
2. A situation of fire at the storages area;
3. Slow isolated fires;
4. Fast spreading fires;
5. Structural failures;
6. Contamination of food/water; and
7. Sabotage/Social disorder.

b) Specific Emergencies Anticipated

Fire and Explosion
Fire consequences can be disastrous, since they involve huge quantities of fuel either stored or in dynamic inventory in pipe lines or in nearby areas. Preliminary hazard analysis has provided a basis for consequence estimation. Estimation can be made by using various pool fire, tank fire consequence calculations. During the study of Risk Assessment, the nature of damages is worked out and probability of occurrence of such hazards is also drawn up.
7.2.4 Emergency Organization

It is recommended to setup an Emergency Organization. A senior executive who has control over the affairs of the plant should lead the Emergency Organization. He shall be designated as Site Controller. General Manager [O & M] shall be designated as the Incident Controller. In the case of stores, utilities, open areas, which are not under the control of the Production Heads, Senior Executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controllers would be reporting to the Site Controller.

Each Incident Controller, by himself, organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Co-coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as Key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge, and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the
office/plant offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

7.2.5 Emergency Communication

Whoever notices an emergency situation such as fire, growth of fire, leakage etc would inform his immediate superior and Emergency Control Center. A place nearer to the Gate House Complex shall be identified as Emergency Control Center. The person on duty in the Emergency Control Center would appraise the Site Controller. Site Controller verifies the situation from the Incident Controller of that area or the Shift In-charge and takes a decision about an impending On Site Emergency. This would be communicated to all the Incident Controllers, Emergency Co-ordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

7.2.6 Emergency Responsibilities

The responsibilities of the key personnel are appended below:

1. Site Controller

On receiving information about emergency he would rush to Emergency Control Center (ECC) and take charge of ECC and the situation. His responsibilities would be as indicated below:

1. Assesses the magnitude of the situation on the advice of Incident Controller and decides;
   - Whether the affected area needs to be evacuated;
   - Whether personnel who are at assembly points need to be evacuated;

2. Declares Emergency and orders for operation of emergency siren;

3. Organizes announcement by public address system about location of emergency;

4. Assesses which areas are likely to be affected, or need to be evacuated or are to be alerted;

5. Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting down the plant or any section of the plant is required and if evacuation of persons is required;

6. Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;

7. Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs the District Emergency Authority, Police, Hospital and seeks their intervention and help;

8. Informs Inspector of Factories, Deputy Chief Inspector of Factories, CECB and other statutory authorities;
Rapid Environmental Impact Assessment Report
Proposed Synthetic organic chemicals
Sanjivani Pharma
GIDC Dahej - II
Ta.: Vagra, Dist.: Bharuch

Chapter-7: Additional Studies

9. Gives a public statement if necessary;
10. Keeps record of chronological events and prepares an investigation report and preserves evidence; and
11. On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

2. Incident Controller
   1. Assembles the incident control team;
   2. Directs operations within the affected areas with the priorities for safety to personnel minimize damage to the plant, property and environment and minimize the loss of materials;
   3. Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;
   4. Ensures that key personnel help is sought;
   5. Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
   6. Ensures that all non-essential workers/staff of the affected areas are evacuated to the appropriate assembly points, and the areas are searched for casualties;
   7. Has regard to the need for preservation of evidence so as to facilitate any inquiry into the causes and circumstances, which caused or escalated the emergency;
   8. Co-ordinates with emergency services at the site;
   9. Provides tools and safety equipment to the team members;
   10. Keeps in touch with the team and advises them regarding the method of control to be used; and
   11. Keeps the Site Controller of Emergency informed of the progress being made.

3. Emergency Coordinator - Rescue, Fire Fighting
   1. On knowing about emergency, rushes to ECC;
   2. Helps the Incident Controller in containment of the emergency;
   3. Ensure fire pumps are in operating condition and instructs pump house operator to ready for any emergency with standby arrangement;
   4. Guides the fire fighting crew i.e. firemen, trained plant personnel and security staff;
   5. Organizes shifting the fire fighting facilities to the emergency site, if required;
   6. Takes guidance of the Incident Controller for fire fighting as well as assesses the requirements of outside help;
   7. Arranges to control the traffic at the gate and the incident area;
   8. Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision;
   9. Evacuates the people in the plant or in the nearby areas as advised by Site Controller;
   10. Searches for casualties and arranges proper aid for them;
   11. Assembles search and evacuation team;
12. Arranges for safety equipment for the members of this team;
13. Decides which paths the evacuated workers should follow; and
14. Maintains law and order in the area, and if necessary seeks the help of police.

4. Emergency Coordinator-Medical, Mutual Aid, Rehabilitation, Transport and Communication

1. In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the ECC;
2. Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
3. Mobilizes extra medical help from outside, if necessary;
4. Keeps a list of qualified first aid providers for the plant and seeks their assistance;
5. Maintains first aid and medical emergency requirements;
6. Makes sure that all safety equipment is made available to the emergency team;
7. Assists Site Controller with necessary data to coordinate the emergency activities;
8. Assists Site Controller in updating emergency plan, organizing mock drills, verification of inventory of emergency facilities and furnishing report to Site Controller;
9. Maintains liaison with Civil Administration;
10. Ensures availability of canteen facilities and maintenance of rehabilitation center.
11. Liaises with Site Controller/Incident Controller;
12. Ensures transportation facility;
13. Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
14. Controls rehabilitation of affected areas on discontinuation of emergency; and

5. Emergency Coordinator - Essential Services

1. Assists Site Controller and Incident Controller;
2. Maintains essential services like Diesel Generator, Water, Fire Water, Compressed Air/Instrument Air, power supply for lighting;
3. Plans alternate facilities in the event of power failure, to maintain essential services such as lighting, etc;
4. Organizes separate electrical connections for all utilities and emergency services so that in the event of emergency or fires, essential services and utilities are not affected;
5. Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and
6. Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.
6. General Responsibilities of Employees during an Emergency

During an emergency, which becomes more enhanced and pronounced when an emergency warning is raised, the workers who are in-charge of process equipment should adopt safe and emergency shut down and attend to any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spreading panic. On the other hand, he must assist emergency personnel towards meeting the objectives of DMP.

7.2.7 Emergency Facilities

1. Emergency Control Center (ECC)
   The following information and equipment are to be provided at the Emergency Control Center (ECC).
   1. Intercom, telephone;
   2. P and T telephone;
   3. Self-contained breathing apparatus;
   4. Fire suit/gas tight goggles/gloves/helmets;
   5. Hand tools, wind direction/velocities indications;
   6. Public address megaphone, hand bell, telephone directories;
   7. (internal, P and T) plant layout, site plan;
   8. Emergency lamp/torch light/batteries;
   9. Plan indicating locations of hazard inventories, plant control room, sources of safety equipment, work road plan, assembly points, rescue location vulnerable zones, escape routes;
   10. Hazard chart;
   11. Emergency shut-down procedures;
   12. Nominal roll of employees;
   13. List of key personnel, list of essential employees, list of Emergency Co-ordinators;
   14. Duties of key personnel;
   15. Address with telephone numbers and key personnel, emergency coordinator, essential employees; and
   16. Important address and telephone numbers including Government agencies, neighboring industries and sources of help, outside experts, fuel fact sheets and population details around the factory.

2. Assembly Point
   One assembly points, depending upon the plant location, would be identified wherein employees who are not directly connected with the disaster management would be assembled for safety and rescue. Emergency breathing apparatus, minimum facilities like water etc. would be organized.

   In view of the size of plant, different locations would be ear marked as assembly points. Depending upon the location of hazard, the assembly points are to be used.

3. Fire Fighting Facilities
First Aid and sufficient number of Fire extinguishers suitable for emergency should be maintained in the plant. This would be as per statutory requirements. Fire alarms would be located in the bulk storage areas.

4. Location of Wind Sock
Wind socks shall be installed at appropriate places in the plant to indicate direction of wind for emergency escape.

5. Emergency Medical Facilities
General first aid materials for dealing with chemical burns, fire burns etc would be maintained in the emergency control room. To provide necessary first aid facilities, the first aid training will also be given to the employees. Necessary specific medicines for emergency treatment of Patient’s Burns would be maintained. Breathing apparatus and other emergency medical equipment would be provided and maintained. The unit will appoint the medical officer for the regular medical examination of the employee. The project site is located only 3.5 km away from Dahej city, in case of any emergency Government and private hospital would be approached. Names of Medical Personnel, Medical facilities in the area would be prepared and updated.

6. Ambulance
There is availability of personal vehicles to transport injured or affected persons to the hospital. Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

7.2.8 Emergency Actions

a) Emergency Warning
The emergency would be communicated both to the personnel inside the plant and the people outside. An emergency warning system shall be established for this purpose.

b) Emergency Shutdown
There are number of facilities, which can be provided to help deal with hazardous conditions, when a tank is on fire. The suggested arrangements are:
1. Stop feed;
2. Dilute contents;
3. Remove heat;
4. Deluge with water; and
5. Transfer contents.
Whether a given method is appropriate depends on the particular case.

c) Evacuation of Personnel
There could be a number of persons in the storage area and other areas in the vicinity. The area would have adequate number of exits, staircases. In the event of an emergency, unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time Office shall maintain a copy of deployment of employees in each shift, at ECC. If necessary, persons can be evacuated by rescue teams.
d) All Clear Signal
Also, at the end of an emergency, after discussing with Incident Controllers and Emergency Co-ordinators, the Site Controller orders an all clear signal. When it becomes essential, the Site Controller communicates to the District Emergency Authority, Police, and Fire Service personnel regarding help required or development of the situation into an Off-Site Emergency.

7.2.9 General

a) Employee Information
During an emergency, employees would be warned by raising siren in specific pattern. Employees would be given training of escape routes and taking shelter. Employees would be provided with information related to fire hazards, antidotes and first aid measures. Those who would be designated as key personnel and essential employees should be given training for emergency response.

b) Public Information and Warning
The industrial disaster effects related to this plant may mostly be confined to the plant area. The detailed risk analysis has indicated that the pool fire effects would not be felt outside. However, as an abundant precaution, the information related to Chemical in use would be furnished to District Emergency Authority for necessary dissemination to general public and for any use during an offsite emergency. Plants of this size and nature have been in existence in our country for a long time.

c) Co-ordination with Local Authorities
Keeping in view of the nature of emergency, two levels of coordination are proposed. In the case of an On Site Emergency, resources within the organization would be mobilized and in the event extreme emergency local authorities help would be sought.

In the event of an emergency developing into an offsite emergency, local authority and District Emergency Authority (normally the Collector) would be appraised and under his supervision, the Off Site Disaster Management Plan would be exercised. For this purpose, the facilities that are available locally, i.e. medical, transport, personnel, rescue accommodation, voluntary organizations etc. would be mustered. Necessary rehearsals and training in the form of mock drills would be organized.

d) Mutual Aid
Mutual aid in the form of technical personnel, runners, helpers, special protective equipment, transport vehicles, communication facility etc. would be sought from the neighboring industries.

e) Mock Drills
Emergency preparedness is an important part of planning in Industrial Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated
procedures. Similarly, the key personnel and essential personnel would be trained in the operations.

f) Important Information
Once the Plant goes on stream, important information such names and addresses of key personnel, essential employees, medical personnel outside the plant, transporters address, address of those connected with Off Site Emergency such as Police, Local Authorities, Fire Services, District Emergency Authority would be prepared and maintained. The on-site emergency organization chart for various emergencies is shown in below figure.
7.2.10 Off-Site Emergency Preparedness Plan

The task of preparing the Off-Site Emergency Plan lies with the District Collector; however the off-site plan will be prepared with the help of the local district authorities. The proposed plan will be based on the following guidelines.

a) Introduction

Off-site emergency plan would follow the on-site emergency plan. When the consequences of an emergency situation go beyond the plant boundaries, it becomes an off-site emergency. Off-site emergency is essentially the responsibility of the public administration. However, the plant management will provide the public administration with the technical information relating to the nature, quantum and probable consequences on the neighboring population.

The off-site plan in detail will be based on those events, which are most likely to occur, but other less likely events, which have severe consequence, will also be considered. Incidents which have very severe consequences yet have a small probability of occurrence would also be considered during the preparation of the plan. However, the key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan.

The roles of the various parties who will be involved in the implementation of an off-site plan are described below. Depending on local arrangements, the responsibility for the off-site plan would either rest with the plant management or with the local authority. Either way, the plan would identify an emergency coordinating officer, who would take the overall command of the off-site activities.
As with the on-site plan, an emergency control center would be setup within which the emergency co-ordination officer can operate.

An early decision will be required in many cases on the advice to be given to people living "within range" of the accident - in particular whether they should be evacuated or told to go indoors. In the latter case, the decision can regularly be reviewed in the event of an escalation of the incident.

Consideration of evacuation may include the following factors:

In the case of a major fire but without explosion risk (e.g. an oil storage tank), only houses close to the fire are likely to need evacuation, although a severe smoke hazard may require this to be reviewed periodically; and

If a fire is escalating and in turn threatening a store of hazardous material, it might be necessary to evacuate people nearby, but only if there is time; if insufficient time exists, people should be advised to stay indoors and shield them from the fire. This latter case particularly applies if the installation at risk could produce a fireball with very severe thermal radiation effects.

Although the plan will have sufficient flexibility built in to cover the consequences of the range of accidents identified for the on-site plan, it will cover in some detail the handling of the emergency to a particular distance from each major hazard works.

b) Aspects Proposed to be considered in the Off-Site Emergency Plan

The main aspects, which should be included in the emergency plan, are:

- **Organization**
  Detail of command structure, warning systems, implementation procedures, emergency control centers. Names and appointments of incident controller, site main controller, their deputies and other key personnel.

- **Communications**
  Identification of personnel involved, communication center, call signs, network, list of telephone numbers.

- **Specialized Knowledge**
  Details of specialist bodies, firms and people upon whom it may be necessary to call e.g. those with specialized fuel knowledge, laboratories.

- **Voluntary Organizations**
  Details of organizers, telephone numbers, resources etc.

- **Fuel Information**
  Details of the hazardous substances stored and a summary of the risk associated with them.

- **Meteorological Information**
  Arrangements for obtaining details of weather forecasts and weather conditions prevailing at that time.

- **Humanitarian Arrangements**
Transport, evacuation centers, emergency feeding, treatment of injured, first aid, ambulances and temporary mortuaries.

- **Public Information**
  Arrangements for (a) Dealing with the media press office; (b) Informing relatives, etc.

**Assessment of Emergency Plan**
Arrangements for:
(a) Collecting information on the causes of the emergency;
(b) Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

c) **Role of the Emergency Coordinating Officer**
The various emergency services would be coordinated by an emergency Coordinating officer (ECO), who will be designated by the district collector. The ECO would liaison closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control would be passed to a senior local authority administrator or even an administrator appointed by the central or state government. The ECO will be equipped with address and phone numbers of important agencies.

d) **Role of the Local Authority**
The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed should carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO should liaison with the plant, to obtain the information to provide the basis for the plan. This liaison should ensure that the plan is continually kept up-to-date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans should be organized by the EPO.

e) **Role of Police**
Formal duties of the police during an emergency include protecting life and property and controlling traffic movements.

Their functions should include controlling bystanders, evacuating the public, identifying the dead and dealing with casualties, and informing relatives of death or injury.

f) **Role of Fire Authorities**
The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer should also have a similar responsibility for other events, such as explosions. Fire authorities in the region should be apprised about the location of all stores of
flammable materials, water and foam supply points, and fire-fighting equipment. They should be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

**g) Role of Health Authorities**
Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, should have a vital part to play following a major accident, and they should form an integral part of the emergency plan.

For major fires, injuries should be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally available in most hospitals.

Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical "mutual aid" scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

**h) Role of Government Safety Authority**
This will be the factory inspectorate available in the region. Inspectors are likely to satisfy themselves that the organization responsible for producing the off-site plan has made adequate arrangements for handling emergencies of all types including major emergencies. They may wish to see well-documented procedures and evidence of exercise undertaken to test the plan. In the event of an accident, local arrangements regarding the role of the factory inspector will apply. These may vary from keeping a watching brief to a close involvement in advising on operations.

**i) Personal Protective Equipment**
1. **Clothing**
   Chemical-resistant clothing and protective gloves with material suitable for handling various hazardous chemicals.

2. **Eye Protection**
   Employees will use splash-proof goggles while dealing with hazardous chemicals. An eye- wash fountain or eyes wash kit for in case of emergency.

3. **First Aid:**
   Prompt action will be taken in case of any kind of spillage or leakage. In case of any kind of chemical spill or leak, following actions will be taken:

**Breathing**
Person will be moved to the fresh air at once (in case of inhalation). If breathing stops, artificial respiration will be performed. Affected person will be kept warm and resting and medical attention will be provided immediately.

**Eye Exposure**
Eyes will be washed immediately with large amounts of water for at least 15 minutes, lifting the upper and lower lids. Medical attention will be provided...
immediately. Workers shall not be allowed wearing Contact lenses while working in the premises near the area of risk of hazardous spill or leak.

**Skin Exposure**
Skin contaminated with acid or any kind of chemical will be flushed with soap and water for at least 15 minutes (or as recommended in the MSDS of the chemical). If strong concentrations of gas or solution penetrate clothing, then cloths will be removed and skin will be flushed with water. Medical attention will be provided immediately.

**Swallowing**
In case of swallowing, if the person is conscious, large amounts of water or milk will be given. Medical attention will be provided immediately. Material safety data sheet (MSDS) will be referred or a physician will be called.

**Spill Management**
If any solvents spill or leak occurs, following actions will be taken:
- Fire officer or the local fire department will be intimated. Untrained persons or those without proper personal protective equipment will not allowed enter in affected areas. Evacuation and restriction of people from the hazardous area of release of chemical.
- Stop or control the source of exposure.
- Ventilation of contaminated atmospheres by opening windows to disperse the fumes.
- If the exposure is from the spill of a solution, collection of the spilled material. Dilution and neutralize of the spill if possible and disposal in a secured landfill.

**OCCUPATIONAL HEALTH AND SAFETY**
For large industries, where multifarious activities are involved during construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the boons, industrialization generally brings several problems like occupational health and safety.

The industrial planner, therefore, has to properly plan and take steps to minimize the impacts of industrialization and to ensure appropriate occupational health and safety including fire plans. All these activities again may be classified under construction and erection, and operation and maintenance.

**Occupational Health**
Occupational health needs attention both during construction and erection and operation and maintenance phases. However, the problem varies both in magnitude and variety in the above phases.

**Construction and Erection**
The occupational health problems envisaged at this stage can mainly be due to constructional accident and noise. To overcome these hazards, in addition to
arrangements to reduce it within TLV’s, necessary protective equipments shall also be supplied to workers.

**Operation and Maintenance**

The problem of occupational health, in the operation and maintenance phase is primarily due to noise which could affect hearing. The necessary personal protective equipments will be given to all the workers. The working personnel shall be given the following appropriate personnel protective equipment’s.

1. Industrial Safety Helmet;
2. Face shield with replacement acrylic vision;
3. Zero power plain goggles with cut type filters on both ends;
4. Zero power goggles with cut type filters on both sides and blue colour glasses;
5. Cylindrical type earplug;
6. Ear muffs;
7. Self-contained breathing apparatus;
8. Leather apron;
9. Leather hand gloves;
10. Acid/Alkali proof rubberized hand gloves;
11. Canvas cum leather hand gloves with leather palm;
12. Electrically tested electrical resistance hand gloves; and
13. Industrial safety shoes.

Full-fledged hospital facilities will be available round the clock for attending emergency arising out of accidents, if any. All working personnel will be medically examined at least once in every year and at the end of his term of employment. Pre and Post-employment Medical check-up is being already carried out and the same shall be followed after the said expansion. This is in addition to the pre-employment medical examination.

1. **Safety Plan**

Safety of both men and materials during construction and operation phases is of concern. Safety plan shall be prepared and implemented in the proposed plant. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in the plant is possible due to collapse of structures and fire/explosion etc.

Keeping in view the safety requirement during construction, operation and maintenance phases, and the plant has formulated safety policy with the following regulations:

1. To allocate sufficient resources to maintain safe and healthy conditions of work;
2. To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
3. To ensure that adequate safety instructions are given to all employees;
4. To provide wherever necessary protective equipment, safety appliances and
clothing and to ensure their proper use;
5. To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
6. To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge;
7. To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
8. To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
9. To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
10. To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action;
11. To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
12. To publish/notify regulations, instructions and notices in the common language of employees;
13. To prepare separate safety rules for each type of occupation/processes involved in a plant; and
14. To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

GENERAL SAFETY MEASURES
1. Proper ventilation system will be provided at storage and processing areas of chemicals so that to maintain PEL valves of chemicals and solvents.
2. Good housekeeping, disposal methods will be followed to control the fugitive emissions of chemicals.
3. In order to prevent the work men from facing the muscular-skeletal disorders, backache, pain in minor and major joints etc, and manual carrying of heavy materials will be avoided. All liquid raw materials/solvents will be transferred through closed piping system either by pumping or by gravity, to reduce the carrying load on work men against gravity. Safe carrying weights (up to 15 kgs) only allowed to be carried by work men. Stair cases with suitable gradient will be constructed in the work sheds. Material handling trolleys will be provided to carry/handle the solid materials from one place to other.
4. Employees will be educated, trained and, informed about the chemicals and their properties by displaying the material safety data sheets (MSDS) in the processing areas.
5. Awareness about potential hazards, work hazards, fire hazards, and health hazards associated with the chemicals which are being used by the industry will be developed among the employees.
Apart from the above, the following general safety precautions will be implemented in the plant.

6. Shielding guards will be provided to all belt pulleys, couplings and all moving parts of the machinery.
7. All electrical cables and electrical equipment will be properly grounded and earthed.
8. Poster display regarding safety, health and environmental protection will be arranged in the plant to make awareness of safety and health.
9. All responsible employees will be educated and trained to handle the firefighting equipment.
10. NO SMOKING policy will be strictly implemented in the entire plant area.
11. Emergency exits will be provided at the selected places.
12. No employee will be allowed to expose to a noise level greater than 85 dB (A) for a period of more than 8 hours per day without hearing protection.
13. Periodical health check-up of employees will be held as a part of occupational health surveillance.
14. One shower type eye wash will be provided in the plant area.
15. Fire extinguisher will be provided where ever is needed.
16. All flammable chemicals and solvents will be kept away from ignition sources and heat.
17. Storage of chemicals will be as per their compatibility.
18. Proper exhaust ventilation will be provided to the process area to maintain the airborne concentrations and solvents below their TLV values.

2. Safety Organization

Construction and Erection Phase
A qualified and experienced safety officer shall be appointed. The responsibilities of the safety officer include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health. He is also responsible to ensure compliance of Safety Rules/ Statutory Provisions.

Operation and Maintenance Phase
When the construction is completed the posting of safety officers shall be in accordance with the requirement of Factories Act and their duties and responsibilities shall be as defined there off.

3. Safety Circle

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circles would be constituted in each area of work. The circle would consist of 5-6 employees from that area. The circle normally shall meet for about an hour every week.

4. Health and Safety Monitoring Plan
The health of all employees shall be monitored once in a year for early detection of any ailment due to exposure to heat, fumes and noise. Pre and Post-employment Medical Check-up for all the employees will be carried out regularly.

7.3 Social Impact Assessment

a) Impact

1. Impact on population composition

   The population composition of a place changes due to various factors viz, topography, availability of water, agricultural practices, economic development, transport facilities and migration of people. Migration of people brings changes in population size, sex ratio, adult-child ratio and size & composition of labor force. The industry is a proposed new project in which local people will be employed directly and it will also help in generating various indirect jobs helping in creating an employment cycle.

   As most of the people will be employed locally, therefore, there will be less influx of people from outside in the study area. As the local people will be employed there will be minimal impact on the population of the study area. However, a significant increase in population can be expected through indirect jobs as and when the proposed new project will expand.

2. Impact on employment generation

   Total 60 Employees will be proposed to be employed during proposed project.

   Employment will be given to local people to the extent possible. However, the local people cannot be employed in the proposed project as it is synthetic organic industry and requires an expertise and highly skilled jobs and qualification of the people in the study area do not match the requirement. However, recruitment of local people wherever suitable will be done and at least 80% reservation for recruitment of local people has been planned by proponent.

   The proposed new will generate various indirect employments which will help people locally, regionally mainly and later nationally. They will be involved in various job activities such as packing, warehousing, transportation, advertisement, direct selling, bulk selling etc. This will involve many people to generate income.

3. Impact on Local, Regional and National Environment

   The major impact will be locally especially in the study area. The proponent will focus on the manufacturing of various Active Pharmaceutical Ingredients (API) Products. With the coming up of industry it will lead to a quick and long term impact locally and regionally especially. With the increasing rate of employment in the region the development in terms of standard of living, education etc. will increase. Later, when the industry will increase it will contribute to the national level though marginally.
b) Mitigation / management measures Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) is a concept whereby organizations take responsibility for their impact on society and environment. It is also known as Corporate Responsibility, Corporate Citizenship, Responsible Business and Sustainable Responsible Business (SRB). As is the case in many countries, the private sector is generally more active in this area than the governmental/public sector.

The Government of India has finalized plans to ensure that Public Sector companies actively participate in CSR initiatives. It was expected that 2-5 per cent of the company's net profits would be funded in such projects.

The project proponent has planned various Corporate Social activities in the study area for the proposed expansion project in Vagra Taluka of Bharuch district.

1. The proponent will organize medical camps in the study region. In the survey it was reported by the interviewee that Diarrhoea, anemia, etc. are the common health problems in the study region. The medical camps for these diseases will be organized. The medical camp for vaccination of children against six major diseases will also be organized.
2. The proponent will carry out plantation all along the road side in nearby villages and development of garden/greenbelt on government barren land/common plots.
3. The unit will organize education aids & scholarship to poor students for higher education.
4. The unit will give their adequate and reasonable contribution for the local religious and social programs in the nearby villages.

7.4 Details of occupational health program.

Workers will be exposed to the raw materials/chemicals directly or indirectly.

Details of occupational health surveillance program.

Occupational Health Program is being developed. The Company is committed to promoting the health, safety and well-being of its workers, employees, visitors and contractors.

The Industry will strive to develop and implement best practices in occupational and environmental hygiene principles.

The Industry has developed and implemented a comprehensive Occupational Hygiene Program (OHP) devoted to the recognition, evaluation and control of those environmental factors, arising in or from the work place that may cause illness, injury, or discomfort. To help reduce the risk of hazardous exposures, ensure regulatory compliance, and improve working conditions, appropriate occupational hygiene practices will be applied to the Industrial operations .The Occupational Hygiene Program clearly defines and stipulates the responsibilities
of all workplace parties involved in its development, administration and implementation of the program.

The Occupational Hygiene Program includes the following elements:
1. Organizational Commitment;
2. Occupational Hygiene Process;
3. Roles and Responsibilities;
4. Training and Education;
5. Annual Program Review;
6. Definitions; and,
7. References.

**Purpose and Scope**
The Occupational Hygiene Program provides information to departments, supervisors and workers to allow for informed decision-making regarding exposure to hazardous agents in the workplace.

This program outlines how worker exposures hazards will be addressed in the workplace including the interpretation of technical data, conducting research, and assist in the development of guidelines and procedures that support workplace health and wellness. A hazard may be chemical, biological or physical in nature:
1. Chemical hazard - is any chemical capable of causing bodily injury or illness;
2. Biological hazard - is any biological organism that is infectious or pathological to humans; and
3. Physical hazard - arises from the interaction of matter and energy related to the science of physics such as sounds, light, vibration, and radiation that could result in an occupational injury or illness.

**Supporting Programs & Standards**
There are a number of occupational hygiene related hazards that have regulatory requirements. For these hazards, additional programs or standards have been developed and will work in conjunction with this program. These programs or standards include, but are not limited to the:
1. Respiratory Protection Program;
2. Hearing Conservation Program;
3. Laboratory Safety Program;
4. Indoor Environmental Quality Program;
5. Lock Out - Control of Hazardous Energy;
6. Personal Protective Equipment Program;

**Occupational Hygiene Process**
To ensure occupational hygiene issues are addressed in a consistent manner, concerns will be handled according to the process outlined in Figure 1 (Progression of Occupational Hygiene Issues Flowchart). An explanation of this process is found in the following sub-sections.
Hazard Assessment

Formal Hazard Assessment & Control Process
The document specifies the responsibilities, procedures, and requirements for proactively completing job hazard assessments. The occupational hygiene process is engaged when a chemical, biological, or physical hazard is identified on this hazard assessment.

Reporting a Hazard
Basic steps -
1. Hazard Identification
2. Hazard Recognition
3. Hazard Evaluation
4. Hazard Control

Level of Risk
A competent person must conduct the hazard assessment and include a qualitative evaluation of the risk associated with the identified occupational hygiene hazard. Hazards that pose an acceptable level of risk will not be addressed further. The criterion for determining if the risk level is acceptable is based on the potential health effects that would result from the quantities being used and the duration of exposure. If the substance/agent poses an unacceptable risk, or the risk level is unknown, further action is required.

Can Hazard be controlled?
If the hazard can be readily minimized or eliminated through the implementation of a control, the control should be implemented according to the hierarchy of controls in accordance. If controls are implemented, their effectiveness needs to be verified or monitored to complete the process.

Exposure Assessment

Sampling Strategy
The information collected during the walkthrough survey will be used to determine what action is required to quantitatively determine worker exposure. A quantitative evaluation of exposure will require some degree of monitoring. The exact type of monitoring conducted will be determined by evaluating the:
1. Duration of worker exposure;
2. Number of exposed workers;
3. Sampling methods available and their limits of detection;
4. Degree of accuracy required in the results;
5. Number of samples required to achieve representative results;
6. Cost; and,
7. Regulatory requirements.

Using these factors, Environment, Health and Safety will develop a sampling strategy outlining how, where, and the number of samples that will be collected. Environment, Health and Safety will work collaboratively with the supervisor to determine the best method for conducting the sampling. Where appropriate resources and equipment are available, internal resources may be used to
Sampling Methodology
Before sampling is conducted, the supervisor is required to notify their workers of the pending monitoring. If personal sampling is required, the workers must also be made aware that they will be required to wear sampling equipment. The workers are required to cooperate with monitoring and not intentionally contaminate collected samples.

Sampling methods shall be conducted in accordance with the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods or any other relevant standards. For sampling techniques that require the use of an external laboratory for analysis, only accredited laboratories may be used.

Sampling Results and Assessment
Where Environment, Health and Safety have conducted monitoring, the consultant will evaluate the sample results. Where the monitoring was conducted by another internal resource, Environment, Health and Safety will assist that resource in evaluating the results. When a third party is used to conduct the monitoring, the external occupational hygiene contractor will evaluate the sampling results. Environment, Health and Safety may perform a technical review and provide supplemental interpretation of reports prepared by outside contractors where warranted.

Sampling results will be made available to the supervisor within 30 days of receiving the final laboratory analysis results. The results will be made immediately available if there is an excursion of an Occupational Exposure Limit (OEL).

Written Documentation
The final sampling results may be made available in report or memo format depending on the extent of sampling conducted. Where Environment, Health and Safety conducted the sampling, the consultant will interpret the analysis results and provide the written report or memo.

Determining of Exposure Level
Determining whether results from monitoring indicate an acceptable exposure level will be based on the Occupational Exposure Limits (OELs). Where occupational exposure limits do not exist, other recognized standards and professional judgment will be used to determine at which point hazard controls are required.

Where the exposure results are below the action level, the exposure level will be deemed acceptable. However, recommendations for controls may still be made to address workers’ comfort or due diligence issues.

Where the exposure results are above the action level, the implementation of, or modification to, hazard controls must be made. Where an OEL has been
exceeded, the affected worker is to be informed of the nature and extent of the excess exposure and immediately protected from further excess exposures.

Where the exposure results cannot be clearly interpreted, further exposure assessment will be required.

**Implementation of Controls**
When recommending controls for identified and assessed hazards, the hierarchy of controls will be used; preference will first be given to Engineering controls, then Administrative controls, and lastly Personal Protective Equipment. Each supervisor is responsible for notifying the Occupational Hygiene Consultant, in writing, when the recommended controls have been implemented. The hazard assessment form must also be updated to reflect any changes in control measures.

**Additional Exposure Assessments**
To evaluate the effectiveness of a control, additional exposure assessments of the substance/agent may be required. If additional assessments are required, Environment, Health and Safety will develop a monitoring strategy and schedule.

Additional exposure assessment may also be required after new processes, equipment, or products are introduced.

Where additional exposure assessment is not required, no further action is necessary.

**Monitoring Schedules**
Monitoring schedules must be developed for substances/agents that cannot be eliminated and require additional exposure assessments. A monitoring schedule will specify the substance/agent(s) to be monitored, the frequency of monitoring, and how the monitoring is to be conducted. This schedule may specify continuous monitoring or periodic follow-up monitoring as a means to evaluate the applicable operation. The affected department/ supervisor and Environment, Health and Safety will keep a copy of the monitoring schedule. The schedule may be adjusted if changes are made to the operation, resulting in a change in the hazard assessment.

**Roles and Responsibilities**
In order for the occupational hygiene process to work effectively, the roles and responsibilities of each department (supervisor, worker, Occupational Hygiene Consultant, etc.) must be clearly defined:

**Directors and Department Heads**
Ensure that the Occupational Hygiene Program and all its components are implemented, administered and enforced;

Ensure resources are available for the implementation of this program and,

Ensure that all potentially exposed workers are provided with appropriate controls, including personal protective equipment.
Supervisors (includes Faculty Members)
- Conduct hazard assessments;
- Implement controls in accordance with legislation requirements;
- Be knowledgeable in the appropriate government regulations, safety standards, and prudent safety practices to protect workers;
- Notify Environment, Health & Safety (EH&S) of occupational hygiene issues;
- Follow any monitoring schedules that have been established;
- Provide access to their areas for walkthrough surveys and monitoring, where required;
- Inform Environment, Health and Safety when recommended hygiene controls have been implemented.

Workers
- Attend required training sessions on workplace hazards;
- Participate in personnel monitoring, audiometric testing and respiratory fit testing, where required;
- Wear personal protection equipment, where required (also applies to students, visitors and guests);
- Ensure that personal protection equipment is in a sanitary condition and proper working order by following proper maintenance procedures and inspections; and,
- Report workplace hazards and defective or damaged personal protective equipment to the appropriate supervisor.

Environment, Health and Safety Dept.
- Conduct initial inquiry of hygiene issues;
- Collect spot samples;
- Conduct walkthrough surveys;
- Develop monitoring strategies and schedules;
- Arrange for and coordinate competent occupational hygiene contractors, where required;
- Complete, review, or provide interpretation of reports where required;
- Conduct monitoring where feasible;
- Maintain a database of monitoring results;
- Perform statistical analysis of data;
- Work with supervisors through the exposure assessment process;
- Provide department/supervisors with monitoring schedules;
- Review quality assurance measures for sample collection;
- Monitor regulations, research data, etc. for emerging issues;
- Provide training on the use of monitoring equipment where necessary;
- Maintain occupational hygiene equipment belonging to EH&S; and,
- Maintain an exposure assessment plan.

Education and Training
Education and training, although similar, are different:

1. Education refers to the theoretical instruction of workers in general
information such as the different types of hazards and how to control those hazards

2. Training refers to the practical application of site-specific information such as safe work instructions, standard operating procedures, and emergency response protocols.

Both education and training are an important part of understanding and controlling the hazards that may be present.

**Preventative Maintenance and Inspection**

**Maintenance of a Hygiene Database**

Environment, Health & Safety dept. will maintain a central database of sampling records. The database will be used to address future exposure assessment issues, develop monitoring schedules, and prioritize exposure monitoring. The database will include location, date, conditions under which sampling was conducted, sampling method used, and sampling results. The records will be retained in the database for a minimum of 10 years.

It is the responsibility of each department/supervisor to forward sampling records to Environment, Health & Safety for maintenance of the database.

**Maintenance of Hygiene Equipment**

**Department Responsibility**

Each department is responsible for maintaining and inspecting their own hygiene equipment, such as gas monitors. Guidance on maintaining the equipment can be obtained by referencing the manufacturer’s instructions or contacting Environment, Health & Safety Dept.

Environment, Health and Safety dept will maintain and inspect their own equipment.

**Equipment Storage**

Hygiene equipment will be stored in a manner that keeps it free from damage and contamination. A competent worker may perform minor repairs and preventative maintenance. The equipment’s manufacturer or an approved vendor will complete major repairs and regular factory calibrations as needed.

**Calibration & Documentation**

Records of maintenance, repairs, and calibration must be kept on file for the life of the instrument.

**Annual Program Review**

The Occupational Hygiene Program will be reviewed annually by Environment, Health & Safety:

- To ensure its contents continue to meet regulatory requirements;
- To evaluate the effectiveness of the process/program; and,
- To evaluate the roles and responsibilities of the program.
Environment, Health & Safety dept. must retain the current copy of the Occupational Hygiene Program.

**Definitions**

**Administrative Control**: Encompasses the use of management involvement, training, job rotation, reduction of exposure time, preventive maintenance, and housekeeping in an effort to control worker exposures. Examples include safety rules and enforced safe work procedures, training, lock-out tag out processes to de-energize equipment prior to working on it, immunizations, etc.

**Biological Hazard**: is any biological organism that is infectious or pathological to humans.

**Chemical Hazard**: is any chemical capable of causing bodily injury or illness.

**Engineering Control**: Encompasses the use of process change, substitution, isolation, ventilation and source modification in order to control worker exposures by reducing the quantity of contaminants released into the workplace. Examples include chemical fume hoods, biological safety cabinets, interlock systems, automated systems, etc.

**Hazard**: is a situation, condition, process, material or thing that may cause an injury or illness to a worker.

**Material Safety Data Sheets (MSDSs)**: are technical bulletins which provide detailed hazard and precautionary information on a controlled product.

**Occupational Exposure Limit (OEL)**: Refer to the definition of Threshold Limit Value (TLV).

**Personal Protective Equipment (PPE)**: Involves the use of devices designed to protect individuals from hazards in the workplace. Examples include gloves, goggles or safety glasses, hearing protection, steel-toed shoes, lab coats, etc.

**Physical Hazard**: Arises from the interaction of matter and energy related to the science of physics such as sounds, light, vibration, and radiation that could result in an occupational injury or illness.

**Route of Exposure**: The way in which a substance/agent enters the body. The four primary routes of exposure/entry are inhalation, absorption (through skin and eyes), ingestion and injection.

**Supervisor**: An individual that directs or oversees a person, group, department, organization, or operation.

**Threshold Limit Value (TLV)**: A term used by ACGIH to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse effects. A maximum limit of exposure to an air contaminant.

Three types of limits in common use are:

- Exposure Limit - TWA - The Time-Weighted Average concentration for a
normal 8-hour work day or 40-hour work week to which nearly all workers can be repeatedly exposed without adverse effect.

- Exposure Limit - STEL - The Short-Term Exposure Limit, i.e. the maximum concentration to which workers can be periodically exposed for a period up to 15 minutes without suffering from irritation, chronic or irreversible tissue change, or narcosis of sufficient degree to increase accident proneness, or impair ability for self-rescue.

- Exposure Limit - C - The Ceiling concentration of an airborne substance that must not be exceeded at any time. This limit is applied to substances that are predominantly irritant or fast-acting and for which the TWA is inappropriate.

**Walkthrough Survey:** A technical review of the operations, workers, and materials in a workplace used to more clearly identify potential health hazards and help guide a qualitative assessment of their severity.

**Worker:** Any person engaged in work at the industry, including workers, contracted workers.

### 7.5 FIRE CONTROL PLAN

Unit has considered fire prevention measures at the project planning stage for its upcoming new facility to avoid any outbreak of fire. By looking to the hazardous nature of process and the chemicals that will be handled and processed, the chances of outbreak of fire will be very less which cannot be totally ignored. The company has planned to keep the following types of fire extinguishers at various conspicuous locations.

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Chemical Powder</td>
<td>2 Nos. of each 20 Kg, 6 Kg, 1 Kg</td>
</tr>
<tr>
<td>Mechanical Foam</td>
<td>2 Nos. of each 20 Kg, 6 Kg, 1 Kg</td>
</tr>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td>2 Nos. of each 20 Kg, 6 Kg, 1 Kg</td>
</tr>
<tr>
<td>Sand (Fire) Buckets</td>
<td>6 Buckets at Appropriate locations</td>
</tr>
</tbody>
</table>

Other Fire fighting measures to be adopted, if required, shall be:
- Fire alarms will be provided as per requirements.
- Working staff will be trained to operate fire extinguishers.
- Fire mock drills will be organized periodically.
- If required, help will be taken from nearest fire station which is at Dahej @ 5 km distance.

### 7.6 DO’S & DON’TS

Unit has proposed some of the Do’s & Don’ts activities to strengthen the Safety at Work, which will be followed strictly:

**For Preventive Maintenance:**

**Do’s:**
- Inspection of all Fire Fighting Facilities/Check Alarms operation.
**Don’ts:**
- Don't allow anyone who hasn’t received specific safety and operational training to get indulge in any site activity.
- Don't compromise on Design and Engineering part.
- Don't perform any activity without proper permit.
- Don't panic if you are in a risky situation.
- Don't allow spilled chemicals to drain to sewers/gutters etc.

**Strengthening of HSE (Applicable for Manufacturing Utility Staff)**

**Do’s:**
- Follow the instruction of sign boards/warnings.
- Wash affected part immediately with plenty of water.
- In case of vapour inhalation, immediately render first aid to the patient and then move the patient to First Aid Centre.
- In case of emergency everyone should try to reach at Assembly point.
- Use PPEs like ear plug/muff in high noise area.
- Work permit system to be followed before starting any work, vessel entry or working at height.
- Barricade and mark hazardous/unsafe area.
- Ensure use of safety belt while working at height.
- Electrical cables should be protected from water and from attack by corrosive substances.
- Maintain good housing keeping, it will eliminate many unnecessary hazards.
- All passage ways and stairways should be maintained, clean and unobstructed.
- Employees must know the locations of fire extinguisher and fire exists.
- During emergency be calm and do not get panicky.

**Don’ts:**
- Do not smoke in restricted areas.
- Unauthorized entry into battery limits of every plant is prohibited.
- Moving in the plant area without wearing safety helmet and safety shoes is not permitted.
- Do not follow shortcuts, use proper roads, pathways, wherever provided.
- Do not make vague statements, do not overrule supervisor, do not adopt shortcuts.
- No automobile vehicle should be allowed to enter in the plant area without muffler or exhaust.
7.7 Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers

Company has prepared Safety Plan and implemented for the project activity. Also, management has allotted enough funds to ensure the occupational health & safety of all contract & causal workers and also allotted a special budget for employee’s appreciation for proactive and rescue operations. The same shall be followed for the expansion facilities also.

Details of the same are as follows:

- To allocate sufficient resources (like PPEs) to maintain safe and healthy conditions of work;
- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment;
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and up to date knowledge;
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
- To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
- To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to take corrective, remedial and preventive action;
- To organize safety programs, celebrating safety week, safety competitions during safety week, etc.
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
- To publish/notify regulations, instructions and notices in the common language of employees.
- To prepare separate safety rules for each type of occupation/processes involved in a plant;

7.8 Scenarios Identified For Consequence Analysis

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Scenarios considered</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acetic Anhydride</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flammable area of vapor cloud</td>
<td>Output not obtained</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>2</td>
<td>Acetic acid</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.4</td>
</tr>
<tr>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
</tbody>
</table>
# Additional Studies

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Scenarios considered</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Acetone</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.5</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>4</td>
<td>Acetonitrile</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.6</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>5</td>
<td>Acetyl chloride</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.7</td>
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<td></td>
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<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>6</td>
<td>Benzoyl chloride</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.8</td>
</tr>
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<td></td>
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<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>7</td>
<td>Chloroform</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.9</td>
</tr>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>8</td>
<td>Sulfuric acid</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.10</td>
</tr>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>9</td>
<td>Pyridine</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.11</td>
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<td></td>
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<td>Output not obtained</td>
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<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Output not obtained</td>
</tr>
<tr>
<td>10</td>
<td>n-Pantane</td>
<td>Toxic area of vapor cloud</td>
<td>Figure 7.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flammable area of vapor cloud</td>
<td>Figure 7.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blast area of vapor Cloud Explosion</td>
<td>Figure 7.14</td>
</tr>
</tbody>
</table>

**Acetic Anhydride**

ERPG-1: 0.5 ppm, ERPG-2: 15 ppm, ERPG-3: 100 ppm  
IDLH: 200 ppm  LEL: 27000 ppm  UEL: 100000 ppm  
Vapor Pressure at Ambient Temperature: 0.016 atm  
Air Temperature: 39° C  
Circular Opening Diameter: 1 centimeters  
Max Average Sustained Release Rate: 917 grams/min  

![Toxic area of vapor cloud (Acetic Anhydride)](image-url)
Acetic Acid:

ERPG-1: 5 ppm  ERPG-2: 35 ppm  ERPG-3: 250 ppm  
IDLH: 50 ppm  LEL: 40000 ppm  UEL: 199000 ppm  
Vapor Pressure at Ambient Temperature: 0.044 atm  
Air Temperature: 39° C  
Circular Opening Diameter: 1 inches  
Max Average Sustained Release Rate: 1.37 kilograms/min

Figure: 7.4–Toxic area of vapor cloud (Acetic Acid)

Acetone:

AEGL-1(60 min): 200 ppm, AEGL-2(60 min): 3200 ppm, AEGL-3(60 min): 5700 ppm  
LEL: 26000 ppm  UEL: 130000 ppm  
Vapor Pressure at Ambient Temperature: 0.54 atm  
Air Temperature: 39° C  
Circular Opening Diameter: 2 inches  
Max Average Sustained Release Rate: 17.4 kilograms/min

Figure: 7.5–Toxic area of vapor cloud (Acetone)

Acetonitrile:
AEGL-1 (60 min): 13 ppm  AEGL-2 (60 min): 50 ppm  AEGL-3 (60 min): 150 ppm
IDLH: 500 ppm  LEL: 30000 ppm  UEL: 170000 ppm
Vapor Pressure at Ambient Temperature: 0.22 atm
Air Temperature: 39° C
Circular Opening Diameter: 2 inches
Max Average Sustained Release Rate: 1.4 kilograms/min

**Figure: 7.6–Toxic area of vapor cloud (Acetonitrile)**

**Acetyl Chloride:**
- PAC-1: 0.85 ppm  PAC-2: 9.4 ppm  PAC-3: 56 ppm
- LEL: 73000 ppm  UEL: 190000 ppm
- Vapor Pressure at Ambient Temperature: 0.66 atm
- Air Temperature: 39° C
- Circular Opening Diameter: 1 centimeters
- Max Average Sustained Release Rate: 3.85 kilograms/min

**Figure: 7.7–Toxic area of vapor cloud (Acetyl Chloride)**

**Benzoyl Chloride:**
- ERPG-1: 0.3 ppm  ERPG-2: 5 ppm  ERPG-3: 20 ppm
- LEL: 12000 ppm  UEL: 49000 ppm
Chapter-7: Additional Studies

**Chloroform:**
- Vapor Pressure at Ambient Temperature: 0.0020 atm
- Air Temperature: 39° C
- Circular Opening Diameter: 2 inches
- Max Average Sustained Release Rate: 219 grams/min

Figure: 7.8–Toxic area of vapor cloud (Benzoyl Chloride)

<table>
<thead>
<tr>
<th>AEGL-1 (60 min): N/A</th>
<th>AEGL-2 (60 min): 64 ppm</th>
<th>AEGL-3 (60 min): 3200 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLH: 500 ppm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Vapor Pressure at Ambient Temperature: 0.46 atm
- Air Temperature: 39° C
- Circular Opening Diameter: 1 centimeters
- Release Duration: 57 minutes

Figure: 7.9–Toxic area of vapor cloud (Chloroform)

**Sulphuric Acid:**
- Vapor Pressure at Ambient Temperature: 0.0083 atm
- Air Temperature: 39° C
- Circular Opening Diameter: 2 inches
- Max Average Sustained Release Rate: 683 grams/min
**Pyridine:**

PAC-1: 3 ppm  PAC-2: 19 ppm  PAC-3: 3600 ppm  
LEL: 18000 ppm  UEL: 120000 ppm  
Vapor Pressure at Ambient Temperature: 0.051 atm  
Air Temperature: 37° C  
Circular Opening Diameter: 0.5 inches  
Release Duration: 60 minutes  
Max Average Sustained Release Rate: 2.28 kilograms/min

**Figure: 7.10 – Toxic area of vapor cloud (Sulphuric Acid)**

**n-Pantane:**

PAC-1: 3000 ppm  PAC-2: 33000 ppm  PAC-3: 200000 ppm  
IDLH: 1500 ppm  LEL: 14000 ppm  UEL: 78000 ppm  
Vapor Pressure at Ambient Temperature: greater than 1 atm  
Air Temperature: 39° C  
Circular Opening Diameter: 1 inches  
Release Duration: 4 minutes  
Max Average Sustained Release Rate: 87.9 kilograms/min

**Figure: 7.11 – Toxic area of vapor cloud (Pyridine)**
Recommendations of QRA study

- Procedures should be developed for handling of toxic/flammable materials and should be followed.
- LEL detectors, toxic gas detectors should be provided near tanks which store flammable/toxic material; however, adequacy of number of detectors should be studied. Detectors should be placed at vulnerable areas.
- Active fire protection systems like deluge system should be in place for tank farm area. It should cover entire tank farm area.
- Fire hydrants should be placed such that it should cover entire area.
- Water monitor system for storage tanks should be placed such that it should cover entire tank farm area.
- Ignition sources should not be allowed within the plant area in any circumstances.
- Smoke detectors should be in placed in office areas and control room. However, adequacy of the same should be studied.
- Hydraulic testing of pipes and should be carried out.
- Regular inspection and maintenance of valves should be carried out to ensure effective operability.
- Regular maintenance and inspection for equipments should be done.
- Good safety management, strict adherence to safety management procedures and competency assurance will reduce the risk.

### 7.9 LEAK DETECTION AND REPAIR SYSTEMS (LDAR)

Leak Detection and Repair (LDAR) is a program implemented to comply with environmental regulations for reducing the fugitive emissions of targeted chemicals into the environment. Leaking equipment, such as valves, pumps, and connectors, are a large source of emissions of volatile organic compounds (VOCs) and volatile hazardous air pollutants (VHAPs).

Quarterly VOC monitoring would be conducted by NABL approved laboratory and six-monthly workplace VOC monitoring would be carried out to identify areas with VOC levels greater than the threshold limits. In case of any identified area appropriate controls would be put in to identify the reasons for VOC/fugitive emissions and rectify the same. Documentation of procedures for the monitoring and inspecting of emission control equipment are prepared.

The Following methodology will adopt during LDAR study:
- Identify the Chemical streams that will be monitored.
- Types of components (pumps, valves, connectors, etc.) will be monitored.
- Actions to be taken if a leak is detected.
- All the rotating equipment like pumps will be installed with Mechanical Seals to arrest any sort of emissions.
- Length of time in which an attempt to repair the leak must be performed.
- Actions that must be taken if a leak cannot be repaired within guidelines.
- Record-keeping and reporting requirements.

**Preventive Maintenance to prevent Leakages:**
In order to prevent leakage from Pump, Seals, Valves etc., preventive maintenance shall be carried out periodically as per plan. Regular maintenance
of valves, pumps, flanges, joints and other equipment will be done to prevent leakages and thus minimizing the fugitive emissions of VOCs.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component</th>
<th>Preventive Maintenance Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pump seals with visible liquid dripping</td>
<td>Daily</td>
</tr>
<tr>
<td>2</td>
<td>Valves/flanges</td>
<td>Quarterly</td>
</tr>
<tr>
<td>3</td>
<td>Compressor seals</td>
<td>Quarterly</td>
</tr>
<tr>
<td>4</td>
<td>Pressure relief devices</td>
<td>Yearly</td>
</tr>
<tr>
<td>5</td>
<td>Pipeline Thickness Testing</td>
<td>Yearly</td>
</tr>
</tbody>
</table>

**Immediate Repair of devices in case of Leakages:**
- A regular preventive maintenance schedule will be in place to replace or rectify all gaskets and joints to ensure no fugitive emissions shall take place.
- Plant shall also maintain adequate number of spares and consumables required to repair the leaking device.
- Plant shall also have competent contractor team to handle Leakages and can repair the same immediately.
- Standby equipment’s like Pumps, valves etc. shall be kept basis the criticality and usage.
- Plant shall also have access equipment’s like Boom lift to handle leakages at height immediately.

### 7.10 Hazardous Analysis Of Raw Material

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Raw Material</th>
<th>BP (°C)</th>
<th>FP (°C)</th>
<th>LEL UEL</th>
<th>Hazard identification</th>
<th>Handling</th>
<th>Storage</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Methylene Dichloride</td>
<td>40</td>
<td>NA</td>
<td>13% to 23%</td>
<td>Contact with eyes may cause severe irritation, and possible eye burns.</td>
<td>Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin, and clothing.</td>
<td>Storage in a tightly closed container. Keep from contact with oxidizing materials. Store in a Cool, dry, well-ventilated area from incompatible substance.</td>
<td>Wear chemical splash goggles. Viton gloves are recommender. Wear appropriate protective clothing to prevent skin exposure.</td>
</tr>
<tr>
<td></td>
<td>CAS no. 75-09-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Di IsoPropyl ether</td>
<td>68</td>
<td>--</td>
<td>NA</td>
<td>May cause severe eye irritation. Causes redness and pain.</td>
<td>Use spark-proof tools and explosion proof equipment. Avoid breathing dust, vapor, mist, or gas.</td>
<td>Keep away from source of ignition. Store in a cool, dry places. Do not store in direct sunlight.</td>
<td>Wear chemical splash goggles. Wear appropriate gloves to prevent skin exposure.</td>
</tr>
<tr>
<td></td>
<td>CAS no. 108-20-3</td>
<td></td>
<td></td>
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</tbody>
</table>
## Chapter 7: Additional Studies

### Table: Additional Studies

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Raw Material</th>
<th>BP (°C)</th>
<th>FP (°C)</th>
<th>LEL</th>
<th>Hazard identification</th>
<th>Handling</th>
<th>Storage</th>
<th>Personal protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Acetone CAS no. 67-64-1</td>
<td>56</td>
<td>NA</td>
<td>NA</td>
<td>Serious eye damage/ eye irritation. Specific target organ toxicity.</td>
<td>Comply with legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handel un cleaned empty container as full ones.</td>
<td>Keep only in the original container in a cool, well ventilated place away from heat sources. Direct sunlight, incompatible materials.</td>
<td>Safety glasses. Head/neck protection. Protective clothing. Wear gas mask with filter type A if conc.</td>
</tr>
<tr>
<td>4</td>
<td>n-Pentane CAS no. 109-66-0</td>
<td>36</td>
<td>-49 (Closed cup)</td>
<td>1.4 % to 8.3 %</td>
<td>Flammable Liquid, Aspiration hazard, specific target organ toxicity.</td>
<td>Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.</td>
<td>Store in cool place. Keep container tightly closed in a dry and well-ventilated place.</td>
<td>Face shield and safety glasses tested and approved under appropriate government standards.</td>
</tr>
<tr>
<td>5</td>
<td>Chloroform CAS no. 67-66-3</td>
<td>60.5</td>
<td>N/A</td>
<td>N/A</td>
<td>Harmful if inhaled or swallowed. Causes respiratory tract, eyes and skin irritation. Suspect cancer hazard may cause cancer.</td>
<td>Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation.</td>
<td>Store in accordance with local regulations. Store in original container, protected from Direct sunlight.</td>
<td>Use a properly fitted, air-purifying or air-fed respirator complying with an approved Standard if a risk assessment indicates this is necessary.</td>
</tr>
<tr>
<td>6</td>
<td>Acetonitrile CAS no. 75-05-8</td>
<td>81.6</td>
<td>2</td>
<td>N/A</td>
<td>Flammable liquid and vapor. Causes eye irritation. May be harmful if swallowed, inhaled or absorbed through the skin.</td>
<td>Wash thoroughly after handling. Remove contaminated clothing and wash before reuse.</td>
<td>Keep away from source of ignition. Store in a tightly closed container. Keep from contact with oxidizing material.</td>
<td>Wear chemical splash goggles. Wear appropriate protective gloves to prevent skin exposure.</td>
</tr>
<tr>
<td>7</td>
<td>n-Hexane CAS no. 110-54-3</td>
<td>69</td>
<td>-22</td>
<td>1 % to 8.1 %</td>
<td>Wear appropriate protective gloves to prevent skin exposure.</td>
<td>Work under hood. Do not inhale substance/mixture. Avoid</td>
<td>Keep container tightly closed in a dry and well-</td>
<td>Protective clothing needs to be selected specifically.</td>
</tr>
<tr>
<td>S. No.</td>
<td>Raw Material</td>
<td>BP (°C)</td>
<td>FP (°C)</td>
<td>LEL UEL</td>
<td>Hazard identification</td>
<td>Handling</td>
<td>Storage</td>
<td>Personal protection</td>
</tr>
<tr>
<td>-------</td>
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<tr>
<td>8</td>
<td>Pyridine CAS no. 110-86-1</td>
<td>115</td>
<td>17</td>
<td>N/A</td>
<td>Causes severe eye and skin irritation with possible burns. May cause central nervous system depression.</td>
<td>Wash thoroughly after handling. Remove contaminated clothing and wash before reuse.</td>
<td>Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well ventilated area away from incompatible substances.</td>
<td>Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommend ed exposure limits.</td>
</tr>
<tr>
<td>9</td>
<td>Methanol CAS no. 67-56-1</td>
<td>64.5</td>
<td>11</td>
<td>6 % to 36 %</td>
<td>May be fatal or cause blindness if swallowed. Harmful if inhaled or absorbed through the skin. Flammable liquid and vapor.</td>
<td>Wash hands thoroughly after handling. In the event of exposure, remove contaminated clothing and wash before reuse.</td>
<td>Keep away from heat, sparks, flames (all sources of ignition). Keep away from oxidizers, acids and bases.</td>
<td>Use explosion-proof ventilation equipment. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.</td>
</tr>
<tr>
<td>S. No.</td>
<td>Raw Material</td>
<td>BP (°C)</td>
<td>FP (°C)</td>
<td>LEL UEL</td>
<td>Hazard identification</td>
<td>Handling</td>
<td>Storage</td>
<td>Personal protection</td>
</tr>
<tr>
<td>--------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>10</td>
<td>Phenol CAS no. 108-95-2</td>
<td>182</td>
<td>79.4</td>
<td>N/A</td>
<td>Causes digestive and respiratory tract burns. Causes eye and skin burns. Readily absorbed through the skin.</td>
<td>Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin or on clothing.</td>
<td>Keep away from heat, sparks and flame. Keep away from source of ignition. Store in a cool, dry place.</td>
<td>Use explosion – proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.</td>
</tr>
<tr>
<td>11</td>
<td>Ethyl Acetate CAS No. 141-78-6</td>
<td>77</td>
<td>-4</td>
<td>N/A</td>
<td>Flammable liquid and vapor. Harmful if swallowed or inhaled. Affects central nervous system. Causes irritation to skin, eyes and Respiratory tract.</td>
<td>Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute.</td>
<td>Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation.</td>
<td>Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.</td>
</tr>
</tbody>
</table>
CHAPTER – 8

PROJECT BENEFITS

8.1 INTRODUCTION

Growth in the industrial sector creates new opportunities for employment and can also help diversify the economy. This chapter describes about benefits of the project to the region in terms of improvements in the physical infrastructure, social infrastructure, Employment potential.

8.2 IMPROVEMENT IN THE INFRASTRUCTURE

The project area is having easily accessible approach roads, public transport, communication, etc. Also, the proposed project site will have sufficient infrastructural facilities including drinking water, toilets, sanitation facilities, power etc. Hence, no major benefit to the public infrastructure is anticipated due to the proposed project. However, benefits due to CSR activities may be realized if any CSR activities would be related with such facilities.

8.3 EMPLOYMENT POTENTIAL

The Project will create direct & indirect employment opportunities within the surrounding region. The Unit will use good faith efforts to employ local people from the nearby villages depending upon the availability of skilled & un-skilled manpower surrounding the project site. In construction phase many people will get temporary employment. In operation phase, the proposed project would require significant workforce of non-technical and technical persons at around 60. Migration of highly education and skilled experience will result in increase of literacy in the surrounding Villages. The employed people will be benefited financially. This financial gain will fulfill their monetary requirements, which in turn will increase their standard of living.

8.4 CSR ACTIVITIES

Unit has planned to institutionalize the Corporate Social Responsibility (CSR) activities so that the CSR transforms itself into personal Social Responsibility for the personnel manning the factory.

- Funds will be provided to arrange extra-curricular activities for nearby school and colleges.
- School uniforms, notebooks and scholarship will be provided to poor students.
- Regular medical camps in the surrounding villages to provide treatment with free supply of medicines and highlight the aspects of hygiene and good health.
- Tree Plantation in rural areas.
- Free education material for school girl of nearby villages.
- Provision of sanitation (toilets) facility.
Initially CSR budget commitment will be approximately 2% of company’s annual net profit. The activities in which CSR fund will be used are covered under schedule VII of the company’s act 2013.

8.5 ECONOMIC DEVELOPMENT

This project will increase the economic activities around the area, creating avenues for direct/indirect employment during operation phase of the project. This project will contribute additional revenue to the Central & State exchequer in the form of income tax, GST, corporate taxes etc. Indirect contribution to the Central & State exchequer will be there due to Income by way of registration of trucks, payment of road tax, income tax from individual as well as taxes from associated units. Thus, the proposed project will help the Government by paying different taxes from time to time, which is a part of revenue and thus, will help in developing the area. Demand of the proposed products in foreign market is also significant, which will boost the export potential of the company as well as country. Export oriented units plays vital role in development of economy as well as local physical infrastructure for further boosting of industrial development with sustainable approach as the industries need to maintain good environment & safety condition to get better foreign market.

8.6 GREENBELT DEVELOPMENT

Tree plantation is one of the effective remedial measures to control the air pollution and noise pollution. It also causes aesthetics improvement of the area as well as sustains and supports the biosphere. Total land area is 5000 m². The unit will develop greenbelt in area of 1663 m² (33.3% of the total area). Additionally, unit also has plans to develop greenbelt in areas available outside the plant premises if necessary and will participate in greenbelt development program organized by GIDC.

8.7 CORPORATE ENVIRONMENT RESPONSIBILITY (CER)

As per MoEF&CC OM F.No.22-65/2017-IA.III dated 1st May, 2018 industry will provide 2% of the project cost (465 Lakh) i.e. 9.3 Lakh towards the Corporate Environmental Responsibility (CER). Following is the Five year action plan for carrying out various activities under CER in nearby villages:

**Action Plan for Socio-Economic Development Activities**

<table>
<thead>
<tr>
<th>Type of Activities</th>
<th>Yearly amount to be spent in CER activities (Rs in Lakh)</th>
<th>Total amount to be spent (Rs in Lakh)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Year</td>
<td>2nd Year</td>
</tr>
<tr>
<td>Tree plantation/ Solar panel provision/ Rain water harvesting in nearby area</td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>
CHAPTER–9 ENVIRONMENTAL MANAGEMENT PLAN

9.1 INTRODUCTION

Environmental Management is basically resource management and environmental planning is similar to development planning. The conventional resource management and development planning look at the issues from narrow micro-economical point of view while environmental management views the issues from the broader prospective of long term sustainable development option, which ensures that the environment is not desecrated. An Environmental Management Plan is prepared for construction phase, post construction phase (commissioning and operation) and for post project phase. The environmental management plan is prepared to minimize the impact of atmospheric emissions, liquid effluents, solid wastes & noise generation on the surrounding environment.

The baseline settings of different relevant environmental components in the study area are analyzed and potential impacts on those components due to the proposed project are documented. The impacts on environment are found to be minimal during the study; however additional measures are documented for operation phase for further improvement of Environmental Quality in the form of an Environmental Management Plan (EMP).

Environment, Health and Safety (EHS)
- It is of utmost concern for a company to conduct its business in a manner that will promote the protection of the occupational Health & Safety; Welfare of its employees and others involved in or affected by its business operations and address the environmental concerns regarding sustainable development.
- To be a responsive and responsible corporate citizen, we shall strive to achieve an organizational culture of Safety, Health and Environmental excellence.
- As an integral part of the company’s business performance, the company shall declare full commitment to achieve high levels of performance in Health, Safety and Environment.
- Continual improvements in Safety, Health and Environment shall be recognized as essential for the future success of the company.

9.2 THE ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) is prepared to mitigate and manage various environmental impacts identified. The EMP presents the project specific guidelines on:
- Environmental management strategies
- Specialized engineering construction procedures in relation to environmental guidelines of the country
- Spill prevention and control
• Management of wastes and hazardous chemicals
• Air, water and soil quality protection
• Noise control
• Soil erosion control and slope stabilization
• Vegetation, wildlife and habitat protection
• Socio-economic and welfare considerations
• Risk and disaster management plan
• To prepare a checklist for statutory compliance

Due to its complexity and implications, the implementation of the EMP must be executed utilizing a specific EMS framework. Once an EMP has been approved, it should provide the basis for environmental considerations of all the activities carried out on the site by the appointed personnel.

With respect to the various environmental impacts identified during the EIA stage, mitigation measures to prevent or minimize the impacts are suggested for all the environmental components.

The environmental management plan for the proposed project aims to mitigate the potentially detrimental impacts on the environment, both during construction and operation phases of the project. It is also necessary that continued compliance with existing environmental regulations is ensured. The construction and associated activities have been planned so as to minimize impacts on the physical, biological and socio-economic-cultural environments. Even though it would be naive to expect that all detrimental impacts can be avoided, it is apparent that most of the impacts will be localized and temporary in nature.

9.3 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

While developing an EMP within the framework of an EMS, it is imperative to have clear environmental objectives and delineate them. The key environmental management objectives for this project are to avoid significant adverse environmental impacts and to ensure that where impacts do occur they are mitigated. In addition, the project proponent aims to meet the following specific objectives:

• To adopt construction and operational methods that will limit environmental degradation.
• To protect physical environmental components such as air, water and soil.
• To improve workplace conditions for employees by reducing every kind of pollution and improving workplace environment/atmosphere.
• To make budgetary provision and allocation of funds for environment management system and to timely revision of budgetary provisions.
• To implement & ensure effective implementation of research and development program for the innovative technologies for better environment, resource conservation/ recovery/recycling/reuse.
• To eliminate/reduce the possibility of potential hazard due to operations.
• To generate/extend employment opportunities wherever possible and feasible.
• To provide advanced sophisticated safety system to ensure safety of the public at large.
9.4 EMP FOR OPERATIONAL PHASE

Routine operational activities of the project would be associated with the following potentially significant environmental impacts. These activities associated with the impacts as listed hereunder:

- Routine production activities
- Waste treatment and disposal
- Transport of men and material
- Storage of raw materials
- Fire / Explosion

The operational phase activities due to proposed project have the potential to cause long-term environmental impacts. Cumulative impacts due to the air pollution are predicted using simulation models as discussed in chapter 4.

Several control measures have been incorporated to minimize the generation of wastes and subsequent environmental impacts during the operational phase. Strict adherence to these pollution prevention and control measures will moderate the environmental impacts to the minimum possible level during operational phase. In general, the environmental management plan during operational phase of the plant will be directed to the following:

- It will be ensured that all the pollution control / environment management systems are commissioned before the commencement of operation of the project.
- Wherever possible, the control systems will be interlinked with the operational units, so that failure of the control system will shut down the respective operational unit.
- Regular performance evaluation of the control systems will be undertaken to ensure their optimum performance.
- Preventive maintenance schedule of the control systems will be matching with that of the respective operational unit.
- Regular monitoring for various components of environment will be undertaken to ensure effective functioning of pollution control measures as well as to safe guard against any unforeseen changes in environment.
- Efforts will be made to ensure the maximum utilization of wastes to be generated.
- During the operational phase, there will not be any significant impacts on various environmental components. Hence, the following Management Plan is recommended to mitigate adverse impacts during operation phase:

9.4.1 Management of Air Environment

To control fugitive emissions following measures are recommended:

- Controlled emissions and provision of PPE for the workers.
- Adequate measures for the minimization/prevention of the fugitive emission.
- Regular maintenance of valves, pumps and other equipment to prevent leakage.
- Entire process is carried out in the closed reactors with proper maintenance of pressure and temperature.
- Regular periodic monitoring of work area to check the fugitive emission.
- Adequate stack heights as per the CPCB estimation will be provided at all locations to reduce GLCs of pollutants.
- Greenbelt development is implemented to mitigate impacts from fugitive emissions. About 33% of the total area of site area will be developed for greenbelt.
- The air quality surveillance program will be undertaken for proposed and the program may be strengthened properly keeping in view the combined maximum impacts from post-project activities particularly in critical downwind directions.
- Air Pollution Control System will be installed in the plant.

9.4.2 Management of Noise

To minimize the noise pollution the unit proposes the following noise control measures:
- Manufacturers / suppliers of major noise generating machines / equipments like air compressors, feeder pumps, etc. will be instructed to make required design modifications wherever possible before supply and installation to mitigate the noise generation and to comply with the national / international regulatory norms with respect to noise generation.
- Periodic maintenance of machinery and vehicles will be undertaken to reduce the noise impact.
- Noise suppression measures such as enclosures, buffers and / or protective measures will be provided (wherever noise level is more than 75 dB (A)).
- Employees will be provided with Personal Protective Equipments like earplugs or earmuffs, wherever required.
- Extensive oiling, lubrication and preventive maintenance will be carried out or the machineries and equipments to reduce noise generation.
- The green belt area will be developed within industrial premises and around the periphery to prevent the noise pollution in surrounding area.
- Noise monitoring will be carried out to check the efficacy of maintenance schedules undertaken to reduce noise levels and noise protection measures.
- Good quality digital sound level meter will be in place to monitor noise level.

9.4.3 Management of Water Environment

The source of water is GIDC water supply. Total water requirement will be 17.0 KLD. Out of 5 KLD domestic use, 4 KLD sewage will be generated which will be discharged to soak pit through septic tank. 8.3 KLD will be required for green belt development in 1663 sqmt. area. Out of 3.7 KLD industrial requirements, 1.45 KLD wastewater will be generated. 1 KLD Low concentrated effluent stream will be treated in in-house ETP and then sent to CETP for further treatment. 0.45 KLD Concentrated Stream will be separately collected and sent to Common MEE facility.
The mitigation measures for minimizing the impacts on water environment in general includes following:

- Optimum utilization of water resource.
- Minimize waste generation.
- Reuse/recycle and disposal.
- Use of high-pressure hoses for cleaning the floor to reduce the amount of wastewater generated.
- Reducing the actual process water consumption by way of improvement in operation of processing units.
- Unit proposes to collect rain water during the monsoon and use for various purposes.
- Advance controls and instrumentation for operations and control and leak detection techniques shall be implemented for this project.
- The domestic sewage will be disposed in soak-pits and septic tanks.

9.4.4 Management of Land Environment

The management plan for this component of environment lays emphasis on development of greenbelt comprising of appropriately selected species of shrubs and trees. It is recommended that plantation be made on sites, road sides and on barren land. Such a development of greenbelt and plantation of shrubs and trees will not only significantly reduce or mitigate adverse impacts due to aerosols and gaseous pollutants, noise, odour and nuisance etc, but also, serve as shelter belts for avifauna, stabilize and improve soil permeability and aesthetic environment.

9.4.5 Management of Solid/Hazardous Waste

Waste is an unavoidable byproduct of human activity. Economic development, rapid urbanization & improved living standards have led to the increase in quantity & complexity of the waste generated. Proper disposal of waste is essential for preservation and improvement of public health.

Solid waste management is one of the most essential services for maintaining the quality of life in the plant and for ensuring better standards of health and sanitation. Solid waste generated in the plant area can be handled under two main categories, namely domestic wastes and industrial wastes. Effective measures will be taken to effectively implement the solid waste management systems in the plant. Solid waste will be handed over to authorized vendor for disposal.

The Hazardous waste like Discarded Containers, Bags with liner, distillation residue, ETP sludge etc. will be handled as per Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016. Discarded Containers and Bags will be sold to registered recycler having decontamination facility.

The Waste Management plan includes:
- Waste Inventory
Waste Management:

1. Solid Waste
   - The solid waste shall be segregated as bio-degradable and non-biodegradable.
   - The organic waste will be segregated and handed over to outside agency for disposal.
   - The non-biodegradable (inorganic) waste shall be handed over to authorized recycler for further handling and disposal.
   - Reuse of paper and plastic waste.
   - Planned system for waste collection, segregation and disposal.

2. Hazardous waste
   - Hazardous waste will be stored in proper storage room and handed over to authorized vendor for final disposal.
   - The collection, treatment and disposal of hazardous waste will be as per Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016, and hence no adverse impact on land environment is envisaged.

Manual handling of waste will be avoided maximum as possible. However, necessary PPE’s shall be provided to workers while handling of hazardous wastes.

9.4.6 Management of Hazardous Raw materials

During the operation period, Hazardous raw materials, especially solvents will be handled with care and precautions. SOP will be followed for handling the chemicals. Minimum possible storage will be provided for chemicals. Detailed physical and chemical characteristics, handing and management of hazardous chemicals are given in chapter-7. Storage inventory is given in chapter-2.

9.4.7 Management of Biological Environment

- No trash/non-biodegradable materials should be dumped outside the project site.
- Domestic wastewater (sewage) will be disposed off into septic tank & soak pit. No contaminated water will be allowed to enter the surrounding environment or surface water body.
- Green belt will be developed all along the boundary of the installation by choosing fast growing and resistant varieties suitable to the soil conditions in the site (native plants) and special care will be taken to maintain it.
- Survival rate of the planted trees will be closely monitored in the green belt and the trees which could not survive should be counted.
- There will be a waste management plan developed for categorization and handling of wastes.
9.4.8 Greenbelt Development Plan

Tree plantation is one of the effective remedial measures to control the air pollution and noise pollution. It also causes aesthetics improvement of the area as well as sustains and supports the biosphere.

**Design of greenbelt:**
As far as possible, following guidelines will be considered in greenbelt development.

- The spacing between the trees will be maintained as per guideline, so that the trees may grow vertically and slightly increase the effective height of the green belt.
- The short trees (< 10 m height) will be planted in the first two rows (towards plant side). The tall trees (> 10 m height) will be planted in the outer three rows (away from plant side).

**Selection of species for greenbelt**
For the development of greenbelt, plants having simple big leaves and native species are preferred to the plants. The plants are suitable for greenbelt development based on gaseous exchange capacity of foliage which is ascertained by the following characteristics:

- The plant should be fast growing.
- It should be perennial and evergreen.
- It should have large leaf area index.

**Selection of species for greenbelt**
Limdo, Asopalav, Gulmahor, Badam and other small fruit/flower plant are suggested for the greenbelt development with respect to this particular area. They are evergreen tree types suitable to be grown in the area.

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of trees/plants</th>
<th>Area(m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>150</td>
<td>375</td>
</tr>
<tr>
<td>2nd</td>
<td>150</td>
<td>375</td>
</tr>
<tr>
<td>3rd</td>
<td>126</td>
<td>315</td>
</tr>
<tr>
<td>4th</td>
<td>110</td>
<td>302</td>
</tr>
<tr>
<td>5th</td>
<td>107</td>
<td>296</td>
</tr>
<tr>
<td>Total</td>
<td>643</td>
<td>1663</td>
</tr>
</tbody>
</table>

* Survival rate is expected to be around 70-75%

9.4.9 Management of Socio-economic factors

- In order to mitigate the impacts likely to arise out of the proposed project and also to maintain goodwill of local people for the proposed project, it is necessary to take steps for improving the social environment. Necessary social welfare measures by the industry will be useful in gaining public
confidence depending on local requirement.
- Formal and informal training to be provided to the employees of the affected villages due to the project will be taken up on priority basis. Job oriented skill training, courses may be organized.
- Personal protective facilities like helmets, safety (gas) mask / safety dress, shoes etc. are ensured for all workers, engaged in operation.

9.4.10 Management of Traffic

- One gate for entry and exit will be provided with 12 m wide approach road.
- Adequate Ramp Feeds will be provided.
- Flow of traffic is eased out by providing adequate entries and exits space.
- Entry and exit will be managed by security personnel who will also regulate traffic.
- Thus the traffic management will be easily and smoothly monitored without any hindrances to the regular flow of traffic on the main road.

9.5 ADDITIONAL MITIGATION MEASURES

In addition to the above suggested measures for management of air, water, soil, traffic etc following additional measures will be provided.

9.5.1 Water Conservation

Minimizing Water Consumption
A combination of water saving appliances and water management measures will be planned in the plant. The message of water conservation will be spread to all occupiers on site by way of awareness campaigns and circulars. Specific measures that will be implemented include the following:

Management Measures
- Reduce toilet cistern volume in single flush models.
- Promote awareness on water conservation and reducing water wastage.
- Quick fixing of leaking taps, pipes and toilet cisterns;
- Sweep with a broom and pan where possible, rather than hose down external areas;

Water Saving Investments
- Collect rain water from rooftop and appropriate built-up area for use in various applications.
- Reduce water delivery in taps and showers, through the installation of low flow devices or aerators on showerheads.
- Spring-loaded taps;
- Installation of sub-meters on key areas of water use – monitoring water use is a precursor for management and
- Water Efficient Plumbing Fixtures

9.5.2 Odour Management Plan

Causes of odour can be bad sanitation, bacterial growth in the interconnecting pipes & unattended drains etc.
Remedial Measures
- Better management to avoid staling.
- Use of sanitation biocides to minimize the growth of aerobic/anaerobic micro-organisms.
- Steaming of major pipe lines.
- Proper cleaning of drains.
- Regular use of bleaching powder in the drains to avoid growth of sulphur decomposing micro-organisms to control H₂S generation.

9.5.3 Safety measures to prevent the Occupational Health Hazards
- Proper training will be given to all the employees at regular time period to bring awareness among the employees.
- Employees will be provided with Personal Protective Equipments like earplugs or earmuffs, shoes, gloves wherever required.
- Electrical equipments will be properly earthed & lock out/tag out, electrical isolation method will be developed & displayed at required locations.

9.5.4 Social welfare measures for future planning
- School uniforms, notebooks and scholarship will be provided to poor students.
- Scholarship will be provided to meritorious students.
- Special Health awareness camp and medical camps for primary check up will be arranged at least once in a year in nearby villages for health check-ups.
- During the construction and operation phase villagers will be directly or indirectly employed.
- Funds will be provided to arrange extracurricular activities for nearby school and colleges.

9.5.5 Cleaner production strategies:

1. Good Housekeeping:
   We shall take appropriate managerial and operational actions:
   - Spill and leak detection and prevention programs
   - Training employees in proper material storage and handling procedures
   - Dedicated equipment for large volume products
   - Use spill and drip trays to recover losses from manual material transfer operations

2. Input Substitution:
   - Use biodegradable detergents and cleaners
   - Use higher purity materials
   - Substitute input materials by renewable materials
   - By using adjunct materials which have a longer service lifetime in production.
   - Using Energy efficiently to reduce the environmental impact from energy use by improved energy efficiency.
3. **Better Process control:**
   - Process record keeping in order to run the processes more efficiently and at lower waste and emission generation rates.

4. **On-site recovery & reuse:**
   - Reuse of the wasted materials in the same process for another useful application within the company
   - Wastewater from industrial processes will be recycled in the next batch

5. **Product modification:**
   - Environmentally preferred packaging (e.g. less or reusable packaging, recyclable materials)

### 9.5.6 Energy Conservation

Energy conservation measures are often the easiest, quickest and cheapest way to reduce costs and be environmentally pro-active. Energy conservation will be one of the focuses during planning and operation stages. The conservation efforts would consist of the following:

**Architectural design**
- Public areas will be cooled by natural ventilation as opposed to air-conditioning.
- Maximize the use of natural lighting through design.

**Energy Saving Practices**
- Purchase of energy efficient appliances.
- Constant monitoring of energy consumption and defining targets for energy conservation.
- Adjusting the settings and illumination levels to ensure minimum energy used for desired comfort levels.
- Proper temperature controls will be provided to reduce load on heating systems.
- Proper load factor will be maintained by the company.
- Company will adopt good maintenance practices and will maintain good housekeeping which will help in better illumination levels with least number of fixtures.
- On most of roofs transparent acrylic sheets will be provided to use day light and to stop use of lights during day time.
- CFL/LED lamps will be provided, wherever applicable.
- To the extent possible and technically feasible, energy efficient equipment will be selected.
- Gravity flow will be preferred wherever possible to save pumping energy.
- Recycling of water will done.

**Behavioral change on consumption**
- Awareness on energy conservation.
- Training to staffs on methods of energy conservation.
Solar Architectural Features

- The proposed project will provide enough day light factors in the building to permit maximum day light to interior to minimize overall energy consumption.
- These features will also minimize the impact of climate both in summer and in winter and as a result, the use of electricity will likely to be reduced.

9.6 Occupational Health & Safety Plan

To maintain high standard in Health, Safety and Environment, necessary key mitigation measures & action plan as EMP has been suggested as described below.

- Post-employment health check-up programs will be carried out on annually and all records & documents related with employee health check-up program will be maintained.
- Necessary PPEs, safety equipments/materials to ensure healthy & safe work conditions will be provided to employees.
- All employees will be provided with required set of PPEs like ear plug, ear muff etc. where noise levels in excess of 80 dB(A) are regularly generated.
- It is recommended that Pre-employment health check-up programs shall be carried out for every new employee and all records & documents related with employee health check-up program shall be maintained by the proponent.
- Safety documents, procedures, guidelines along with MSDS shall be provided to the associated/concerned personnel engaged in respective operational activities.
- Training programs & safety audit shall be done on regular basis to prevent impacts of the operational activities on occupational health as well as to improve workplace condition & safe work system.
- Proponent shall also ensure proper implementation & functioning as well as assess effectiveness of this safety & emergency system on regular basis throughout the project operation phase.

Plans for Periodic Medical Check-up:

- Part time doctor will periodically visit the plant for health check-up of each employee.
- Pre-employment health check-up will be followed by periodical health check-up with special attention to occupational health.
- Medical records of each employee will be maintained in prescribed format as per Factory Act.
- The work zone monitoring will be conducted on regular basis.

Monitoring of the Occupational Injury & It’s Impact on workers

The action plan will be prepared to monitor the injury to workers:

- Each workplace will be evaluated for the existing work conditions.
- Unsafe Act & unsafe Practices will be identified.
- Unsafe equipment, unsafe areas, etc., will be identified.
- Area will be checked for proper Ventilation and Illumination.
- Air-borne concentration of toxic chemicals will be measured and records will be kept.
- Evaluation of training & on the job work.
- Impact of the above mentioned unsafe conditions on workers will be studied and remedial measures for the same will be adopted.

### 9.7 SUMMARY OF ENVIRONMENT MANAGEMENT PLAN AND ACTIONS

A summary of the recommended measures or actions proposed with respect to the various envisaged impacts as a part of Environment Management Plan is given below.

#### Table 9.2: Summary of Environmental Management Plan

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Environmental Component</th>
<th>Potential Impacts</th>
<th>Potential source of Impact</th>
<th>Controls though EMP and Design</th>
<th>Impact Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Water</td>
<td>Water Contamination</td>
<td>Operation phase Domestic waste water</td>
<td>Sewage will be disposed to soak pit.</td>
<td>No adverse impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Surface runoff from site</td>
<td>Rain water will be stored and utilized to prevent runoff and water logging.</td>
<td>Positive impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Generation of industrial waste water</td>
<td>Proper treatment and disposal will be provided</td>
<td>No adverse impact</td>
</tr>
<tr>
<td>2.</td>
<td>Air Quality</td>
<td>Emission from DG sets (PM, SO₂, NOₓ)</td>
<td>Operation of DG set</td>
<td>Providing adequate stack height for mixing of emissions. Maintenance of DG set regularly</td>
<td>No significant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emission from Process (HCl)</td>
<td>Emissions from Process</td>
<td>Providing Water Scrubber</td>
<td>No significant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Particulate &amp; gaseous emissions</td>
<td>Emissions from vehicular traffic.</td>
<td>Adequate wide approach road is proposed for smooth vehicular movement. Approach road side plantation will further act as sink to gaseous emission.</td>
<td>No significant impact</td>
</tr>
<tr>
<td>3.</td>
<td>Noise</td>
<td>Increase in noise level</td>
<td>Operation Phase Vehicles movement</td>
<td>Wide road and ample parking space will be provided. Vehicles with inbuilt silencer will be allowed in the site.</td>
<td>No significant impact</td>
</tr>
<tr>
<td>S. No.</td>
<td>Environmental Component</td>
<td>Potential Impacts</td>
<td>Potential source of Impact</td>
<td>Controls though EMP and Design</td>
<td>Impact Evaluation</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------</td>
<td>------------------</td>
<td>---------------------------</td>
<td>--------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>4.</td>
<td>Land</td>
<td>Land contamination</td>
<td>D.G. sets operations</td>
<td>Generators with inbuilt mufflers will be provided. Ear plugs will be provided to operators of DG set. Periodic maintenance &amp; noise level monitoring of DG.</td>
<td>No significant impact.</td>
</tr>
<tr>
<td>5.</td>
<td>Biodiversity</td>
<td>Impact on Flora &amp; Fauna</td>
<td>Operation Phase Solid waste like rubbish, paper, plastic garbage etc.</td>
<td>Efficient solid/hazardous waste collection and storage facility is proposed.</td>
<td>No significant impact</td>
</tr>
<tr>
<td>6.</td>
<td>Traffic Pattern</td>
<td>Increase of vehicular movements</td>
<td>Operational Phase Traffic due to commercial once the site is operational</td>
<td>Vehicular movement will be regulated inside the site with adequate roads and parking will be provided.</td>
<td>Minor impact</td>
</tr>
<tr>
<td>7.</td>
<td>Socio-Economic</td>
<td>Increase in Job opportunities</td>
<td>Operational Phase</td>
<td>Socio-economic development through direct and indirect employment and CSR activity will be made.</td>
<td>Positive impact</td>
</tr>
</tbody>
</table>

The Environmental Management Plan will be effectively implemented so that optimum benefit could be achieved. The Environmental Management and Monitoring Plan will be synchronized with the construction schedules.

### 9.8 ENVIRONMENT POLICY

Environment Policy includes-
- To ensure continuous improvement in environmental performance of our works through protective Environmental management system.
- To comply with applicable legal and other requirements related to environmental aspects.
- To conserve the resources particularly water, power by fixing and improving consumption norms.
• To adopt concept of cleaner production.
• To ensure involvement of all employees and contractors in effective implementation of Environment Management System through training and awareness.
• To promote awareness among local surrounding community for preservation and maintaining clean environment.

### 9.9 Environmental Budget

For environment protection and management and pollution control and treatment and monitoring systems, appropriate budgetary provision would be made and provision for recurring expenditure for environment management of the project would be made. The details of budget allocation for proposed operation phase are given in below Table:

#### Table 9.3: Budget Allocations for Environmental Management

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Pollution Control Measures</th>
<th>Capital Cost Rs. (Lakhs)</th>
<th>Recurring Cost per annum Rs. (Lakhs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Air Pollution Control</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>2</td>
<td>Water Pollution Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Noise Pollution Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Environment Monitoring and Management</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>5</td>
<td>Occupational Health</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>Green Belt</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>7</td>
<td>Solid waste management</td>
<td>2.5</td>
<td>3.0</td>
</tr>
<tr>
<td>8</td>
<td>Rain Water collection system</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>12.5</strong></td>
<td><strong>11.7</strong></td>
</tr>
</tbody>
</table>

#### 9.10 REPORTING SYSTEM OF NON COMPLIANCES/VIOLATIONS OF ENVIRONMENTAL NORMS

Company will develop reporting systems of non-compliances/violations of environmental norms. The mechanism is summarized below:

1. Identify deviation/non-compliance/violation of environmental norms as lay down in consent to operate and letter of Environmental clearance. Record to communication/complain received from plausible stake holder.
2. The EHS officer will identify deviation/non-compliance/violation from failure to comply with statutory requirements.
3. Respond from EHS officer within reasonable time limit to concern authorities with c/c mark to Manager.
4. Manager will take it in action and give necessary guideline to comply any deviation/non-compliance/violation of environmental norms. Parallel arrange budget for necessary action to comply the condition.

5. Communication received from the EHS officer will be discussed in technical management meeting.

6. Board discussion, Decision and Action

9.11 FINDINGS

From the foregoing sections it is clear that environmental considerations are foremost during development of the project, at all the following levels:

- Project sitting
- Planning and design
- Project construction
- Post project operations

The following findings are to be mentioned:

- The Project will have no significant environmental impacts during operations.
- Project risks will be minimized through rigorous enforcement of international design and operational standards.
- The environmental and safety aspects of the Project are straightforward and well understood.
- A detailed environmental impact study is carried out. No further studies are required to elaborate these subjects.

The EMP also provides for establishing, and maintaining a system of environmental monitoring and auditing to ensure strict compliance of all the measures identified in the EMP, and minimize adverse environmental and social impacts. Suitable provisions related to environmental management will also be made in the construction contract agreement.

9.12 CONCLUSIONS

The project can cause minor impacts due to the various activities involved during operational phase. However, strict adherence to the various mitigation measures as identified under the EMP, strengthened by adequate environmental monitoring using best available technology (BAT) and auditing will go a long way in effectively reducing the impacts as to negligible levels.

During operation phase of the project, none of the routine activities will cause any noticeable impact on any component of the environment, including the socio-economic component. Provision of green belt and rain water harvesting, storm water management and energy conservation will further facilitate in overall scenario management of Environment.

Thus, it can be concluded on a positive note that after the implementation of the mitigation measures and Environmental Management Plan, the proposed project will have negligible impact on environment and will benefit the local people and economy.
CHAPTER – 10  PROJECT SUMMARY & CONCLUSIONS

10.1 INTRODUCTION

M/s. Sanjivani Pharma is Small scale proposed unit for manufacturing of various Active Pharmaceutical Ingredients (API) with the production capacity of 1350 Kg/Month.

10.2 SALIENT FEATURES OF THE PROJECT

a. Name of the Project : M/S. SANJIVANI PHARMA

b. Details of Applicant : Mr. Sandip Patel (Partner)
   Email : Sanjivanipharma102@gmail.com
   Mobile No. : 7874200948

c. Status : Proposed Project for the API manufacturing

d. Year of Commissioning

e. Type of Land & Status : 100% industrial land.

f. Capital Investment of the Project, Rs. in Lakh : Rs. 465 Lakh

g. Capital Investment for EMP, Rs. in Lakh : Rs. 12.5 Lakh

h. Recurring Cost for EMP, Rs. in Lakh/Annum : Rs. 11.7 Lakh/Annum

i. Employment Opportunity : 60 persons

j. Greenbelt Development : 1663 sqm (33% of the total plot area)

k. Water pollution control : Total water requirement for proposed project will be 17 KLD, out of which 5.0 KLD will be used for domestic activities, 3.7 KLD for industrial purposes and 8.3 KLD for greenbelt development. 4 KLD of sewage and 1.45 KLD of industrial effluent will be generated. Wastewater to be generated from washing, Cooling, Scrubbing and Equipment Cleaning will be treated in ETP with primary treatment facility and then discharged to CETP. Wastewater generated from process will be sent to Common MEE. Wastewater generated from domestic activity will be disposed of by
10.2

10.3 CONCLUSIONS

It can be concluded on a positive note that due to the adequate provision and efficient operation of proposed environmental management systems and after the implementation of the proposed mitigation measures and environmental management plans, the project activities during the construction and operation phase would have negligible impacts on the environment, and on balance the project would be beneficial to surrounding communities and the region.
CHAPTER – 11 DISCLOSURE OF CONSULTANT

<table>
<thead>
<tr>
<th>Project Proponent</th>
<th>Sanjivani Pharma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project site</td>
<td>Plot no: D-2-CH-102, GIDC Dahej - II, Taluka: Vagra, District: Bharuch, Gujarat</td>
</tr>
<tr>
<td>Type of Project</td>
<td>Small scale API manufacturing unit</td>
</tr>
<tr>
<td>Category of project as per EIA Notification</td>
<td>5(f)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EIA Consultant Organization</th>
<th>Enviro Fluid Consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Information</td>
<td>Office 205, Ganesh Glory, Nr. BSNL office, S. G. Highway, Jagatpur, Ahmedabad-382481, Gujarat</td>
</tr>
<tr>
<td>Phone</td>
<td>9904261161, 9727069222</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:envirofluidconsultants@gmail.com">envirofluidconsultants@gmail.com</a>, <a href="mailto:nikunj.efc@gmail.com">nikunj.efc@gmail.com</a></td>
</tr>
<tr>
<td>High Court Order</td>
<td>Special Civil Application No 11208 of 2017 at High Court Gov of Gujarat</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory engaged in the EIA Project:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Organization</td>
</tr>
<tr>
<td>Status of Laboratory</td>
</tr>
</tbody>
</table>

**Declaration by the head of the Consultant Organization**

I, Seema Oza, hereby confirm that the here mentioned experts have contributed in the EIA study of “Sanjivani Pharma”. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

**Signature**

Name: Seema Oza
Designation: Partner
Consulting Organization Name: Enviro Fluid Consultants
Address: Office 205, Ganesh Glory, Nr. BSNL office, S.G. Highway, Jagatpur, Ahmedabad-382481.
## Period of involvement: September 2018 to till date

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Expert</th>
<th>Qualification</th>
<th>Experience</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. Nikunj Makwana</td>
<td>B.E. Chemical PDIETM; PDIS (Cont.)</td>
<td>9 Years</td>
<td>- <strong>EIA Coordinator</strong>&lt;br&gt;- Risk &amp; Hazard&lt;br&gt;- Air Pollution Monitoring &amp; Control&lt;br&gt;- Noise &amp; Vibration&lt;br&gt;- Air Quality Modeling &amp; Prediction</td>
</tr>
<tr>
<td>2</td>
<td>Mrs. Seema D. Oza</td>
<td>B.E. Environment M.E. Env.Mgmt.</td>
<td>16 Years</td>
<td>- Water Pollution&lt;br&gt;- Air Pollution Monitoring &amp; Control&lt;br&gt;- Solid &amp; Hazardous waste management&lt;br&gt;- Air Quality Modeling &amp; Prediction</td>
</tr>
<tr>
<td>3</td>
<td>Mr. Kalpesh Savaliya</td>
<td>B.E. Environment</td>
<td>4.5 Years</td>
<td>- Water Pollution&lt;br&gt;- Air Quality Modeling &amp; Prediction&lt;br&gt;- Soil Conservation&lt;br&gt;- Risk &amp; Hazard</td>
</tr>
<tr>
<td>4</td>
<td>Mrs. Khyati N. Vaghasiya</td>
<td>B.E. Environment</td>
<td>4 Years</td>
<td>- Water Pollution&lt;br&gt;- Air Pollution Monitoring &amp; Control&lt;br&gt;- Noise &amp; Vibration&lt;br&gt;- Solid &amp; Hazardous waste management</td>
</tr>
<tr>
<td>5</td>
<td>Mr. Apurva Trivedi</td>
<td>BSc. Geology MSc. Geology</td>
<td>30 Years</td>
<td>- Geology&lt;br&gt;- Hydrology &amp; water conservation&lt;br&gt;- Soil conservation</td>
</tr>
<tr>
<td>6</td>
<td>Mrs. Dharika K. Ghaswala</td>
<td>BSc. Botany MSc. Env. Science</td>
<td>10 Years</td>
<td>- Ecology &amp; Bio-diversity&lt;br&gt;- Water Pollution&lt;br&gt;- Soil Conservation</td>
</tr>
<tr>
<td>7</td>
<td>Mrs. Tanvi A. Kataria</td>
<td>MCA</td>
<td>4 Years</td>
<td>- Landuse</td>
</tr>
<tr>
<td>8</td>
<td>Mr. Gunjan Damor</td>
<td>B.E. Environment</td>
<td>4 Years</td>
<td>- Air Pollution Monitoring &amp; Control&lt;br&gt;- Water Pollution&lt;br&gt;- Noise &amp; Vibration</td>
</tr>
</tbody>
</table>
Annexure-I

Manufacturing Process
MANUFACTURING PROCESS

1.1 Hydroxy Progesterone Caproate

- **Manufacturing Process**
  - First 17α-Hydroxy Progesterone react with Trichloroacetic Acid, N-Caproic Anhydride and Methylene Dichloride at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in Diisopropyl Ether treated with Carbone and Alumina, distil out Diisopropyl Ether.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.

- **Chemical Reaction**

  \[
  \text{17-} \alpha\text{-Hydroxy Progesterone} + \text{n-caproic anhydride} \rightarrow \text{4-Hydro Progesterone Caproate} + \text{Hexanoic acid}
  \]

  - 17-alpha-Hydroxy Progesterone: \( C_{21}H_{30}O_3 \)  
    - Mol. Wt.: 330.46
  - n-caproic anhydride: \( C_{12}H_{22}O_3 \)  
    - Mol. Wt.: 214.3
  - 4-Hydro Progesterone Caproate: \( C_{27}H_{40}O_4 \)  
    - Mol. Wt.: 428.6
  - Hexanoic acid: \( C_6H_{12}O_2 \)  
    - Mol. Wt.: 116.16

  1) Acetic acid  
  2) Di Chloro Methane  
  3) Di Iso Propyl Ether

  1) At 25-30 °C  
  2) Water
**Flow Diagram**

Acetic Acid - 0.618 Kg  
N-Caproic Anhydride - 0.726 Kg  
Methylene Dichloride (F+R) - 5.320 Kg

Alumina Oxide - 0.500 Kg  
Di iso Propyl ether (F+R) - 1.450 Kg  
Activated Carbon - 0.100 Kg  
Purified Water - 2.500 Kg

17 Alpha-Hydroxy Progesterone (Std quantity - 1 Kg)  
MDC Recover - 4 Kg  
EVR. Loss - 1.320 Kg

Work up & Reduction  
DIPE Recover - 1.250 Kg  
EVR. Loss Loss - 0.200 Kg  
Spent Carbon - 0.100 Kg  
Process Waste - 0.500 Kg  
Waste Water - 3.618 Kg

Drying Loss - 0.53 Kg

Pure Hydroxy Progesterone Caproate - 1.2 kg

**Mass Balance**

<table>
<thead>
<tr>
<th>Hydroxy Progesterone Caproate</th>
<th>600 Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Batch Size</strong></td>
<td>1.2 Kg</td>
</tr>
</tbody>
</table>

| **Input** | | | | |
|-----------|-----------|-----------|-----------|
| Particular | Kg/Batch | Kg/Kg of Product | Kg/Month | Kg/day |
| 17 Alpha-Hydroxy Progesterone | 1.000 | 0.833 | 500.000 | 16.667 |
| Acetic Acid | 0.618 | 0.515 | 309.000 | 10.300 |
| N-Caproic Anhydride | 0.726 | 0.605 | 363.000 | 12.100 |
| Methylene Dichloride (Fresh) | 0.426 | 0.355 | 213.000 | 7.100 |
| Alumina Oxide | 0.500 | 0.417 | 250.000 | 8.333 |
| Di iso Propyl ether (DIPE) (Fresh) | 0.131 | 0.109 | 65.500 | 2.183 |
| Di iso Propyl ether (DIPE) (Recovered) | 1.319 | 1.099 | 659.500 | 21.983 |
| Methylene Dichloride (Recovered) | 4.894 | 4.078 | 2447.000 | 81.567 |
| Activated Carbon | 0.100 | 0.083 | 50.000 | 1.667 |
| Purified Water | 2.500 | 2.083 | 1250.000 | 41.667 |
| **Total** | **12.214** | **10.178** | **6107.000** | **203.567** |

| **Output** | | | | |
|-----------|-----------|-----------|-----------|
| Product | 1.200 | 1.000 | 600.000 | 20.000 |
| Methylene Dichloride (Recovered) | 4.894 | 4.078 | 2447.000 | 81.567 |
| Di iso Propyl ether (DIPE) (Recovered) | 1.319 | 1.099 | 659.500 | 21.983 |
| Spent Carbon | 0.100 | 0.083 | 50.000 | 1.667 |
| Process Waste | 0.500 | 0.417 | 250.000 | 8.333 |
| Waste Water | 3.114 | 2.595 | 1557.000 | 51.900 |
| Evaporation Loss | 0.552 | 0.460 | 276.000 | 9.200 |
| Distillation residue | 0.005 | 0.004 | 2.500 | 0.083 |
| Drying loss | 0.530 | 0.442 | 265.000 | 8.833 |
| **Total** | **12.214** | **10.178** | **6107.000** | **203.567** |
1.2 Nandrolone Decanoate

- **Manufacturing Process**
  - First Nandrolone Base react with Decanoyl Chloride, n-Hexane and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbone and Alumina, distil out n-Pentane.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.

- **Chemical Reaction**

![Diagram of Nandrolone Deconate (NDD)](image)
**Flow Diagram**

Decanoyl Chloride - 0.869 Kg  
Acetone (F+R) - 3.290 Kg  
Pyridine - 0.721 Kg  

Sodium Hydroxide - 0.350 Kg  
Alumina Oxide - 0.500 Kg  
n-Pentane (F+R) - 1.565 Kg  
Activated Carbon - 0.100 Kg  
Purified Water - 4.0 Kg

**Mass Balance**

<table>
<thead>
<tr>
<th>Nandrolone Deconoate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.3</td>
<td>Kg</td>
</tr>
</tbody>
</table>

**Input**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
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</thead>
<tbody>
<tr>
<td>Nandrolone Base</td>
<td>1.000</td>
<td>0.769</td>
<td>461.538</td>
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<td>Decanoy Chloride</td>
<td>0.869</td>
<td>0.668</td>
<td>401.077</td>
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<tr>
<td>Acetone (Fresh)</td>
<td>0.197</td>
<td>0.152</td>
<td>90.923</td>
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<td>Pyridine</td>
<td>0.721</td>
<td>0.555</td>
<td>332.769</td>
<td>11.092</td>
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<tr>
<td>Sodium Hydroxide</td>
<td>0.350</td>
<td>0.269</td>
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<td>5.385</td>
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<tr>
<td>Alumina Oxide</td>
<td>0.500</td>
<td>0.385</td>
<td>230.769</td>
<td>7.692</td>
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<tr>
<td>n-Pentane (Fresh)</td>
<td>0.125</td>
<td>0.096</td>
<td>57.692</td>
<td>1.923</td>
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<tr>
<td>Activated Carbon</td>
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<td>0.077</td>
<td>46.154</td>
<td>1.538</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.093</td>
<td>2.379</td>
<td>1427.538</td>
<td>47.585</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>1.440</td>
<td>1.108</td>
<td>664.615</td>
<td>22.154</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.077</td>
<td>1846.154</td>
<td>61.538</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12.395</td>
<td>9.535</td>
<td>5720.769</td>
<td>190.692</td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.300</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.093</td>
<td>2.379</td>
<td>1427.538</td>
<td>47.585</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>1.440</td>
<td>1.108</td>
<td>664.615</td>
<td>22.154</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.500</td>
<td>0.385</td>
<td>230.769</td>
<td>7.692</td>
</tr>
<tr>
<td>Process Waste</td>
<td>0.500</td>
<td>0.385</td>
<td>230.769</td>
<td>7.692</td>
</tr>
<tr>
<td>Waste Water</td>
<td>4.850</td>
<td>3.731</td>
<td>2238.462</td>
<td>74.615</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.319</td>
<td>0.245</td>
<td>147.231</td>
<td>4.908</td>
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<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.002</td>
<td>1.385</td>
<td>0.046</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.390</td>
<td>0.300</td>
<td>180.000</td>
<td>6.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12.395</td>
<td>9.535</td>
<td>5720.769</td>
<td>190.692</td>
</tr>
</tbody>
</table>
1.3 Nandrolone Phenyl Propionate

- **Manufacturing Process**
  - First Nandrolone Base react with 3-Phenyl Propionyl Chloride, Methylene Dichloride and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbone and Alumina, distill out n-Pentane.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.

- **Chemical Reaction**

```
Nandrolone Phenyl Propionate (NPP)
C18H26O2
Mol. Wt.: 274.4
Nandrolone Base

1) 20 to 30°C
2) Sodium Bi Carbonate
3) Water

Cl
O
Cl
O
H
H
H
H
O
C9H9ClO
Mol. Wt.: 168.62
3-Phenyl Propionyl Chloride

Nandrolone Phenyl Propionate
C27H34O3
Mol. Wt.: 406.56

1) MDC
2) Pyridine
3) N-Pentane

HCl
CIH
Mol. Wt.: 36.46
Hydrochloric Acid
```
### Flow Diagram

- **3-Phenyl Propionyl Chloride**: 0.768 Kg
- **Methylene Dichloride**: 6.650 Kg
- **Pyridine**: 0.721 Kg

**Mass Balance**

<table>
<thead>
<tr>
<th>Nandrolone Phenyl Propionate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Batch Size</strong></td>
<td></td>
<td>Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Input</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particular</strong></td>
<td><strong>Kg/Batch</strong></td>
<td><strong>Kg/Kg of Product</strong></td>
<td><strong>Kg/Month</strong></td>
<td><strong>Kg/day</strong></td>
</tr>
<tr>
<td>Nandrolone Base</td>
<td>1.000</td>
<td>0.833</td>
<td>500.000</td>
<td>16.667</td>
</tr>
<tr>
<td>3-Phenyl Propionyl Chloride</td>
<td>0.768</td>
<td>0.640</td>
<td>384.000</td>
<td>12.800</td>
</tr>
<tr>
<td>Methylene Dichloride (Fresh)</td>
<td>0.333</td>
<td>0.278</td>
<td>166.500</td>
<td>5.550</td>
</tr>
<tr>
<td>Pyridine</td>
<td>0.721</td>
<td>0.601</td>
<td>360.500</td>
<td>12.017</td>
</tr>
<tr>
<td>Sodium bi Carbonate</td>
<td>0.350</td>
<td>0.292</td>
<td>175.000</td>
<td>5.833</td>
</tr>
<tr>
<td>Alumina Oxide</td>
<td>0.500</td>
<td>0.417</td>
<td>250.000</td>
<td>8.333</td>
</tr>
<tr>
<td>n-Pentane (Fresh)</td>
<td>0.078</td>
<td>0.065</td>
<td>39.000</td>
<td>1.300</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.100</td>
<td>0.083</td>
<td>50.000</td>
<td>1.667</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>6.317</td>
<td>5.264</td>
<td>3158.500</td>
<td>105.283</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>1.487</td>
<td>1.239</td>
<td>743.500</td>
<td>24.783</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.333</td>
<td>2000.000</td>
<td>66.667</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.654</strong></td>
<td><strong>13.045</strong></td>
<td><strong>7827.000</strong></td>
<td><strong>260.900</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Output</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Particular</strong></td>
<td><strong>Kg/Batch</strong></td>
<td><strong>Kg/Kg of Product</strong></td>
<td><strong>Kg/Month</strong></td>
<td><strong>Kg/day</strong></td>
</tr>
<tr>
<td>Product</td>
<td>1.200</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>6.317</td>
<td>5.264</td>
<td>3158.500</td>
<td>105.283</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>1.487</td>
<td>1.239</td>
<td>743.500</td>
<td>24.783</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.500</td>
<td>0.417</td>
<td>250.000</td>
<td>8.333</td>
</tr>
<tr>
<td>Process Waste</td>
<td>0.500</td>
<td>0.417</td>
<td>250.000</td>
<td>8.333</td>
</tr>
<tr>
<td>Waste Water</td>
<td>4.849</td>
<td>4.041</td>
<td>2424.500</td>
<td>80.817</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.407</td>
<td>0.339</td>
<td>203.500</td>
<td>6.783</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.004</td>
<td>0.003</td>
<td>2.000</td>
<td>0.067</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.390</td>
<td>0.325</td>
<td>195.000</td>
<td>6.500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.654</strong></td>
<td><strong>13.045</strong></td>
<td><strong>7827.000</strong></td>
<td><strong>260.900</strong></td>
</tr>
</tbody>
</table>
1.4 Mifepristone

- **Manufacturing Process**
  - First 1,2-Ethanediyl Acetal react with Acetic Acid, Methylene Dichloride and Sodium Carbonate at ambient temperature. Then Work Up with Water.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.

- **Chemical Reaction**

![Chemical Reaction Diagram]

1,2-ethanediyl acetal

\[ C_{31}H_{41}NO_4 \]

Mol. Wt.: 491.66

Mifepristone

\[ C_{29}H_{35}NO_2 \]

Mol. Wt.: 429.59

Acetic acid

\[ C_2H_4O_2 \]

Mol. Wt.: 60.05
Flow Diagram

Acetic Acid - 2.100 Kg
Sodium Carbonate – 0.350 Kg
Methylene Dichloride (F+R) – 6.650 Kg

1,2-Ethanediyl Acetal (Std quantity – 1 Kg)
MDC Recover – 5.0 Kg
EVR. Loss – 1.650 Kg

Purified Water – 4.0 Kg

Work up
Waste Water – 5.500 Kg

Drying
Drying Loss – 1.15 Kg

Pure Mifepristone – 0.8 kg

Mass Balance

<table>
<thead>
<tr>
<th>Mifepristone</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
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<td>Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2-Ethanediyl Acetal</td>
<td>1.000</td>
<td>1.250</td>
<td>750.000</td>
<td>25.000</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>2.100</td>
<td>2.625</td>
<td>1575.000</td>
<td>52.500</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>0.350</td>
<td>0.438</td>
<td>262.500</td>
<td>8.750</td>
</tr>
<tr>
<td>Methylene Dichloride (Fresh)</td>
<td>0.399</td>
<td>0.499</td>
<td>299.250</td>
<td>9.975</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>6.251</td>
<td>7.814</td>
<td>4688.250</td>
<td>156.275</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>5.000</td>
<td>3000.000</td>
<td>100.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14.100</strong></td>
<td><strong>17.625</strong></td>
<td><strong>10575.000</strong></td>
<td><strong>352.500</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>0.800</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>6.251</td>
<td>7.814</td>
<td>4688.250</td>
<td>156.275</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.500</td>
<td>6.875</td>
<td>4125.000</td>
<td>137.500</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.395</td>
<td>0.494</td>
<td>296.250</td>
<td>9.875</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.004</td>
<td>0.005</td>
<td>3.000</td>
<td>0.100</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>1.150</td>
<td>1.438</td>
<td>862.500</td>
<td>28.750</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>14.100</strong></td>
<td><strong>17.625</strong></td>
<td><strong>10575.000</strong></td>
<td><strong>352.500</strong></td>
</tr>
</tbody>
</table>

1.5 Medroxy Progesterone Acetate

Manufacturing Process
- Medroxy Progesterone react with Acetic anhydride in process pyridine and chloroform ambient temperature. Then Work Up with Water.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
### Chemical Reaction

#### Medroxy Progesterone Acetate

1. Chloroform
2. Acetic Acid
3. Water
4. Pyridine

![Chemical Structure of Medroxy Progesterone Acetate](attachment:image.png)

**Medroxy Progesterone**

\[ C_{22}H_{32}O_2 \]

Mol. Wt.: 328.49

**Acetic Anhydride**

\[ C_4H_6O_3 \]

Mol. Wt.: 102.09

**Acetylized Product**

\[ C_{24}H_{34}O_4 \]

Mol. Wt.: 386.52

### Flow Diagram

- **Medroxy Progesterone** (Std quantity – 1 Kg)
- Acetic Anhydride - 0.413 Kg
- Pyridine - 0.360 Kg
- Chloroform (F+R) - 7.450 Kg
- Acetic acid - 2.525 kg
- Activated Carbon - 0.100 kg
- Purified Water - 4.0 Kg

**Output**

- Chloroform Recover - 6.5 Kg
- EVR. Loss - 0.95 Kg
- Activated Carbon - 0.1 Kg
- EVR. Loss - 2.198 Kg
- Waste Water - 4.5 Kg

**Drying**

- Drying Loss - 0.5 Kg

- Pure Medroxy Progesterone Acetate - 1.1 kg
## Mass Balance

<table>
<thead>
<tr>
<th>Medroxy Progesterone Acetate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.1</td>
<td>Kg</td>
</tr>
</tbody>
</table>

### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medroxy Progesterone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Acetic Anhydride</td>
<td>0.413</td>
<td>0.375</td>
<td>225.273</td>
<td>7.509</td>
</tr>
<tr>
<td>Pyridine</td>
<td>0.360</td>
<td>0.327</td>
<td>196.364</td>
<td>6.545</td>
</tr>
<tr>
<td>Chloroform (Fresh)</td>
<td>0.447</td>
<td>0.406</td>
<td>243.818</td>
<td>8.127</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>2.525</td>
<td>2.295</td>
<td>1377.273</td>
<td>45.909</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>7.003</td>
<td>6.366</td>
<td>3819.818</td>
<td>127.327</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.636</td>
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<td>72.727</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.848</strong></td>
<td><strong>14.407</strong></td>
<td><strong>8644.364</strong></td>
<td><strong>288.145</strong></td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Product</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.100</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>7.003</td>
<td>6.366</td>
<td>3819.818</td>
<td>127.327</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td>Wastewater</td>
<td>6.698</td>
<td>6.089</td>
<td>3653.455</td>
<td>121.782</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.443</td>
<td>0.403</td>
<td>241.636</td>
<td>8.055</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.004</td>
<td>0.004</td>
<td>2.182</td>
<td>0.073</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.500</td>
<td>0.455</td>
<td>272.727</td>
<td>9.091</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.848</strong></td>
<td><strong>14.407</strong></td>
<td><strong>8644.364</strong></td>
<td><strong>288.145</strong></td>
</tr>
</tbody>
</table>

### 1.6 Progesterone

#### Manufacturing Process

- 20-Carbaldehyde react with 1-Piperidino Cyclohexane, further add Methylene Dichloride and Acetonitrile at room temperature.
- Again this material react with Cuprous chloride in presence of Methanol.
- After quality check report, purified water will be added for precipitation.
- Further it will filtered, drying and pulverize to make the final product.
Chemical Reaction

PROGESTERONE

3-Oxopreg-4-ene-20-carbaldehyde
$C_{21}H_{30}O_2$
Mol. Wt.: 314.46

1-Piperidino-1-cyclohexane
$C_{11}H_{19}N$
Mol. Wt.: 165.28

Flow Diagram

1-Piperidino Cyclohexane - 0.553 Kg
MDC (F+R) - 6.65 Kg
Acetonitrile (F+R) - 3.9 Kg
Purified Water - 2.0 Kg

20-Carbaldehyde (Std quantity - 1 Kg)

MDC Recover - 5.5 Kg
EVR. Loss - 1.15 Kg
Acetonitrile - 3.0 Kg
EVR. Loss - 0.9 Kg

Output

Progesterone Crude

EVR. Loss Loss - 4.74 Kg
Spent Carbon - 0.1 Kg
Waste Water - 4.469 Kg

Drying

Drying Loss - 0.3 Kg

Progesterone - 0.8 kg
## Mass Balance

### Progesterone

<table>
<thead>
<tr>
<th>particulars</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>0.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Input

<table>
<thead>
<tr>
<th>particulars</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-Carbaldehyde</td>
<td>1.000</td>
<td>1.250</td>
<td>750.000</td>
<td>25.000</td>
</tr>
<tr>
<td>1-Piperidino Cyclohexane</td>
<td>0.553</td>
<td>0.691</td>
<td>414.750</td>
<td>13.825</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Fresh)</td>
<td>0.532</td>
<td>0.665</td>
<td>399.000</td>
<td>13.300</td>
</tr>
<tr>
<td>Acetonitrile (Fresh)</td>
<td>0.195</td>
<td>0.244</td>
<td>146.250</td>
<td>4.875</td>
</tr>
<tr>
<td>Cuprous Chloride</td>
<td>0.001</td>
<td>0.001</td>
<td>0.750</td>
<td>0.025</td>
</tr>
<tr>
<td>Metahanol (Fresh)</td>
<td>0.237</td>
<td>0.296</td>
<td>177.750</td>
<td>5.925</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.100</td>
<td>0.125</td>
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<td>2.500</td>
</tr>
<tr>
<td>HCl 35 %</td>
<td>0.015</td>
<td>0.019</td>
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<td>0.375</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>6.118</td>
<td>7.648</td>
<td>4588.500</td>
<td>152.950</td>
</tr>
<tr>
<td>Acetonitrile (Recovered)</td>
<td>3.705</td>
<td>4.631</td>
<td>2778.750</td>
<td>92.625</td>
</tr>
<tr>
<td>Metahanol (Recovered)</td>
<td>4.503</td>
<td>5.629</td>
<td>3377.250</td>
<td>112.575</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>5.000</td>
<td>3000.000</td>
<td>100.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.959</strong></td>
<td><strong>26.199</strong></td>
<td><strong>15719.250</strong></td>
<td><strong>523.975</strong></td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>particulars</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>0.800</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>6.118</td>
<td>7.648</td>
<td>4588.500</td>
<td>152.950</td>
</tr>
<tr>
<td>Acetonitrile (Recovered)</td>
<td>3.705</td>
<td>4.631</td>
<td>2778.750</td>
<td>92.625</td>
</tr>
<tr>
<td>Metahanol (Recovered)</td>
<td>4.503</td>
<td>5.629</td>
<td>3377.250</td>
<td>112.575</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.100</td>
<td>0.125</td>
<td>75.000</td>
<td>2.500</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.469</td>
<td>5.586</td>
<td>3351.750</td>
<td>111.725</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.955</td>
<td>1.194</td>
<td>716.250</td>
<td>23.875</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.009</td>
<td>0.011</td>
<td>6.750</td>
<td>0.225</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.300</td>
<td>0.375</td>
<td>225.000</td>
<td>7.500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20.959</strong></td>
<td><strong>26.199</strong></td>
<td><strong>15719.250</strong></td>
<td><strong>523.975</strong></td>
</tr>
</tbody>
</table>

### 1.7 Testosterone Acetate

#### Manufacturing Process

- First Testosterone Base react with Acetyl Chloride, n-Hexane and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbon and Alumina, distill out n-Pentane.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
### Chemical Reaction

**Testosterone Base**

\[ C_{19}H_{28}O_2 \]
Mol. Wt.: 288.42

**Acetyl Chloride**

\[ C_2H_3ClO \]
Mol. Wt.: 78.5

\[ \text{Testosterone Base} + \text{Acetyl Chloride} \rightarrow \text{Testosterone Acetate} \]

C\(_{21}\)H\(_{30}\)O\(_3\)
Mol. Wt.: 330.46

1) 0 to -5°C
2) Sodium Carbonate
3) Water

---

### Flow Diagram

**Acetyl Chloride** - 0.340 Kg  
**Acetone (F+R)** - 3.290 Kg  
**Pyridine** - 0.686 Kg  
**Testosterone Base** (Std quantity - 1 Kg)  
**Acetone Recover** - 3.0 Kg  
**EVR. Loss** - 0.290 Kg

**Sodium Hydroxide** - 0.375 Kg  
**Alumina Oxide** - 0.500 Kg  
**DIPE** - 1.565 Kg  
**Activated Carbon** - 0.100 Kg  
**Purified Water** - 4.0 Kg

**Work up**

**DIIP Recover** - 1.250 Kg  
**EVR. Loss** - 0.315 Kg  
**Spent Carbon** - 0.500 Kg  
**Process Waste** - 0.500 Kg  
**Waste Water** - 4.850 Kg

**Drying**

**Drying Loss** - 0.00 Kg

**Pure Testosterone Acetate** - 1.15 kg
Mass Balance

**Testosterone Acetate**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testosterone Base</td>
<td>1.000</td>
<td>0.870</td>
<td>521.739</td>
<td>17.391</td>
</tr>
<tr>
<td>Acetyl Chloride</td>
<td>0.340</td>
<td>0.296</td>
<td>177.391</td>
<td>5.913</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.197</td>
<td>0.171</td>
<td>102.783</td>
<td>3.426</td>
</tr>
<tr>
<td>Pyridine</td>
<td>0.686</td>
<td>0.597</td>
<td>357.913</td>
<td>11.930</td>
</tr>
<tr>
<td>Sodium Hydoxide</td>
<td>0.375</td>
<td>0.326</td>
<td>195.652</td>
<td>6.522</td>
</tr>
<tr>
<td>Alumina Oxide</td>
<td>0.500</td>
<td>0.435</td>
<td>260.870</td>
<td>8.696</td>
</tr>
<tr>
<td>Di iso Propyl ether (DIPE) (Fresh)</td>
<td>0.131</td>
<td>0.114</td>
<td>68.348</td>
<td>2.278</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.100</td>
<td>0.087</td>
<td>52.174</td>
<td>1.739</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.093</td>
<td>2.690</td>
<td>1613.739</td>
<td>53.791</td>
</tr>
<tr>
<td>Di iso Propyl ether (DIPE) (Recovered)</td>
<td>1.434</td>
<td>1.247</td>
<td>748.174</td>
<td>24.939</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.478</td>
<td>2086.957</td>
<td>69.565</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11.856</td>
<td>10.310</td>
<td>6185.739</td>
<td>206.191</td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.150</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.093</td>
<td>2.690</td>
<td>1613.739</td>
<td>53.791</td>
</tr>
<tr>
<td>Di iso Propyl ether (DIPE) (Recovered)</td>
<td>1.434</td>
<td>1.247</td>
<td>748.174</td>
<td>24.939</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.500</td>
<td>0.435</td>
<td>260.870</td>
<td>8.696</td>
</tr>
<tr>
<td>Process Waste</td>
<td>0.500</td>
<td>0.435</td>
<td>260.870</td>
<td>8.696</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.851</td>
<td>4.218</td>
<td>2530.957</td>
<td>84.365</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.325</td>
<td>0.283</td>
<td>169.565</td>
<td>5.652</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.003</td>
<td>1.565</td>
<td>0.052</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>11.856</td>
<td>10.310</td>
<td>6185.739</td>
<td>206.191</td>
</tr>
</tbody>
</table>

1.8 Testosterone Decanoate

**Manufacturing Process**

- First Testosterone Base react with Decanoyl Chloride, n-Hexane and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbone and Alumina, distill out n-Pentane.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
**Chemical Reaction**

Testosterone Deconate

![Chemical Reaction Diagram]

- **Testosterone Base**
  - $C_{19}H_{28}O_2$
  - Mol. Wt.: 288.42
- **Decanoyl chloride**
  - $C_{16}H_{19}ClO$
  - Mol. Wt.: 190.71

1) 10 to 15°C
2) Sodium Hydroxide
2) Water

Testosterone Deconate

- **Mol. Wt.: 442.67**

**Flow Diagram**

Decanoyl Chloride - 0.529 Kg
n-Hexane (F+R) - 3.290 Kg
Testosterone Base (Std quantity - 1 Kg)
n-Hexane Recover - 2.340 Kg
EVR. Loss - 0.950 Kg
Sodium Hydroxide - 0.375 Kg
Alumina Oxide - 0.200 Kg
Activated Carbon - 0.070 Kg
Purified Water - 4.0 Kg
Work up
Spent Carbon - 0.070 Kg
Process Waste - 0.200 Kg
Waste Water - 4.105 Kg
Drying
Drying Loss - 0.108 Kg
Pure Testosterone Decanoate - 1.7 kg
Mass Balance

<table>
<thead>
<tr>
<th>Testosterone Deconoate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.7</td>
<td>Kg</td>
</tr>
</tbody>
</table>

### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testosterone Base</td>
<td>1.000</td>
<td>0.588</td>
<td>352.941</td>
<td>11.765</td>
</tr>
<tr>
<td>Decanoyl Chloride</td>
<td>0.529</td>
<td>0.311</td>
<td>186.706</td>
<td>6.224</td>
</tr>
<tr>
<td>n-Hexane (Fresh)</td>
<td>0.164</td>
<td>0.096</td>
<td>57.882</td>
<td>1.929</td>
</tr>
<tr>
<td>Sodium Hydoxide</td>
<td>0.375</td>
<td>0.221</td>
<td>132.353</td>
<td>4.412</td>
</tr>
<tr>
<td>Alumina Oxide</td>
<td>0.070</td>
<td>0.041</td>
<td>24.706</td>
<td>0.824</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.200</td>
<td>0.118</td>
<td>70.588</td>
<td>2.353</td>
</tr>
<tr>
<td>n-Hexane (Recovered)</td>
<td>3.126</td>
<td>1.839</td>
<td>1103.294</td>
<td>36.776</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>2.353</td>
<td>1411.765</td>
<td>47.059</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9.464</td>
<td>5.567</td>
<td>3340.235</td>
<td>111.341</td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
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<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>n-Hexane (Recovered)</td>
<td>3.126</td>
<td>1.839</td>
<td>1103.294</td>
<td>36.776</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.070</td>
<td>0.041</td>
<td>24.706</td>
<td>0.824</td>
</tr>
<tr>
<td>Process Waste</td>
<td>0.200</td>
<td>0.118</td>
<td>70.588</td>
<td>2.353</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.100</td>
<td>2.412</td>
<td>1447.059</td>
<td>48.235</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.162</td>
<td>0.095</td>
<td>57.176</td>
<td>1.906</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.002</td>
<td>0.001</td>
<td>0.706</td>
<td>0.024</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.104</td>
<td>0.061</td>
<td>36.706</td>
<td>1.224</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9.464</td>
<td>5.567</td>
<td>3340.235</td>
<td>111.341</td>
</tr>
</tbody>
</table>

1.9 Estradiol Benzoate

- First Estadiol react with Benzoyl Chloride, n-Hexane and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbon, distill out n-Pentane.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
Chemical Reaction

**Estradiol Benzoate**

\[ \text{Estradiol} + \text{Benzoyl chloride} \rightarrow \text{Estradiol Benzoate} \]

1) 25 to 35°C
2) Potassium Hydroxide
3) Water

**Flow Diagram**

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzoyl Chloride</td>
<td>0.424 Kg</td>
</tr>
<tr>
<td>Acetone (F+R)</td>
<td>3.528 Kg</td>
</tr>
<tr>
<td>Potassium Hydroxide</td>
<td>0.375 Kg</td>
</tr>
<tr>
<td>n-Pentane (F+R)</td>
<td>3.443 Kg</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.070 Kg</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.0 Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone Recover</td>
<td>2.975 Kg</td>
</tr>
<tr>
<td>EVR. Loss</td>
<td>0.553 Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drying</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Pentane Recover</td>
<td>2.493 Kg</td>
</tr>
<tr>
<td>EVR. Loss</td>
<td>0.950 Kg</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.07 Kg</td>
</tr>
<tr>
<td>Waste Water</td>
<td>4.380 Kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drying Loss</th>
<th>0.252</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Estradiol Benzoate</td>
<td>1.250 kg</td>
</tr>
</tbody>
</table>
### Mass Balance

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estradiol Benzoate</td>
<td>600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batch Size</td>
<td>1.250</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estardiol</td>
<td>1.000</td>
<td>0.800</td>
<td>480.000</td>
<td>16.000</td>
</tr>
<tr>
<td>Benzoyl Chloride</td>
<td>0.424</td>
<td>0.339</td>
<td>203.520</td>
<td>6.784</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.142</td>
<td>0.114</td>
<td>68.160</td>
<td>2.272</td>
</tr>
<tr>
<td>Potassium Hydroxide</td>
<td>0.375</td>
<td>0.300</td>
<td>180.000</td>
<td>6.000</td>
</tr>
<tr>
<td>n-Pentane (Fresh)</td>
<td>0.172</td>
<td>0.138</td>
<td>82.560</td>
<td>2.752</td>
</tr>
<tr>
<td>Alumina Oxide</td>
<td>0.150</td>
<td>0.120</td>
<td>72.000</td>
<td>2.400</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>0.070</td>
<td>0.056</td>
<td>33.600</td>
<td>1.120</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.386</td>
<td>2.709</td>
<td>1625.280</td>
<td>54.176</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>3.271</td>
<td>2.617</td>
<td>1570.080</td>
<td>52.336</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.200</td>
<td>1920.000</td>
<td>64.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.990</strong></td>
<td><strong>10.392</strong></td>
<td><strong>6235.200</strong></td>
<td><strong>207.840</strong></td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.250</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.386</td>
<td>2.709</td>
<td>1625.280</td>
<td>54.176</td>
</tr>
<tr>
<td>n-Pentane (Recovered)</td>
<td>3.271</td>
<td>2.617</td>
<td>1570.080</td>
<td>52.336</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.070</td>
<td>0.056</td>
<td>33.600</td>
<td>1.120</td>
</tr>
<tr>
<td>Process Waste</td>
<td>0.070</td>
<td>0.056</td>
<td>33.600</td>
<td>1.120</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.380</td>
<td>3.504</td>
<td>2102.400</td>
<td>70.080</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.308</td>
<td>0.246</td>
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<td>4.928</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.002</td>
<td>1.440</td>
<td>0.048</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.252</td>
<td>0.202</td>
<td>120.960</td>
<td>4.032</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.990</strong></td>
<td><strong>10.392</strong></td>
<td><strong>6235.200</strong></td>
<td><strong>207.840</strong></td>
</tr>
</tbody>
</table>

1.10 Estradiol Valerate

- **Manufacturing Process**
  - First Estadiol react with n-Valeryl Chloride Chloride, n-Hexane and Pyridine at ambient temperature. Then Work Up with Sodium Carbonate and Water. Dissolved in n-Pentane treated with Carbon, distill out n-Pentane.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.
**Chemical Reaction**

**Estradiol Valerate (EDV)**

\[
\text{HO} \quad \text{OCH}_3 \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{C}^{18} \text{H}_{22} \text{O}_2 \\
\text{Mol. Wt.: 272.38} \\
\text{Estradiol}
\]

\[
\text{C}_5 \text{H}_9 \text{ClO} \\
\text{Mol. Wt.: 120.58} \\
n\text{-valeryl chloride}
\]

1) 0 to -5°C  
2) Sodium Carbonate  
3) Water

\[
\text{HO} \quad \text{OCH}_3 \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{C}^{23} \text{H}_{32} \text{O}_3 \\
\text{Mol. Wt.: 356.5} \\
\text{Estradiol valerate}
\]

**Flow Diagram**

- n-Valeryl Chloride - 0.553 Kg  
- Pyridine - 0.726 Kg  
- n-Hexane (F+R) - 3.290 Kg

\[
\text{Estadiol (Std quantity – 1 Kg)}
\]

- Sodium Carbonate - 0.350 Kg  
- Purified Water - 4.0 Kg

\[
\text{Work up}
\]

- n-Hexane Recover - 3.0 Kg  
- EVR. Loss - 0.290 Kg  
- Waste Water - 4.850 Kg

- n-Pentane Rec. - 1.250 Kg  
- EVR. Loss - 0.315 Kg  
- Spent Carbon - 0.100 Kg

\[
\text{Crude}
\]

- Drying Loss - 0.58 Kg

\[
\text{Pure Estradiol Valerate – 1.2 kg}
\]
## Mass Balance

<table>
<thead>
<tr>
<th>Estradiol Valerate</th>
<th>600 Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Batch Size</strong></td>
<td>1.2 Kg</td>
</tr>
</tbody>
</table>

### Input

<table>
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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
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<tbody>
<tr>
<td>Estradiol</td>
<td>1</td>
<td>0.833</td>
<td>500.000</td>
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<tr>
<td>n-Valeryl Chloride</td>
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<td>0.461</td>
<td>276.500</td>
<td>9.217</td>
</tr>
<tr>
<td>Pyridine</td>
<td>0.726</td>
<td>0.605</td>
<td>363.000</td>
<td>12.100</td>
</tr>
<tr>
<td>n-Hexane (Fresh)</td>
<td>0.132</td>
<td>0.110</td>
<td>66.000</td>
<td>2.200</td>
</tr>
<tr>
<td>Sodium Carbonate</td>
<td>0.350</td>
<td>0.292</td>
<td>175.000</td>
<td>5.833</td>
</tr>
<tr>
<td>n-Pentene (Fresh)</td>
<td>0.063</td>
<td>0.053</td>
<td>31.500</td>
<td>1.050</td>
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<tr>
<td>Activated Carbon</td>
<td>0.100</td>
<td>0.083</td>
<td>50.000</td>
<td>1.667</td>
</tr>
<tr>
<td>n-Hexane (Recovered)</td>
<td>3.158</td>
<td>2.632</td>
<td>1579.000</td>
<td>52.633</td>
</tr>
<tr>
<td>n-Pentene (Recovered)</td>
<td>1.502</td>
<td>1.252</td>
<td>751.000</td>
<td>25.033</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.333</td>
<td>2000.000</td>
<td>66.667</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11.584</strong></td>
<td><strong>9.653</strong></td>
<td><strong>5792.000</strong></td>
<td><strong>193.067</strong></td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.200</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>n-Hexane (Recovered)</td>
<td>3.158</td>
<td>2.632</td>
<td>1579.000</td>
<td>52.633</td>
</tr>
<tr>
<td>n-Pentene (Recovered)</td>
<td>1.502</td>
<td>1.252</td>
<td>751.000</td>
<td>25.033</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.100</td>
<td>0.083</td>
<td>50.000</td>
<td>1.667</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.849</td>
<td>4.041</td>
<td>2424.500</td>
<td>80.817</td>
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<tr>
<td>Evaporation Loss</td>
<td>0.193</td>
<td>0.161</td>
<td>96.500</td>
<td>3.217</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.002</td>
<td>0.002</td>
<td>1.000</td>
<td>0.033</td>
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<tr>
<td>Drying Loss</td>
<td>0.580</td>
<td>0.483</td>
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<td>9.667</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11.584</strong></td>
<td><strong>9.653</strong></td>
<td><strong>5792.000</strong></td>
<td><strong>193.067</strong></td>
</tr>
</tbody>
</table>

### 1.11 Betamethasone Dipropionate

#### Manufacturing Process

- Betamethasone react with triethylortho propionate, further add catalyst as a p-toluene sulphonyl acid at room temperature for 3 hours. This material is called betamethasone17-propionate.
- Again this material react with propionyl chloride or propionic anhydride in presence of pyridine at 0-5°C temperature for minimum 3 hours.
- After quality check report, purified water will be added for precipitation.
- Further it will filtered, drying and pulverize to make the final product.
**Chemical Reaction**

Betamethasone dipropionate

![Chemical Structure of Betamethasone Dipropionate](image)

**Flow Diagram**

Triethyl Ortho Propionate - 0.2 Kg
P-toluene Sulphonic Acid - 0.1 Kg
Acetic Acid - 0.1 Kg
Purified Water - 2.6 Kg
Methylene Dichloride (F+R) - 5 Kg

Betamethasone (Std quantity - 1 Kg)

MDC Recover - 4.0 Kg
EVR. Loss - 1.0 Kg
Waste Water - 2.2 Kg

Propionyl Chloride - 0.3 Kg
Pyridine (F+R) - 3.0 Kg
Purified Water - 3.0 Kg

Betamethasone 17-Propionate (7.5 Kg)

Pyridine Rec. - 2.8 Kg
Waste Water - 2.7 Kg

Drying

Drying Loss - 0.0 Kg

Acetone (F+R) - 0.4 Kg
Purified Water - 0.6 Kg

Pure Betamethasone Dipropionate - 1.0 kg

Acetone Recover - 0.3 Kg
Waste Water - 0.85 Kg
### Mass Balance

<table>
<thead>
<tr>
<th>Betamethasone Dipropionate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1</td>
<td>Kg</td>
</tr>
</tbody>
</table>

#### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone</td>
<td>1.000</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Tri Methyl ortho Propionate</td>
<td>0.200</td>
<td>0.200</td>
<td>120.000</td>
<td>4.000</td>
</tr>
<tr>
<td>P-toluene sulphonic acid</td>
<td>0.100</td>
<td>0.100</td>
<td>60.000</td>
<td>2.000</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.100</td>
<td>0.100</td>
<td>60.000</td>
<td>2.000</td>
</tr>
<tr>
<td>Methylene Dichloride (Fresh)</td>
<td>0.200</td>
<td>0.200</td>
<td>120.000</td>
<td>4.000</td>
</tr>
<tr>
<td>Propionyl Chloride</td>
<td>0.300</td>
<td>0.300</td>
<td>180.000</td>
<td>6.000</td>
</tr>
<tr>
<td>Pyridine (Fresh)</td>
<td>0.120</td>
<td>0.120</td>
<td>72.000</td>
<td>2.400</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.016</td>
<td>0.016</td>
<td>9.600</td>
<td>0.320</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>4.800</td>
<td>4.800</td>
<td>2880.000</td>
<td>96.000</td>
</tr>
<tr>
<td>Pyridine (Recovered)</td>
<td>2.880</td>
<td>2.880</td>
<td>1728.000</td>
<td>57.600</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>0.384</td>
<td>0.384</td>
<td>230.400</td>
<td>7.680</td>
</tr>
<tr>
<td>Purified Water</td>
<td>5.600</td>
<td>5.600</td>
<td>3360.000</td>
<td>112.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.700</strong></td>
<td><strong>15.700</strong></td>
<td><strong>9420.000</strong></td>
<td><strong>314.000</strong></td>
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</tbody>
</table>

#### Output

<table>
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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.000</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (Recovered)</td>
<td>4.800</td>
<td>4.800</td>
<td>2880.000</td>
<td>96.000</td>
</tr>
<tr>
<td>Pyridine (Recovered)</td>
<td>2.880</td>
<td>2.880</td>
<td>1728.000</td>
<td>57.600</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>0.384</td>
<td>0.384</td>
<td>230.400</td>
<td>7.680</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.750</td>
<td>5.750</td>
<td>3450.000</td>
<td>115.000</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.333</td>
<td>0.333</td>
<td>199.800</td>
<td>6.660</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.003</td>
<td>1.800</td>
<td>0.060</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.550</td>
<td>0.550</td>
<td>330.000</td>
<td>11.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>15.700</strong></td>
<td><strong>15.700</strong></td>
<td><strong>9420.000</strong></td>
<td><strong>314.000</strong></td>
</tr>
</tbody>
</table>

### 1.12 Betamethasone Sodium Phosphate

#### Manufacturing Process

- Betamethasone react in pyridine with methane sulphonyl chloride, then after react with sodium iodide in acetone at 60 °C reflux for 3 hours.
- beta phosphate, react with silver dihydrogen phosphate at high temperature to warm with 4 hours To prepare at 80 °C.
- After this phosphate material adjust pH 8.0 by caustic soda solution. Material precipitated, then filter and drying.
- 2nd alternatively method Betamethasone react with pyrophosphoryl chloride at below -20 °C, in tetrahydrofuran at least 1 hour complete reaction, distilled tetrahydrofuran, then precipitated Betamethasone phosphate, filter and complete dry.
- After this phosphate material adjust pH 8.0 by caustic soda solution. Material precipitated, then filter and drying.
Chemical Reaction

Betamethasone Sodium Phosphate

\[
\begin{align*}
\text{Beta methasone} & \quad C_{22}H_{29}FO_5 \\
\text{Mol. Wt.:} & \quad 392.46 \\
\end{align*}
\]

\[
\begin{align*}
\text{Silver dihydrogen phosphate} & \quad AgH_2O_2P \\
\text{Mol. Wt.:} & \quad 204.86 \\
\end{align*}
\]

1) Methyl Sulphonyl Chloride
2) Pyridine
3) Sodium Iodied
4) NaOH

Flow Diagram

Methyl Sulphonyl Chloride - 0.2 Kg
Pyridine - 2.0 Kg
Purified Water - 2.0 Kg

Sodium Iodide - 0.3 Kg
Acetone (F+R) - 3.0 Kg
Purified Water - 2.0 Kg

Silver Dihydrogen Phosphate - 0.3 Kg
Methanol (F+R) - 3.0 Kg
Purified Water - 2.0 Kg

NaOH - 1.0 Kg
Methanol (F+R) - 3.0 Kg
IPA (F+R) - 5.0 Kg

Betamethasone (Std quantity - 1 Kg) → Waste Water - 2.6 Kg

Stage - I

Acetone Recover - 2.5 Kg
EVR. Loss - 0.3 Kg
Waste Water - 3.9 Kg

Stage - II

Methanol Recover - 2.5 Kg
EVR. Loss - 2.9 Kg

Betamethasone phosphate - 1.0 kg → IAP Recover - 4.5 Kg
EVR. Loss - 0.3 Kg
Waste Water - 4.0 Kg

Betamethasone Sodium phosphate - 1.3 kg
### Mass Balance

<table>
<thead>
<tr>
<th>Mass Balance</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Betamethasone Sodium Phosphate</strong></td>
<td>600</td>
<td>Kg/Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batch Size</td>
<td>1.3</td>
<td>Kg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Input

<table>
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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone</td>
<td>1.000</td>
<td>0.769</td>
<td>461.538</td>
<td>15.385</td>
</tr>
<tr>
<td>Methyl Sulphonyl Chloride</td>
<td>0.200</td>
<td>0.154</td>
<td>92.308</td>
<td>3.077</td>
</tr>
<tr>
<td>Sodium Iodide</td>
<td>0.300</td>
<td>0.231</td>
<td>138.462</td>
<td>4.615</td>
</tr>
<tr>
<td>Silver dihydrogen Phosphate</td>
<td>0.300</td>
<td>0.231</td>
<td>138.462</td>
<td>4.615</td>
</tr>
<tr>
<td>Methanol (Fresh)</td>
<td>0.240</td>
<td>0.185</td>
<td>110.769</td>
<td>3.692</td>
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<tr>
<td>Sodium Hydroxide</td>
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<td>0.769</td>
<td>461.538</td>
<td>15.385</td>
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<tr>
<td>Pyridine</td>
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<td>30.769</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.150</td>
<td>0.115</td>
<td>69.231</td>
<td>2.308</td>
</tr>
<tr>
<td>IPA (Fresh)</td>
<td>0.200</td>
<td>0.154</td>
<td>92.308</td>
<td>3.077</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>5.760</td>
<td>4.431</td>
<td>2658.462</td>
<td>88.615</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.850</td>
<td>2.192</td>
<td>1315.385</td>
<td>43.846</td>
</tr>
<tr>
<td>IPA (Recovered)</td>
<td>4.800</td>
<td>3.692</td>
<td>2215.385</td>
<td>73.846</td>
</tr>
<tr>
<td>Purified Water</td>
<td>6.000</td>
<td>4.615</td>
<td>2769.231</td>
<td>92.308</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24.800</td>
<td>19.077</td>
<td>11446.154</td>
<td>381.538</td>
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</tbody>
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#### Output

<table>
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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.300</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.850</td>
<td>2.192</td>
<td>1315.385</td>
<td>43.846</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>5.760</td>
<td>4.431</td>
<td>2658.462</td>
<td>88.615</td>
</tr>
<tr>
<td>IPA (Recovered)</td>
<td>4.800</td>
<td>3.692</td>
<td>2215.385</td>
<td>73.846</td>
</tr>
<tr>
<td>Wastewater</td>
<td>10.500</td>
<td>8.077</td>
<td>4846.154</td>
<td>161.538</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.585</td>
<td>0.450</td>
<td>270.000</td>
<td>9.000</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.005</td>
<td>0.004</td>
<td>2.308</td>
<td>0.077</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25.800</td>
<td>19.846</td>
<td>11907.692</td>
<td>396.923</td>
</tr>
</tbody>
</table>

### 1.13 Betamethasone Valerate

#### Manufacturing Process

- Betamethasone react with trimethyl ortho valerate, in presence of catalyst p-toluene sulphonic acid used in Methylene chloride solution. Wash the ester group with 2N sulphuric acid. Betamethasone Valerate pure in Methylene chloride and methanol.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
Chemical Reaction

Betamethasone Valerate

\[
\text{Betamethasone} \quad \text{C}_{22}\text{H}_{29}\text{FO}_5 \quad \text{Mol. Wt.: 392.46}
\]

\[
\text{trimethyl ortho valerate} \quad \text{C}_8\text{H}_{18}\text{O}_3 \quad \text{Mol. Wt.: 162.23}
\]

1) Para Toluene sulphonic acid
2) Sulphuric Acid
3) Water

Flow Diagram

MDC- 5.0 Kg
Tri Methyl ortho Valerate – 0.5 Kg
P-toluene sulphonic acid – 0.1 Kg
Sulphuric Acid – 0.2 Kg
Acetone (F+R) – 1.0 Kg
Purified Water – 2.0 Kg

Betamethasone (Std quantity – 1 Kg)

Acetone Recover – 0.5 Kg
EVR. Loss – 0.3 Kg
MDC Recover – 4.5 Kg
EVR. Loss – 0.3 Kg
Waste Water – 3.0 Kg

Pure in Methylene Dichloride (F+R) – 3.0 Kg
Methanol – 1.0 Kg

Betamethasone Valerate Crude

MDC Recover – 2.5 Kg
EVR. Loss – 0.2 Kg
Waste Water – 0.8 Kg

Pure Betamethasone Valerate – 1.2 kg

Drying Loss – 0.5 Kg
## Mass Balance

<table>
<thead>
<tr>
<th>Beta Methasone Valerate</th>
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</tr>
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<td>Batch Size</td>
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### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone</td>
<td>1.000</td>
<td>0.833</td>
<td>500.000</td>
<td>16.667</td>
</tr>
<tr>
<td>Tri Methyl ortho Valerate</td>
<td>0.500</td>
<td>0.417</td>
<td>250.000</td>
<td>8.333</td>
</tr>
<tr>
<td>P-toluene sulphonic acid</td>
<td>0.100</td>
<td>0.083</td>
<td>50.000</td>
<td>1.667</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Fresh)</td>
<td>0.320</td>
<td>0.267</td>
<td>160.000</td>
<td>5.333</td>
</tr>
<tr>
<td>Sulphuric Acid</td>
<td>0.200</td>
<td>0.167</td>
<td>100.000</td>
<td>3.333</td>
</tr>
<tr>
<td>Methanol</td>
<td>1.000</td>
<td>0.833</td>
<td>500.000</td>
<td>16.667</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.040</td>
<td>0.033</td>
<td>20.000</td>
<td>0.667</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>7.680</td>
<td>6.400</td>
<td>3840.000</td>
<td>128.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>0.960</td>
<td>0.800</td>
<td>480.000</td>
<td>16.000</td>
</tr>
<tr>
<td>Purified Water</td>
<td>2.000</td>
<td>1.667</td>
<td>1000.000</td>
<td>33.333</td>
</tr>
</tbody>
</table>

**Total** | 13.800 | 11.500 | 6900.000 | 230.000 |

### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.200</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>7.680</td>
<td>6.400</td>
<td>3840.000</td>
<td>128.000</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>0.960</td>
<td>0.800</td>
<td>480.000</td>
<td>16.000</td>
</tr>
<tr>
<td>Wastewater</td>
<td>3.400</td>
<td>2.833</td>
<td>1700.000</td>
<td>56.667</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.357</td>
<td>0.298</td>
<td>178.500</td>
<td>5.950</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.003</td>
<td>1.500</td>
<td>0.050</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.200</td>
<td>0.167</td>
<td>100.000</td>
<td>3.333</td>
</tr>
</tbody>
</table>

**Total** | 13.800 | 11.500 | 6900.000 | 230.000 |

### 1.14 Beclomethasone Dipropionate

#### Manufacturing Process

- Take 21-acetoxy- 17-hydroxy-16β-methylpregna-1,4,9(11)-triene-3,20-dione first react with n-chloro succinamide to make beclomethasone 21-acetate, this reaction with Acetic acid gets Beclomethasone. This Beclomethasone react with Propionyl Chloride with pyridine at 0°C-5°C giving the final product.
**Chemical Reaction**

Beclomethasone dipropionate

\[
\text{C}_{22}\text{H}_{29}\text{ClO}_5 \\
\text{Mol. Wt.: 372.45}
\]

16-Beta-Methyl Epoxide DB-11

\[
\text{C}_4\text{H}_7\text{ClO}_2 \\
\text{Mol. Wt.: 133.53}
\]

n-chloro succinimide

1) Acetone
2) Acetic Acid
3) Water

Beclomethasone

\[
\text{C}_{22}\text{H}_{28}\text{O}_5 \\
\text{Mol. Wt.: 408.92}
\]

Propionyl Chloride

\[
\text{C}_{3}\text{H}_5\text{ClO} \\
\text{Mol. Wt.: 92.52}
\]

1) Pyridine

Beclomethasone-
Di Propionate

\[
\text{C}_{28}\text{H}_{37}\text{ClO}_7 \\
\text{Mol. Wt.: 521.04}
\]

**Flow Diagram**

N Chloro Succanamide – 0.7 Kg
Purified Water – 2.0 Kg

\[\rightarrow\]

Waste Water – 2.2 Kg

21-acetoxy-17-hydroxy-16beta methylpregna-1,4,9(11)-triene-3,20-dione (intermediate of Synthesis of Betamethasone) q.v

(Std quantity – 1 Kg)

Beclomethasone 21Acetate

Propionyl Chloride – 0.6 Kg
Pyridine (F+R) – 3.0 Kg
Purified Water – 2.0 Kg
- 0.1 Kg

\[\rightarrow\]

Pyridine Recover – 2.8 Kg
EVR. Loss – 0.2 Kg
Waste Water – 1.2 Kg

Beclomethasone

Acetone (F+R) – 3.0 Kg

\[\rightarrow\]

Beclomethasone Dipropionate Crude

\[\rightarrow\]

Acetone Recover – 2.5 Kg
EVR. Loss – 0.5 Kg
Waste Water – 1.4 Kg

Beclomethasone Dipropionate Drying

Drying Loss – 0.35 Kg

\[\rightarrow\]

Pulverize & Packing – 1.25 Kg
### Mass Balance

<table>
<thead>
<tr>
<th>Beclomethasone Dipropionate</th>
<th>600 Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Batch Size</strong></td>
<td><strong>1.25 Kg</strong></td>
</tr>
<tr>
<td><strong>Working days per Month</strong></td>
<td><strong>30 days</strong></td>
</tr>
</tbody>
</table>

#### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-acetoxy-17-hydroxy-16beta-methylpregna-1,4,9(11)-triene-3,20-dione</td>
<td>1.000</td>
<td>0.800</td>
<td>480.000</td>
<td>16.000</td>
</tr>
<tr>
<td>N Chloro Succanamide</td>
<td>0.700</td>
<td>0.560</td>
<td>336.000</td>
<td>11.200</td>
</tr>
<tr>
<td>Propionyl Chloride</td>
<td>0.600</td>
<td>0.480</td>
<td>288.000</td>
<td>9.600</td>
</tr>
<tr>
<td>Pyridine (Fresh)</td>
<td>0.120</td>
<td>0.096</td>
<td>57.600</td>
<td>1.920</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.100</td>
<td>0.080</td>
<td>48.000</td>
<td>1.600</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.090</td>
<td>0.072</td>
<td>43.200</td>
<td>1.440</td>
</tr>
<tr>
<td>Pyridine (Recovered)</td>
<td>2.880</td>
<td>2.304</td>
<td>1382.400</td>
<td>46.080</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.910</td>
<td>2.328</td>
<td>1396.800</td>
<td>46.560</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.000</td>
<td>3.200</td>
<td>1920.000</td>
<td>64.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.400</strong></td>
<td><strong>9.920</strong></td>
<td><strong>5952.000</strong></td>
<td><strong>198.400</strong></td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.250</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Pyridine (Recovered)</td>
<td>2.880</td>
<td>2.304</td>
<td>1382.400</td>
<td>46.080</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.910</td>
<td>2.328</td>
<td>1396.800</td>
<td>46.560</td>
</tr>
<tr>
<td>Wastewater</td>
<td>4.800</td>
<td>3.840</td>
<td>2304.000</td>
<td>76.800</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.208</td>
<td>0.166</td>
<td>99.840</td>
<td>3.328</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.002</td>
<td>0.002</td>
<td>0.960</td>
<td>0.032</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.350</td>
<td>0.280</td>
<td>168.000</td>
<td>5.600</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.400</strong></td>
<td><strong>9.920</strong></td>
<td><strong>5952.000</strong></td>
<td><strong>198.400</strong></td>
</tr>
</tbody>
</table>

#### 1.15 Deflazacort

- **Manufacturing Process**
  - Deflazacort intermediate react with Iodine and produce iodo derivatives, after it, second stage/iodo derivatives reacts with potassium acetate to convert Deflazacort.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.
Chemical Reaction

Deflazacort Intermediate (D5) 11b, 21- Dihydroxy - 2'Methyl- 5'bH- proga-1,4-dieno[17,16-d] Oxazole - 3, 20 - dione (Std quantity - 1 Kg)

Flow Diagram

Deflazacort Intermediate (D5) 11b, 21- Dihydroxy - 2'Methyl- 5'bH- proga-1,4-dieno[17,16-d] Oxazole - 3, 20 - dione (Std quantity - 1 Kg)

Acetone F+R) – 3.0 Kg
Iodine – 0.5 Kg
Purified Water – 2.0 Kg

Potassium Acetate – 0.6 Kg
Calcium Chloride – 0.30 Kg
Methanol (F+R) – 3.0 Kg
Purified Water – 2.0 Kg

Deflazacort Crude

Pure Deflazacort

Filter

Pulverize & Packing – 1.1 Kg

Acetone Recover – 2.5 Kg
EVR. Loss – 0.40 Kg
Waste Water – 2.50 Kg

Waste Water – 3.0 Kg
Methanol Recover – 2.5 Kg
EVR. Loss – 0.4 Kg

DFC Stage – I (Mono iodo)

Purification in Acetone:
Water – 0.7:0.3
Mass Balance

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflazacort intermediate (D5)</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.185</td>
<td>0.168</td>
<td>100.909</td>
<td>3.364</td>
</tr>
<tr>
<td>Iodine</td>
<td>0.500</td>
<td>0.455</td>
<td>272.727</td>
<td>9.091</td>
</tr>
<tr>
<td>Potassium Acetate</td>
<td>0.600</td>
<td>0.545</td>
<td>327.273</td>
<td>10.909</td>
</tr>
<tr>
<td>Calcium Chloride</td>
<td>0.300</td>
<td>0.273</td>
<td>163.636</td>
<td>5.455</td>
</tr>
<tr>
<td>Methanol (Fresh)</td>
<td>0.120</td>
<td>0.109</td>
<td>65.455</td>
<td>2.182</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.515</td>
<td>3.195</td>
<td>1917.273</td>
<td>63.909</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Purified Water</td>
<td>4.300</td>
<td>3.909</td>
<td>2345.455</td>
<td>78.182</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13.400</strong></td>
<td><strong>12.182</strong></td>
<td><strong>7309.091</strong></td>
<td><strong>243.636</strong></td>
</tr>
</tbody>
</table>

Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.100</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>3.515</td>
<td>3.195</td>
<td>1917.273</td>
<td>63.909</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.600</td>
<td>5.091</td>
<td>3054.545</td>
<td>101.818</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.302</td>
<td>0.275</td>
<td>164.727</td>
<td>5.491</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.003</td>
<td>1.636</td>
<td>0.055</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13.400</strong></td>
<td><strong>12.182</strong></td>
<td><strong>7309.091</strong></td>
<td><strong>243.636</strong></td>
</tr>
</tbody>
</table>

1.16 Clobetasone Butyrate

Manufacturing Process

- First Betamethasone react with triethyl butyrate, p-toluene sulphonic acid and monohydrate in butyric acid, after that this beta 17-butyrate react with methane sulphonyl chloride in pyridine to give beta 17-butyrate 21-mesylate. After chromium trioxide reaction gets reflux, add lithium chloride for 20 hours after purification in acetone we get pure Clobetasone Butyrate which is ready for packing.
Chemical Reaction

Clobetasone Butyrate

\[
\text{Beta methasone} + \text{triethyl ortho butyrate} \rightarrow \text{Clobetasone Butyrate}
\]

\[
\text{Beta methasone} + \text{Methanesulfonyl chloride} \rightarrow \text{Beta methasone-17-Butyrate}
\]

\[
\text{Beta methasone-17-Butyrate} + \text{CrO}_3 \rightarrow \text{Clobetasone Butyrate}
\]
**Mass Balance**

<table>
<thead>
<tr>
<th>Clobetasone Butyrate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.1</td>
<td>Kg</td>
</tr>
<tr>
<td>Working days per Month</td>
<td>30</td>
<td>days</td>
</tr>
</tbody>
</table>

**Input**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Tri ethyl Butyrate</td>
<td>0.800</td>
<td>0.727</td>
<td>436.364</td>
<td>14.545</td>
</tr>
<tr>
<td>P-toluene sulphonic acid</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td>Methyl Sulphonic Acid</td>
<td>0.500</td>
<td>0.455</td>
<td>272.727</td>
<td>9.091</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Fresh)</td>
<td>0.120</td>
<td>0.109</td>
<td>65.455</td>
<td>2.182</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td>Pyridine</td>
<td>2.000</td>
<td>1.818</td>
<td>1090.909</td>
<td>36.364</td>
</tr>
<tr>
<td>Chromium Trioxide</td>
<td>0.700</td>
<td>0.636</td>
<td>381.818</td>
<td>12.727</td>
</tr>
<tr>
<td>DMF</td>
<td>2.000</td>
<td>1.818</td>
<td>1090.909</td>
<td>36.364</td>
</tr>
<tr>
<td>Lithium Chloride</td>
<td>0.800</td>
<td>0.727</td>
<td>436.364</td>
<td>14.545</td>
</tr>
<tr>
<td>Methyl Ethyl Ketone (MEK) (Fresh)</td>
<td>0.120</td>
<td>0.109</td>
<td>65.455</td>
<td>2.182</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.090</td>
<td>0.082</td>
<td>49.091</td>
<td>1.636</td>
</tr>
<tr>
<td></td>
<td>Unit 1</td>
<td>Unit 2</td>
<td>Unit 3</td>
<td>Unit 4</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Methyl Ethyl Ketone (MEK) (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.910</td>
<td>2.645</td>
<td>1587.273</td>
<td>52.909</td>
</tr>
<tr>
<td>Purified Water</td>
<td>7.000</td>
<td>6.364</td>
<td>3818.182</td>
<td>127.273</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24.000</td>
<td>21.818</td>
<td>13090.909</td>
<td>436.364</td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th></th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.100</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>2.910</td>
<td>2.645</td>
<td>1587.273</td>
<td>52.909</td>
</tr>
<tr>
<td>Methyl Ethyl Ketone (MEK) (Recovered)</td>
<td>2.880</td>
<td>2.618</td>
<td>1570.909</td>
<td>52.364</td>
</tr>
<tr>
<td>Wastewater</td>
<td>13.900</td>
<td>12.636</td>
<td>7581.818</td>
<td>252.727</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.326</td>
<td>0.296</td>
<td>177.818</td>
<td>5.927</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.004</td>
<td>0.004</td>
<td>2.182</td>
<td>0.073</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24.000</td>
<td>21.818</td>
<td>13090.909</td>
<td>436.364</td>
</tr>
</tbody>
</table>

1.17 Clobetasol propionate

**Manufacturing Process**

- First Betamethasone react with triethylortho propionateto get beta 17-propionate, 2nd reaction with methane sulphonyl chloride in methylene dichloride produces mesylate compound. In third reaction lithium group is attached by hot reaction at 90°C for 5 hours and we get the final product ready for packing.
- Further it will Filtered, Drying and Pulverize to make the Final Product.

**Chemical Reaction**

![Chemical Reaction Diagram](image-url)
**Flow Diagram**

- Triethyl ortho Propionate – 0.7 Kg
- P-Toluene Sulfuric Acid – 0.1 Kg
- Acetic Acid – 0.2 Kg
- Methylene Dichloride (F+R) – 3.0 Kg
- Purified Water – 2.0 Kg

- Methyl Sulphone Chloride – 0.5 Kg
- Pyridine – 2.0 Kg
- HCl – 0.1 Kg
- Purified Water – 2.0 Kg

- Lithium Chloride – 0.8 Kg
- DMF – 1.0 Kg
- Acetone (F+R) – 2.5 Kg
- Purified Water – 2.0 Kg

- Betamethasone (Std quantity – 1 Kg)

- Output
  - MDC Recover – 2.85 Kg
  - EVR. Loss – 0.10 Kg
  - Waste Water – 2.8 Kg

- Betamethasone 17 – Butyrate (1.2 Kg)

- Output
  - Waste Water – 4.5 Kg

- Betamethasone 17 – Butyrate 21 Mesylat (1.3 Kg)

- Output
  - Acetone Recover – 2.4 Kg
  - EVR. Loss – 0.148 Kg
  - Waste Water – 4.0 Kg

- Clobetasone Propionate Crude (1.4 Kg)

- Pure in Chloroform methanol Mixture

- Pure Clobetasol Propionate (1.2 Kg)

- Pulverize & Packing

**Mass Balance**

<table>
<thead>
<tr>
<th>Clobetasol Propionate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.1</td>
<td>Kg</td>
</tr>
</tbody>
</table>

**Input**

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Tri Methyl ortho Propionate</td>
<td>0.700</td>
<td>0.636</td>
<td>381.818</td>
<td>12.727</td>
</tr>
<tr>
<td>P-toluene sulphonic acid</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.200</td>
<td>0.182</td>
<td>109.091</td>
<td>3.636</td>
</tr>
<tr>
<td>Methylene Dichloride (MDC) (Fresh)</td>
<td>0.150</td>
<td>0.136</td>
<td>81.818</td>
<td>2.727</td>
</tr>
<tr>
<td>Methyl Sulphonyl Chloride</td>
<td>0.500</td>
<td>0.455</td>
<td>272.727</td>
<td>9.091</td>
</tr>
<tr>
<td>Pyridine</td>
<td>2.000</td>
<td>1.818</td>
<td>1090.909</td>
<td>36.364</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.100</td>
<td>0.091</td>
<td>54.545</td>
<td>1.818</td>
</tr>
<tr>
<td></td>
<td>HCl</td>
<td>Lithium Chloride</td>
<td>DMF</td>
<td>Methylene Dichloride (MDC) (Recovered)</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
<td>------------------</td>
<td>--------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td></td>
<td>0.100</td>
<td>0.800</td>
<td>1.000</td>
<td>2.850</td>
</tr>
<tr>
<td></td>
<td>0.091</td>
<td>0.727</td>
<td>0.909</td>
<td>2.591</td>
</tr>
<tr>
<td></td>
<td>54.545</td>
<td>436.364</td>
<td>545.455</td>
<td>1554.545</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.818</td>
<td>18.182</td>
<td>51.818</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17.900</strong></td>
<td><strong>16.273</strong></td>
<td><strong>9763.636</strong></td>
<td><strong>325.455</strong></td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th></th>
<th>Product</th>
<th>Methylene Dichloride (MDC) (Recovered)</th>
<th>Acetone (Recovered)</th>
<th>Wastewater</th>
<th>Evaporation Loss</th>
<th>Distillation residue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.100</td>
<td>2.850</td>
<td>2.400</td>
<td>11.300</td>
<td>0.248</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>1.000</td>
<td>2.591</td>
<td>2.182</td>
<td>10.273</td>
<td>0.225</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>600.000</td>
<td>1554.545</td>
<td>1309.091</td>
<td>6163.636</td>
<td>135.273</td>
<td>1.091</td>
</tr>
<tr>
<td></td>
<td>20.000</td>
<td>51.818</td>
<td>43.636</td>
<td>205.455</td>
<td>4.509</td>
<td>0.036</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17.900</strong></td>
<td><strong>16.273</strong></td>
<td><strong>9763.636</strong></td>
<td><strong>325.455</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.18 **Mometasone Furoate**

- **Manufacturing process**
  - Beclomethasone Acetate react with 2-Furoyl Chloride, further add Methanol and 4-DMAP at room temperature.
  - Again this material react with Methyl Sulphonyl chloride and Lithium Chloride in presence of DMF and Acetone.
  - After quality check report, purified water will be added for precipitation.
  - Further it will filtered, drying and pulverize to make the final product.
Chemical Reaction

**Mometasone Furoate**

\[
\text{Beclomethasone Acetate} + 2\text{-Furoyl Chloride} \rightarrow \text{Mometasone Furoate}
\]

**Flow Diagram**

- 2-Furoyl Chloride – 0.5 Kg
- 4-DMAP – 0.3 Kg
- Perchloric Acid – 0.2 Kg
- Methanol (F+R) – 4.0 Kg

**Output**

- Methanol Recover – 3.84 Kg
- EVR. Loss – 0.07 Kg

**Mometasone Furoate Crude**

- DMF – 4.0 Kg
- Methyl Sulphone Chloride – 0.5 Kg
- Lithium Chloride – 1.0 Kg
- Acetone (F+R) – 5.0 Kg
- Purified Water – 6.5 Kg

**Mometasone Furoate (1 Kg)**

- Acetone Recover – 4.85 Kg
- EVR. Loss – 0.3 Kg
- Waste Water – 12.80 Kg
# Mass Balance

<table>
<thead>
<tr>
<th>Mometasone Furoate</th>
<th>600 Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1 Kg</td>
</tr>
</tbody>
</table>

## Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betamethasone Acetate</td>
<td>1.000</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>2-Furoyl Chloride</td>
<td>0.500</td>
<td>0.500</td>
<td>300.000</td>
<td>10.000</td>
</tr>
<tr>
<td>4-DMAP</td>
<td>0.300</td>
<td>0.300</td>
<td>180.000</td>
<td>6.000</td>
</tr>
<tr>
<td>Methanol (Fresh)</td>
<td>0.160</td>
<td>0.160</td>
<td>96.000</td>
<td>3.200</td>
</tr>
<tr>
<td>DMF</td>
<td>4.000</td>
<td>4.000</td>
<td>2400.000</td>
<td>80.000</td>
</tr>
<tr>
<td>Methyl Sulphonyl Chloride</td>
<td>0.500</td>
<td>0.500</td>
<td>300.000</td>
<td>10.000</td>
</tr>
<tr>
<td>Lithium Chloride</td>
<td>1.000</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Acetone (Fresh)</td>
<td>0.150</td>
<td>0.150</td>
<td>90.000</td>
<td>3.000</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>3.840</td>
<td>3.840</td>
<td>2304.000</td>
<td>76.800</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>4.850</td>
<td>4.850</td>
<td>2910.000</td>
<td>97.000</td>
</tr>
<tr>
<td>Purified Water</td>
<td>6.500</td>
<td>6.500</td>
<td>3900.000</td>
<td>130.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22.800</strong></td>
<td><strong>22.800</strong></td>
<td><strong>13680.000</strong></td>
<td><strong>456.000</strong></td>
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</tbody>
</table>

## Output

<table>
<thead>
<tr>
<th>Product</th>
<th>1.000</th>
<th>1.000</th>
<th>600.000</th>
<th>20.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (Recovered)</td>
<td>3.840</td>
<td>3.840</td>
<td>2304.000</td>
<td>76.800</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>4.850</td>
<td>4.850</td>
<td>2910.000</td>
<td>97.000</td>
</tr>
<tr>
<td>Wastewater</td>
<td>12.800</td>
<td>12.800</td>
<td>7680.000</td>
<td>256.000</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.307</td>
<td>0.307</td>
<td>184.200</td>
<td>6.140</td>
</tr>
<tr>
<td>Distillation residue</td>
<td>0.003</td>
<td>0.003</td>
<td>1.800</td>
<td>0.060</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22.800</strong></td>
<td><strong>22.800</strong></td>
<td><strong>13680.000</strong></td>
<td><strong>456.000</strong></td>
</tr>
</tbody>
</table>

### 1.19 Methyl Prednisolone Acetate

#### Manufacturing Process

- This stage Methyl Prednisolone react with Acetyl Chloride in pyridine at room temperature.
- Further it will Filtered, Drying and Pulverize to make the Final Product.
**Chemical Reaction**

**Methylprednisolone Acetate**

![Chemical Structure](image)

- Methyl prednisolone
  - \( C_{22}H_{30}O_5 \)
  - Mol. Wt.: 374.47
- Acetyl Chloride
  - \( C_2H_3ClO \)
  - Mol. Wt.: 78.5

\[ \text{Methyl prednisolone} + \text{Acetyl Chloride} \rightarrow \text{Methylprednisolone Acetate} \]

- 1) Chloroform
- 2) Methanol
- 3) Pyridine

**Flow Diagram**

- Acetyl Chloride – 1.0 Kg
- Pyridine – 2.5 Kg
- Acetic Acid – 0.2 Kg
- Purified Water – 2.0 Kg

Methylprednisolone (Std quantity – 1 Kg)

- Output
  - Waste Water – 5.5 Kg

Methylprednisolone Crude (1.2 Kg)

- Pure in Chloroform (F+R) 0.7 Kg
- Methanol (F+R) 0.3 Kg

Methylprednisolone Acetate (1.1 Kg)

- CF Recover – 0.6 Kg
- EVR. Loss – 0.1 Kg
- Methanol Recover – 0.2 Kg
- EVR. Loss – 0.05 Kg
- Waste Water – 0.15 Kg
- Drying Loss – 0.35 Kg
### Mass Balance

<table>
<thead>
<tr>
<th>Methyl Prednisolone Acetate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.1</td>
<td>Kg</td>
</tr>
</tbody>
</table>

#### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylprednisolone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Acetyl Chloride</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Methanol (Fresh)</td>
<td>0.012</td>
<td>0.011</td>
<td>6.545</td>
<td>0.218</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.200</td>
<td>0.182</td>
<td>109.091</td>
<td>3.636</td>
</tr>
<tr>
<td>Chloroform (Fresh)</td>
<td>0.022</td>
<td>0.020</td>
<td>12.000</td>
<td>0.400</td>
</tr>
<tr>
<td>Pyridine</td>
<td>2.500</td>
<td>2.273</td>
<td>1363.636</td>
<td>45.455</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.288</td>
<td>0.262</td>
<td>157.091</td>
<td>5.236</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>0.678</td>
<td>0.616</td>
<td>369.818</td>
<td>12.327</td>
</tr>
<tr>
<td>Purified Water</td>
<td>2.050</td>
<td>1.864</td>
<td>1118.182</td>
<td>37.273</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.750</strong></td>
<td><strong>7.045</strong></td>
<td><strong>4227.273</strong></td>
<td><strong>140.909</strong></td>
</tr>
</tbody>
</table>

#### Output

<table>
<thead>
<tr>
<th>Product</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.100</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>0.678</td>
<td>0.616</td>
<td>369.818</td>
<td>12.327</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.288</td>
<td>0.262</td>
<td>157.091</td>
<td>5.236</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.300</td>
<td>4.818</td>
<td>2890.909</td>
<td>96.364</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.033</td>
<td>0.030</td>
<td>18.000</td>
<td>0.600</td>
</tr>
<tr>
<td>Distillation residue</td>
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<td>0.001</td>
<td>0.545</td>
<td>0.018</td>
</tr>
<tr>
<td>Drying Loss</td>
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<td>0.318</td>
<td>190.909</td>
<td>6.364</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.750</strong></td>
<td><strong>7.045</strong></td>
<td><strong>4227.273</strong></td>
<td><strong>140.909</strong></td>
</tr>
</tbody>
</table>

#### 1.20 Prednisolone Acetate

- **Manufacturing Process**
  - This stage Prednisolone react with Acetyl Chloride in pyridine at room temperature.
  - Further it will Filtered, Drying and Pulverize to make the Final Product.
Chemical Reaction

Prednisolone Acetate

C₂₁H₂₈O₅
Mol. Wt.: 360.44
Prednisolone

1) Chloroform
2) Methanol

Acetyl Chloride
C₂H₄ClO
Mol. Wt.: 78.5

Prednisolone Acetate
C₂₃H₃₀O₆
Mol. Wt.: 402.48

Flow Diagram

Acetic Anhydride – 0.9 Kg
Pyridine – 2.5 Kg
Acetic Acid – 0.2 Kg
Purified Water – 2.050 Kg

Prednisolone (Std quantity – 1 Kg)

Output

Prednisolone Acetate Crude (1.2 Kg)

Pure in Chloroform (F+R) 0.7 Kg
Methanol (F+R) 0.3 Kg

Output

Prednisolone Acetate (1.1 Kg)

CF Recover – 0.672 Kg
EVR. Loss – 0.1 Kg
Methanol Recover – 0.285 Kg
EVR. Loss – 0.05 Kg
Waste Water – 0.15 Kg
Drying loss – 0.200 Kg
Mass Balance

<table>
<thead>
<tr>
<th>Prednisolone Acetate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
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<td>Kg</td>
</tr>
</tbody>
</table>

### Input

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prednisolone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Acetic Anhydride</td>
<td>0.900</td>
<td>0.818</td>
<td>490.909</td>
<td>16.364</td>
</tr>
<tr>
<td>Pyridine</td>
<td>2.500</td>
<td>2.273</td>
<td>1363.636</td>
<td>45.455</td>
</tr>
<tr>
<td>Acetic Acid</td>
<td>0.200</td>
<td>0.182</td>
<td>109.091</td>
<td>3.636</td>
</tr>
<tr>
<td>Methanol (Fresh)</td>
<td>0.015</td>
<td>0.014</td>
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<td>0.273</td>
</tr>
<tr>
<td>Chloroform (Fresh)</td>
<td>0.028</td>
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</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.285</td>
<td>0.259</td>
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<td>5.182</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>0.672</td>
<td>0.611</td>
<td>366.545</td>
<td>12.218</td>
</tr>
<tr>
<td>Purified Water</td>
<td>2.050</td>
<td>1.864</td>
<td>1118.182</td>
<td>37.273</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.650</strong></td>
<td><strong>6.955</strong></td>
<td><strong>4172.727</strong></td>
<td><strong>139.091</strong></td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>1.100</td>
<td>1.000</td>
<td>600.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>0.672</td>
<td>0.611</td>
<td>366.545</td>
<td>12.218</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.285</td>
<td>0.259</td>
<td>155.455</td>
<td>5.182</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.350</td>
<td>4.864</td>
<td>2918.182</td>
<td>97.273</td>
</tr>
<tr>
<td>Evaporation Loss</td>
<td>0.042</td>
<td>0.038</td>
<td>22.909</td>
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</tr>
<tr>
<td>Distillation residue</td>
<td>0.001</td>
<td>0.001</td>
<td>0.545</td>
<td>0.018</td>
</tr>
<tr>
<td>Drying Loss</td>
<td>0.200</td>
<td>0.182</td>
<td>109.091</td>
<td>3.636</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.650</strong></td>
<td><strong>6.955</strong></td>
<td><strong>4172.727</strong></td>
<td><strong>139.091</strong></td>
</tr>
</tbody>
</table>

### 1.21 Hydrocortisone Acetate

#### Manufacturing Process

- First Hydrocortisone react with Acetic Acid and Acetyl Chloride in Pyridine at room temperature to giving final product.
Chemical Reaction

Hydrocortisone Acetate

Hydrocortisone
\( C_{21}H_{30}O_5 \)
Mol. Wt.: 362.46

Acetyl chloride
\( C_2H_3ClO \)
Mol. Wt.: 78.5

1) Chloroform
2) Methanol
3) Pyridine

Hydrocortisone Acetate
\( C_{23}H_{32}O_6 \)
Mol. Wt.: 404.5

Flow Diagram

Acetic Chloride – 1.0 Kg
Pyridine – 2.5 Kg
Acetic Acid – 0.2 Kg
Purified Water – 2.0 Kg

Hydrocortisone
(Std quantity – 1 Kg)

Output

Waste Water – 5.35 Kg

Hydrocortisone Crude (1.2 Kg)

Pure in Chloroform (F+R) 0.7 Kg
Methanol (F+R) 0.3 Kg

Output

CF Recover – 0.6 Kg
EVR. Loss – 0.1 Kg
Methanol Recover – 0.2 Kg
EVR. Loss – 0.05 Kg
Waste Water – 0.15 Kg
Drying Loss – 0.10 Kg

Hydrocortisone Acetate (1.1 Kg)
Mass Balance

<table>
<thead>
<tr>
<th>Hydrocortisone Acetate</th>
<th>600</th>
<th>Kg/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch Size</td>
<td>1.1</td>
<td>Kg</td>
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### Input

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<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocortisone</td>
<td>1.000</td>
<td>0.909</td>
<td>545.455</td>
<td>18.182</td>
</tr>
<tr>
<td>Acetyl Chloride</td>
<td>1.000</td>
<td>0.909</td>
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<td>18.182</td>
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<tr>
<td>Pyridine</td>
<td>2.500</td>
<td>2.273</td>
<td>1363.636</td>
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<tr>
<td>Acetic Acid</td>
<td>0.200</td>
<td>0.182</td>
<td>109.091</td>
<td>3.636</td>
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<tr>
<td>Methanol (Fresh)</td>
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<td>0.011</td>
<td>6.545</td>
<td>0.218</td>
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<tr>
<td>Chloroform (Fresh)</td>
<td>0.021</td>
<td>0.019</td>
<td>11.455</td>
<td>0.382</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.288</td>
<td>0.262</td>
<td>157.091</td>
<td>5.236</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>0.679</td>
<td>0.617</td>
<td>370.364</td>
<td>12.345</td>
</tr>
<tr>
<td>Purified Water</td>
<td>2.050</td>
<td>1.864</td>
<td>1118.182</td>
<td>37.273</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>7.750</td>
<td>7.045</td>
<td>4227.273</td>
<td>140.909</td>
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### Output

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<th>Product</th>
<th>1.100</th>
<th>1.000</th>
<th>600.000</th>
<th>20.000</th>
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</thead>
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<tr>
<td>Chloroform (Recovered)</td>
<td>0.679</td>
<td>0.617</td>
<td>370.364</td>
<td>12.345</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>0.288</td>
<td>0.262</td>
<td>157.091</td>
<td>5.236</td>
</tr>
<tr>
<td>Wastewater</td>
<td>5.550</td>
<td>5.045</td>
<td>3027.273</td>
<td>100.909</td>
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<tr>
<td>Evaporation Loss</td>
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<td>1.818</td>
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<tr>
<td><strong>Total</strong></td>
<td>7.750</td>
<td>7.045</td>
<td>4227.273</td>
<td>140.909</td>
</tr>
</tbody>
</table>

### 1.22 Dexamethasone Sodium Phosphate

#### Manufacturing Process

- Charge THF & Dexamethasone at room temperature.
- Cool to 10°C. Add pyro at 10°C.
- Maintain for 1 hr. Dump solution in chill water. Start distillation of THF.
- Cool to 0°C. Add chloroform. Stirr for 1 hr at 0°C. Start filter & wash with water & ethyl Acetate. Collect wet material for drying.
- Tack methanol & dry material stage – I. Stirr for clear solution at 40°C.
- For pH 7.5 to 10.5 at 10°C. Add IPA 15 lit. Stirr for 1 hr at 10°C.
- Start filter & wash with 2 lit IPA. Collect wet material for drying. Dry in Vacuum dryer at 65°C. Collect dry material.
**Chemical Reaction**

Tetrahydrofouran (F+R) – 5.78 Kg
Pyro Phosphryl Chloride – 0.62 Kg
Chloroform (F+R) – 1.492 Kg
Ethyl Acetate (F+R) – 1.35 Kg
Activated charcoal - 0.1 Kg
Water – 3.0 Kg

**Flow Diagram**

![Flow Diagram Diagram](image)

Dexa methasone (Std quantity – 1 Kg)

- Chloroform Recover - 1.30 Kg
- EVR. Loss – 0.192 Kg
- THF Recover – 5.5 Kg
- EVR. Loss – 0.28 Kg
- Ethyl Acetate Recover – 1.1 Kg
- Spent loss – 0.1 Kg
- Waste Water – 3.0 Kg

**Output**

Methanol (F+R) – 4.75 Kg
Activated charcoal - 0.1 Kg
Sodium Hydroxide – 0.1 Kg
Iso Propyl alcohol (F+R) – 15.0 Kg

**Drying**

- Methanol Recover – 4.50 Kg
- EVR. Loss – 0.25 Kg
- Spent charcoal – 0.2 Kg
- IPA Recover – 13.5 Kg
- EVR. Loss – 1.5 Kg

**Purification**

**Drying**

Drying loss – 0.5 Kg

Dexamethasone sodium phosphate (1.0 Kg)
Mass Balance

<table>
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<tr>
<th>Dexamethasone Sodium Phosphate</th>
<th>600</th>
<th>Kg/Month</th>
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</thead>
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<td>Batch Size</td>
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<td>Kg</td>
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Input

<table>
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<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
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</thead>
<tbody>
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<td>0.800</td>
<td>480.000</td>
<td>16.000</td>
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<td>Tetrahydrofuran (Fresh)</td>
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<td>0.191</td>
<td>114.720</td>
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<td>Pyro phosphoryl chloride</td>
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<td>0.496</td>
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<td>9.920</td>
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<td>Chloroform (Fresh)</td>
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<td>0.036</td>
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<td>0.033</td>
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<tr>
<td>Activated Carbon</td>
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<td>0.160</td>
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<tr>
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<td>0.080</td>
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<tr>
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<tr>
<td>Tetrahydrofuran (Recovered)</td>
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<td>4.433</td>
<td>2659.680</td>
<td>88.656</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
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<td>1.158</td>
<td>694.560</td>
<td>23.152</td>
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<tr>
<td>Ethyl Acetate (Recovered)</td>
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<td>1.047</td>
<td>628.320</td>
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<td>4.560</td>
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<td>232.000</td>
</tr>
<tr>
<td>Purified Water</td>
<td>3.000</td>
<td>2.400</td>
<td>1440.000</td>
<td>48.000</td>
</tr>
</tbody>
</table>

Total | 33.292 | 26.634 | 15980.160 | 532.672 |

Output

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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
</tr>
</thead>
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<td>4.433</td>
<td>2659.680</td>
<td>88.656</td>
</tr>
<tr>
<td>Chloroform (Recovered)</td>
<td>1.447</td>
<td>1.158</td>
<td>694.560</td>
<td>23.152</td>
</tr>
<tr>
<td>Ethyl Acetate (Recovered)</td>
<td>1.309</td>
<td>1.047</td>
<td>628.320</td>
<td>20.944</td>
</tr>
<tr>
<td>Methanol (Recovered)</td>
<td>4.560</td>
<td>3.648</td>
<td>2188.800</td>
<td>72.960</td>
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<tr>
<td>Iso propyl alcohol (Recovered)</td>
<td>14.500</td>
<td>11.600</td>
<td>6960.000</td>
<td>232.000</td>
</tr>
<tr>
<td>Spent Carbon</td>
<td>0.200</td>
<td>0.160</td>
<td>96.000</td>
<td>3.200</td>
</tr>
<tr>
<td>Wastewater</td>
<td>3.000</td>
<td>2.400</td>
<td>1440.000</td>
<td>48.000</td>
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<td>Distillation residue</td>
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<td>225.600</td>
<td>7.520</td>
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</tbody>
</table>

Total | 33.292 | 26.634 | 15980.160 | 532.672 |

1.23 Methyl Cobalamin

Manufacturing Process

- First Cynocobalamine reacts with TMSI (trimethylsilyliodide) in presence of Purified water and Ferrous Sulphate at RT for 2 Hrs.
- After that reduction with Sodium Borohydrade at 0-5oC within 4 Hrs. Then work up with Phenol and Chloroform and get organic layer for further process. Distill out Chloroform and dump in acetone.
- Further it will filtered, Drying and Pulverized to make the final product.
Chemical Reaction

Cyno Cobalamine

Sodium Borohydride

Water

Fe S

Phenol

Acetone

Chloroform

TMSI

Methyl Cobalamine

Flow Diagram

TNSI – 0.22 Kg
Ferrous Sulphate – 0.13 Kg
Purified Water – 10 Kg

Cynocobalamine Sty Qty: 1 Kg

Sodium Borohydride – 0.20 Kg
Phenol – 1.9 Kg
Chloroform – 5.20 Kg
Acetone – 2.0 Kg

Reduction

Chloroform Recover – 5.0 Kg
EVR. Loss – 0.20 Kg
Acetone Recover – 1.80 Kg
EVR. Loss – 0.20 Kg
Waste Ware – 11.80 Kg

Drying

Drying Loss – 0.50 Kg

Methyl Cobalamine – 1.15 Kg
# Mass Balance

**Methyl Cobalamine**  
150 Kg/Month

**Batch Size**  
1.15 Kg

## Input

<table>
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<tr>
<th>Particular</th>
<th>Kg/Batch</th>
<th>Kg/Kg of Product</th>
<th>Kg/Month</th>
<th>Kg/day</th>
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<td>Cynocabalamine</td>
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<td>130.435</td>
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<tr>
<td>TMSI</td>
<td>0.220</td>
<td>0.191</td>
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<tr>
<td>Sodium Borohydrate</td>
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<td>0.174</td>
<td>26.087</td>
<td>0.870</td>
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<tr>
<td>Phenol</td>
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<td>1.652</td>
<td>247.826</td>
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<tr>
<td>Chloroform (Fresh)</td>
<td>0.200</td>
<td>0.174</td>
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<td>0.870</td>
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<tr>
<td>Acetone (Fresh)</td>
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<td>0.565</td>
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<td>1.670</td>
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<td><strong>Total</strong></td>
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<td>17.957</td>
<td>2693.478</td>
<td>89.783</td>
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</table>

## Output

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<tr>
<th>Product</th>
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<th>Kg/Kg of Product</th>
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<th>Kg/day</th>
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<tbody>
<tr>
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<td>1.000</td>
<td>150.000</td>
<td>5.000</td>
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<tr>
<td>Chloroform (Recovered)</td>
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<td>4.348</td>
<td>652.174</td>
<td>21.739</td>
</tr>
<tr>
<td>Acetone (Recovered)</td>
<td>1.920</td>
<td>1.670</td>
<td>250.435</td>
<td>8.348</td>
</tr>
<tr>
<td>Waste Water</td>
<td>11.800</td>
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<td>Distillation residue</td>
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<td>0.009</td>
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<tr>
<td>Drying Loss</td>
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<td>0.435</td>
<td>65.217</td>
<td>2.174</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>20.650</td>
<td>17.957</td>
<td>2693.478</td>
<td>89.783</td>
</tr>
</tbody>
</table>
Annexure-II
Adequacy Report
Adequacy Certificate

Of

M/s. Sanjivani Pharma

Located at
Plot No. D-2-CH-102, GIDC Dahej-II, Taluka: Vagra,
Dist: Bharuch, Gujarat

Prepared by

AWH Laboratory

Office
13, Pushpak Industrial Estate, Phase I, GIDC Vatva,
Ahmedabad – 382445

May, 2019
1.0 INTRODUCTION:

The environmental audit scheme was introduced by the Gujarat High Court vide its order dated 20/12/96 and 13/03/97 and modified vide dated: 16/09/99. We are appointed by the Gujarat Pollution Control Board, Gandhinagar as recognized schedule II Environmental Auditor by their order no. GPCB/EA-343/445875 dated 27/02/2018 for compliance of Environmental Audit Scheme of Hon. High Court.

M/s. Sanjivani Pharma, Located at Plot No.D-2-CH-102, GIDC Dahej-II, Taluka: Vagra, District: Bharuch, Gujarat, India approached us to give an Adequacy Certificate for their proposed product. M/s. Sanjivani Pharma has decided to manufacture following products.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Product No.</th>
<th>Name of Products</th>
<th>CAS No.</th>
<th>Production Capacity (Kg/Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
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<td>Nandrolone Deconate</td>
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<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
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<td>H4</td>
<td>Mifepristone</td>
<td>84371-65-3</td>
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Table: 01
Details of Product
<table>
<thead>
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<th>Sr. No.</th>
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<th>Name of Products</th>
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<th>Production Capacity (Kg/Month)</th>
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<td>Deflazacort</td>
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</tbody>
</table>
2.0 WATER POLLUTION CONTROL SYSTEM:

TABLE NO. 02
 DETAILS OF WATER CONSUMPTION & EFFLUENT GENERATION

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Type of Activity</th>
<th>Water Requirement, KLD</th>
<th>Waste Water Generation, KLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Domestic</td>
<td>5.0</td>
<td>4.0</td>
</tr>
<tr>
<td>2.</td>
<td>Gardening</td>
<td>8.3</td>
<td>Nil</td>
</tr>
<tr>
<td>3.</td>
<td>Industrial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Process</td>
<td>0.3</td>
<td>0.45</td>
</tr>
<tr>
<td>b.</td>
<td>Floor Washing</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>c.</td>
<td>Equipment Cleaning</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>d.</td>
<td>Scrubbing</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>e.</td>
<td>Cooling</td>
<td>2.2</td>
<td>0.1</td>
</tr>
<tr>
<td>f.</td>
<td>Reject Water to Cooling</td>
<td>0.3</td>
<td>Nil</td>
</tr>
<tr>
<td>Total Industrial</td>
<td></td>
<td>3.7</td>
<td>1.45</td>
</tr>
<tr>
<td>Total (1+2+3)</td>
<td></td>
<td>17.0</td>
<td>5.45</td>
</tr>
</tbody>
</table>

- Domestic Sewage will be sent in soak pit through Septic tank.
- Process effluent stream will be collected and sent to common MEE. Other low concentrated effluent will be treated in in-house Primary Effluent treatment plant and then sent to CETP for further treatment.
**Water Balance Diagram**

**Source of Water Supply:**
GIDC Supply
Total: 17 KL/day

- **Domestic**: 5 KL/day
- **Gardening**: 8.3 KL/day
- **Industrial**: 3.7 KL/day

- **Sewage to septic tank & Soak Pit**: 4 KL/day

- **Water Treatment Plant**: 0.9 KL/day
  - **Reject water**: 0.3 KL/day
  - **Purified water**: 0.6 KL/day
    - **Process**: 0.3 KL/day
      - **Wastewater**: 0.45 KL/day
        - **To Common NEE**: 0.45 KL/day
    - **Equipment Cleaning**: 0.3 KL/day
      - **Wastewater**: 0.3 KL/day

- **Cooling**: 2.5 KL/day
  - **Wastewater**: 0.1 KL/day
  - **Wastewater**: 0.3 KL/day

- **Floor Washing**: 0.3 KL/day
  - **Scrubbing**: 0.3 KL/day
    - **Scrubbed Liquid**: 0.3 KL/day

- **ETP with primary treatment facility**: 1.0 KL/day
  - **To CETP**: 1.0 KL/day

---

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### Stream-wise characteristics of Industrial Effluent

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Parameters</th>
<th>Unit</th>
<th>Cooling Purge</th>
<th>Floor washing</th>
<th>Equipment cleaning</th>
<th>Scrubbing</th>
<th>Composite diluted stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>--</td>
<td>6.5-7.5</td>
<td>6.0-7.0</td>
<td>6.5-7.5</td>
<td>4.0-5.0</td>
<td>6.0-7.0</td>
</tr>
<tr>
<td>2</td>
<td>COD</td>
<td>mg/l</td>
<td>50-60</td>
<td>300-400</td>
<td>1000-1500</td>
<td>40-50</td>
<td>500-1000</td>
</tr>
<tr>
<td>3</td>
<td>SS</td>
<td>mg/l</td>
<td>200-300</td>
<td>150-200</td>
<td>150-200</td>
<td>100-150</td>
<td>150-200</td>
</tr>
<tr>
<td>4</td>
<td>TDS</td>
<td>mg/l</td>
<td>2000-2500</td>
<td>400-500</td>
<td>2500-3000</td>
<td>800-1000</td>
<td>2000-3000</td>
</tr>
</tbody>
</table>

### Parameters

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Parameters</th>
<th>Unit</th>
<th>Process Effluent to Common MEE</th>
<th>Diluted Effluent steam to In house primary ETP</th>
<th>Primarily treated effluent to CETP</th>
<th>CETP Inlet Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>--</td>
<td>6.0-7.0</td>
<td>6.0-7.0</td>
<td>6.5-7.5</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>2</td>
<td>COD</td>
<td>mg/l</td>
<td>15000-20000</td>
<td>500-1000</td>
<td>&lt;1000</td>
<td>&lt;3000</td>
</tr>
<tr>
<td>3</td>
<td>SS</td>
<td>mg/l</td>
<td>200-300</td>
<td>150-200</td>
<td>&lt;100</td>
<td>&lt;300</td>
</tr>
<tr>
<td>4</td>
<td>TDS</td>
<td>mg/l</td>
<td>20000-30000</td>
<td>2000-30000</td>
<td>&lt;3000</td>
<td>&lt;8000</td>
</tr>
</tbody>
</table>
# TABLE NO. 03
**Effluent Treatment Plant**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular</th>
<th>Quantity</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Feed pump</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nutch/ Disc filter</td>
<td>01</td>
<td>100 L/Hr</td>
</tr>
<tr>
<td>3</td>
<td>Diluted stream Collection Tank</td>
<td>01</td>
<td>1500 L</td>
</tr>
<tr>
<td>4</td>
<td>Treated water tank</td>
<td>01</td>
<td>1500 L</td>
</tr>
<tr>
<td>5</td>
<td>Process effluent stream</td>
<td>01</td>
<td>1500 L</td>
</tr>
</tbody>
</table>

**ETP Flow Diagram**

![Flow Diagram](#)

---

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---

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3.0 AIR POLLUTION CONTROL SYSTEM:

**TABLE NO. 04**

**FLUE GAS STACK DETAILS**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Stacks attached to</th>
<th>Stack Height (m)</th>
<th>APCM</th>
<th>Pollutants &amp; Permissible limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D.G Set (50 KVA) - Stand by</td>
<td>6</td>
<td>Adequate Stack Height</td>
<td>Particulate Matter ≤ 150 mg/Nm³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SO₂ ≤ 100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NOₓ ≤ 50 ppm</td>
</tr>
</tbody>
</table>

**TABLE NO. 05**

**PROCESS GAS EMISSION:**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Stack attached to</th>
<th>Stack Height (m)</th>
<th>APCM</th>
<th>Pollutants &amp; Permissible limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass reactor</td>
<td>20</td>
<td>Water Scrubber</td>
<td>HCl ≤ 20 mg/Nm³</td>
</tr>
</tbody>
</table>

**FUEL REQUIREMENT**

**TABLE - 06**

**DETAILS OF FUELS**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Application</th>
<th>Type of Fuel</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D.G. Set</td>
<td>Diesel</td>
<td>5 L/hr</td>
</tr>
</tbody>
</table>
### 4.0 HAZARDOUS WASTE MANAGEMENT

#### TABLE NO - 07
DETAILS OF HAZARDOUS WASTES

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Type/ Name of Hazardous waste</th>
<th>Specific Source of generation (Name of the Activity, Product etc.)</th>
<th>Category and Schedule as per HW Rules</th>
<th>Quantity (MT/Annum)</th>
<th>Management of HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Used/spent Oil</td>
<td>Plant &amp; Machineries</td>
<td>5.1</td>
<td>0.01</td>
<td>Collection, storage, and reuse within premises for lubrication or disposal to registered recycler.</td>
</tr>
<tr>
<td>2</td>
<td>Discarded Containers/bags</td>
<td>Raw materials</td>
<td>33.1</td>
<td>5.0</td>
<td>Collection, storage, Transportation &amp; sell to authorized vendor</td>
</tr>
<tr>
<td>3</td>
<td>ETP Sludge</td>
<td>Wastewater treatment systems</td>
<td>35.3</td>
<td>5.0</td>
<td>Collection, storage, Transportation and Disposal to TSDF</td>
</tr>
<tr>
<td>4</td>
<td>Process waste</td>
<td>Mfg Process</td>
<td>28.1</td>
<td>3.50</td>
<td>Collection, storage, Transportation and Disposal to CHWIF</td>
</tr>
<tr>
<td>5</td>
<td>Spent Carbon</td>
<td>Mfg Process</td>
<td>28.3</td>
<td>4.50</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Distillation residue</td>
<td>Solvent recovery</td>
<td>20.3</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Spent Solvent</td>
<td>Mfg Process</td>
<td>20.2</td>
<td>540.0</td>
<td>Collection, recovery and reuse in next batch</td>
</tr>
<tr>
<td>8</td>
<td>Spent HCl</td>
<td>Scrubbing system</td>
<td>SC-11-815</td>
<td>54.0</td>
<td>Collection, and to be taken in in-house ETP for treatment and ultimately sent to CETP</td>
</tr>
</tbody>
</table>
CONCLUSION:

Based on the Environmental study of M/s. Sanjivani Pharma, it is concluded that,

The proposed Primary treatment is adequate to treat the Effluent as mentioned in Table No. 3.

The proposed air pollution control measures are Sufficient and adequate to control flue gas emission and process gas emissions as mentioned in Table No. 4 and 5.

The provisions for hazardous waste management are sufficient for types of wastes as mentioned in Table No. 7.

The Proposed Environment Management System (Effluent, Air & hazardous waste) proposed by the unit is adequate for the proposed manufacturing activity.

This EMS Certificate is valid only for following conditions.

- **Unit should collect Process effluent stream and sent to common MEE.** Other low concentrated effluent should be treated in in-house Primary Effluent treatment plant and then sent to CETP for further treatment.

- **Unit should not change the type of fuel without obtaining prior permission from the Board.**

- **The management of generated hazardous waste should be as mentioned in Table 07.**

This certificate is subjected to automatic cancellation in case of any change in product profile/capacity, quantity and quality of effluents (Air, Water, Hazardous waste) and efficiency of EMS.

Date: 29/05/2019

Place: Ahmedabad
Annexure-III

Summary of the Project
EXECUTIVE SUMMARY

1. PROJECT DESCRIPTION

1.1. General Introduction

M/s. Sanjivani Pharma is a proposed unit located at Plot No.: D-2-CH-102. in GIDC Dahej-II, Taluka Vagra in District Bharuch in Gujarat State for the production of synthetic organic chemicals.

Now, looking to the market demand, we intend to established production activity of some products which is raw material for As Pharmaceutical ingredient and in Pharma Formulation. Total products and its capacity will be 1350 MT/Month.

As per the EIA Notification-2006, proposed activities fall under the Activity 5(f) Synthetic Organic Chemicals Industry, Category “B”. The present report is based on the Terms of Reference (TOR) No. SEIAA/GUJ/TOR/5(f)/585/2018, dated: 10/04/2019.

1.2. Brief project description

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total plot area</td>
<td>5000 m²</td>
</tr>
<tr>
<td>Project cost in lacs</td>
<td>465</td>
</tr>
<tr>
<td>Production capacity</td>
<td>1350 MTPM</td>
</tr>
<tr>
<td>Power Requirement</td>
<td>90 kW. Source: DGVCL.</td>
</tr>
<tr>
<td>Fuel Requirement</td>
<td>Diesel @ 5 L/Hr</td>
</tr>
<tr>
<td>Water Requirement</td>
<td>17 KLD (5 KLD: Domestic, 8.3 KLD: Gardening, 3.7 KLD: Industrial)</td>
</tr>
<tr>
<td>Flue gas emission control</td>
<td>Fuel emission due to burning of fuel (Diesel). And adequate stack height provided as APCM.</td>
</tr>
<tr>
<td>Process gas emission control</td>
<td>Process gas emission to Glass rector and Water scrubber provided as APCM.</td>
</tr>
<tr>
<td>Wastewater Generation</td>
<td>5.45 KLD (4 KLD: Domestic, 1.45 KLD: Industrial)</td>
</tr>
<tr>
<td>Hazardous waste management</td>
<td>Hazardous waste generated from the facility shall be disposed off in suitable manner as per the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016</td>
</tr>
<tr>
<td>Manpower requirement</td>
<td>60 persons</td>
</tr>
<tr>
<td>Annual Expenditure for CSR activities</td>
<td>2% of profit</td>
</tr>
<tr>
<td>Annual Expenditure for CER activities</td>
<td>930000 Rs @ 2% of Capital Investment as per OM dated 01/05/2018 by MoEF</td>
</tr>
</tbody>
</table>

1.3. Location of Project

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Location</td>
<td>Plot No. D-2-CH-102, GIDC Dahej-II, Taluka: Vagra</td>
</tr>
<tr>
<td>District</td>
<td>Bharuch</td>
</tr>
</tbody>
</table>
1.4. List of products

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Product No.</th>
<th>Name of Products</th>
<th>Production Capacity (Kg/Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Hormones</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>H1</td>
<td>Hydroxy Progesterone Caproate</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>H2</td>
<td>Nandrolone Deconoate</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>H3</td>
<td>Nandrolone Phenyl Propionate</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>H4</td>
<td>Mifepristone</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>H5</td>
<td>Medroxy Progesterone Acetate</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>H6</td>
<td>Progesterone</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>H7</td>
<td>Testosterone Acetate</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>H8</td>
<td>Testosterone Deconoate</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>H9</td>
<td>Estradiol Benzoate</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>H10</td>
<td>Estradiol Valerate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Steroids</strong></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>S1</td>
<td>Betamethasone Dipropionate</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>S2</td>
<td>Betamethasone Sodium Phosphate</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>S3</td>
<td>Beta Methasone Valerate</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>S4</td>
<td>Beclomethasone Dipropionate</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>S5</td>
<td>Deflazacort</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>S6</td>
<td>Clobetasone Butyrate</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>S7</td>
<td>Clobetasol Propionate</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>S8</td>
<td>Mometasone Furoate</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>S9</td>
<td>Methyl Prednisolone Acetate</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>S10</td>
<td>Prednisolone Acetate</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>S11</td>
<td>Hydrocortisone Acetate</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>S12</td>
<td>Dexamethasone Sodium Phosphate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Vitamin</strong></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>V1</td>
<td>Methyl Cobalamine</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>1350</strong></td>
<td></td>
</tr>
</tbody>
</table>

1.5. List of proposed plant machineries

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Equipment</th>
<th>Size/capacity</th>
<th>Qty (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Glass assembly</td>
<td>200 L</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Glass assembly</td>
<td>100 L</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Nutch Filter</td>
<td>10 Inches</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Vacuum Tray Dryer</td>
<td>6 tray</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Cooling Tower</td>
<td>20 TR</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Chiller</td>
<td>5 TR</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>D.G. Set</td>
<td>50 KVA</td>
<td>1</td>
</tr>
</tbody>
</table>
2. DESCRIPTION OF ENVIRONMENT

2.1. Baseline Environmental Study

To predict the impact of the project on the surrounding environment, the current baseline environmental status was studied by collecting the data and carrying out monitoring during **October to December, 2018** in the study area of 10 km radius from project site as per the TOR.

2.2. Air Environment

The ambient air quality monitoring was carried out at 8 AAQM locations, with a frequency of twice a week, to assess the existing sub-regional air quality status during the period of **October to December, 2018**.

Respirable Dust Sampler & Fine Particular Sampler along with the analytical methods, prescribed by CPCB was used for carrying out air quality monitoring. At all these sampling locations; PM$_{10}$, PM$_{2.5}$, SO$_2$, NO$_x$ and HCl were monitored on 24-hourly basis to enable the comparison with ambient air quality standards prescribed by the CPCB. The data on concentrations of various pollutants were processed for different statistical parameters like arithmetic mean, standard deviation, minimum and maximum concentration and various percentile values. The results are summarized below:

**Particulate Matter (PM$_{10}$)**

As shown in the Table PM$_{10}$ levels were ranging from 67.95 to 87.98 µg/m$^3$. The highest PM$_{10}$ level was found at Dahej and lowest PM$_{10}$ level were observed at Paniadara. PM$_{10}$ concentration was within the NAAQS level (i.e. 100 µg/m$^3$) at all locations.

**Particulate Matter (PM$_{2.5}$)**

As shown in the Table PM$_{2.5}$ levels were ranging from 39.28 to 59.13 µg/m$^3$. The highest PM$_{2.5}$ level was found at Dahej and lowest PM$_{2.5}$ level was observed at Paniadara. PM$_{2.5}$ concentration was found within the NAAQS level (i.e. 60 µg/m$^3$) at all the locations.

**Sulphur Dioxide (SO$_2$)**

As shown in the Table SO$_2$ levels were ranging from 11.47 to 16.91 µg/m$^3$. The highest SO$_2$ level was found at Dahej and lowest SO$_2$ level was observed at Luvara. The SO$_2$ level in all the monitoring locations is within permissible limit i.e. NAAQS level 80µg/m$^3$.

**Oxides of Nitrogen (NO$_x$)**

As shown in the Table NO$_x$ levels were found ranging from 11.29 to 17.98 µg/m$^3$. The highest NO$_x$ level was found at Dahej and lowest NO$_x$ level were observed at Paniadara. The NO$_x$ level in all monitoring locations was under permissible limit i.e. NAAQS level 80 µg/m$^3$.

**HCl**

HCl level were found ranging from <1.0 (BDL) to 1.8 µg/m$^3$. 
Volatile Organic Compounds (VOCs)
VOCs levels were found ranging from 0.1 to 1.1 ppm. The highest VOCs level was found at Project site.

Conclusion:
The quality of ambient air in the study area is compared with AAQM Standards prescribed by CPCB & found below the prescribed standards.

2.3. Water Environment
Water samples were collected from tap water from 7 village locations, GIDC water for project site, pond water from 7 village locations once during the study period and analyzed for physico-chemical parameters

Tap Water Quality:
- All the samples meet the desirable standards (pH ranges from 7.31 to 7.87).
- TDS in samples ranges from 218 mg/L (Vav) to 1018 mg/L (Luvara). All the samples meet the permissible limit of 2000 mg/L.
- Magnesium content in the water ranges from 11.99 mg/L (Ambetha) to 48.25 mg/L (Luvara). All the samples meet the permissible limit of 100 mg/L.
- Sulphates content in the water ranges from 11.41 mg/L (Ambetha) to 65.38 mg/L (Luvara). All the samples meet the permissible limit of 400 mg/L for drinking water.
- Fluorides content in the water ranges from less than <0.05 mg/L. All the samples meet the permissible limit of 1.5 mg/L for drinking water.
- Total alkalinity in the water samples ranges from 120 mg/L (Ambetha) to 235 mg/L (Paniadara). All the samples are within the permissible limit of drinking water (600 mg/L).
- Chlorides range from 20.12 mg/L (Vadadala) to 151.35 mg/L (Luvara), which are below permissible limits (1000 mg/L).
- Heavy metals like Copper, Nickel, Fluorides, Cadmium and Zinc are well below the limit in all samples.

Hence, it can be observed that tap water qualities in terms of various essential and desirable characteristics are found within the limits specified by IS 10500:2012. This water is utilized in villages for domestic activities.

2.4. Noise Environment

Working Time:
The noise levels varied in the study area during Working time from 48.3 dB(A) Leq to 65.1 dB(A) Leq. The working time noise level in the study area is within the noise Limits.

Non-Working Time:
The Non-Working time noise level in the study area is in the range of 48.1 dB (A) Leq to 63.6 dB (A) Leq. The night time noise was also within stipulated standards of CPCB.

2.5. Soil Quality
Soil samples were collected from 8 different locations and analysed to assess the soil quality prevailing in the study area.
Taxonomically soils are mostly sandy loam. pH ranges from 7.25 to 12.41. Organic matter ranges from 2.41 to 0.56 %. Total nitrogen ranges from 207.2 to 420.3 mg/kg. Available potassium ranges from 58.2 to 186 mg/kg.

Physical characteristics of soil have been delineated through specific parameters, viz. particle size distribution (grain size analysis), porosity, water holding capacity and permeability have been analysed.

2.6. Biological Environment

Baseline data for flora & fauna has been collected with its family. It was found that, none of the species of conservation importance exists in the study area and no endangered species found in the study area.

3. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1. Summary of impacts on Air Environment:

Long term impacts on the air quality are anticipated due to operational activities. The baseline ambient air quality status in the study area during winter season indicates that all the criteria pollutants (gaseous as well as particulates), viz., PM$_{10}$, PM$_{2.5}$, SO$_2$, NO$_x$, etc. are well within the prescribed National Ambient Air Quality Standards (NAAQS set by CPCB). There is flue gas emission like PM$_{10}$, PM$_{2.5}$, SO$_2$, NO and HCl from premises; adequate stack height will be provided as APCM. Process emission Glass reactor; Alkali scrubber will be provided as APCM. The emission will be compared with CPCB standards. As a result, stack emissions would be constituted of mainly Sulphur dioxide (SO$_2$), oxides of nitrogen (NO$_x$) and particulate matters. The emission will be compared with CPCB standard.

During the operation phase of the project, the impacts on air quality due to vehicular emissions will be very less. Considering the nature of activities, which the proposed project will result, less number of vehicular movements within the site and low threshold values, air pollution is not expected to be a major concern. It is for these reasons that the ambient air quality predictions using models have not been carried out for fugitive emissions from vehicles.

3.2. Summary of impacts on Water Environment

Impact: Total water requirement will be 17 KLD, out of which 5.0 KLD will be used for domestic use, 8.3 KLD for gardening and 3.7 KLD for industrial purposes. 4 KLD of sewage will be generated. 1.45 KLD of effluent will be generation.

Mitigation measures: Wastewater generated from washing, Cooling, Scrubbing and Equipment Cleaning is disposed by ETP with primary treatment facility to CETP. Wastewater generated from process is disposed by Common MEE. Wastewater generation from domestic activity is disposed-off by soak pit via septic tank.

3.3. Impacts on Noise quality & Mitigation measures
Impact: Operational phase impacts will mainly result from the operation of compressor and transfer pumps. Noise level near the compressor has been predicted to exceed 75 dB(A), therefore site workers shall be provided with personal protective equipments (PPEs). Also, it has been envisaged that noise impacts on local community due to project activities will be insignificant as noise levels of less than 35 dB(A) have been predicted at a distance of one kilometer the impacts will be insignificant. Noise may also be generated due to movement of heavy vehicles, medium vehicles and automobiles during operational phase. However, it has been envisaged that increase in noise impacts due to vehicular movement will be temporary and marginal to be considered for their impacts on nearby human settlement.

Mitigation measures:
- Periodic maintenance of machinery and vehicles should be undertaken to reduce the noise impact.
- Noise suppression measures such as enclosures, buffers and/or protective measures should be provided (wherever noise level is more than 75 dB (A)).
- Employees should be provided with Personal Protective Equipment like earplugs or earmuffs, wherever required.

3.4. Summary of Impacts on Land Environment

Impact:
Total area of the project site is 5000.00 m². 2305 m² area will be available as open area (including Road, parking etc). A total of 1663 m² area has been earmarked for the green area development. The green area development and tree plantation will help in enhancing the aesthetics of the plant.

3.5. Soil Quality

Impact: There are no major sources of land contamination from waste spillage. The used oil shall be collected in drums and shall be sold to the authorized recyclers identified by the GPCB/ CPCB.

3.6. Socio-Economic Environment

Impact:
The proposed project will have some positive impact on the industrial growth in the region. It is anticipated that during the operation phase, the proposed project will generate some indirect employment due to sales / transportation etc.

Mitigation Measures:
The overall project will have a long term benefit and hence no mitigation measure is required. However, as per the skills, preference to local people shall be given in employment.

3.7. Ecology and Biodiversity

Impact:
The project activity does not require tree cutting during land clearing also, the study zone (10 km) does not have any ecologically sensitive location and hence, the plant activities are not expected to have any impact on the ecology and biodiversity.

Mitigation Measures:
A total of 1663.0 m² area has been earmarked for greenbelt development for proposed project, which will help in development of biodiversity. The indigenous plants shall be planted along with ornamental trees/shrubs to provide an aesthetic environment within and around the plant. The maintenance of the greenbelt developed shall be ensured and survival rate of the plants shall also be studied every half yearly.

4. ENVIRONMENT MONITORING PROGRAMME

The unit will have dedicated Environment Management Cell to monitor, evaluate the environmental performance and to supervise the EMS. Budgetary provision for Environment & Safety Monitoring and Management system has been made in the project planning with Rs. 12.5 lakhs of capital cost and Rs. 11.7 Lakhs recurring cost per annum.

**Environmental Monitoring Plans (During Operational Phase)**

<table>
<thead>
<tr>
<th>Component</th>
<th>Parameters</th>
<th>Location</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Air Quality</td>
<td>PM₁₀, PM₂.₅, SO₂, NOₓ, HCl</td>
<td>Two within premises and one outside gate</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Point Source Emissions</td>
<td>Particulates, SO₂, NOₓ, HCl</td>
<td>Each stack</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Work area</td>
<td>HCl, VOC and as specified by factory inspector</td>
<td>4 locations within the premises</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Water quantity</td>
<td>Stream-wise consumption</td>
<td>Intake source and individual main usage area</td>
<td>Regularly</td>
</tr>
<tr>
<td>Water quality</td>
<td>As per IS 10500</td>
<td>Intake source</td>
<td>Twice in a year</td>
</tr>
<tr>
<td>Wastewater quantity</td>
<td>Stream-wise generation</td>
<td>Individual generation sources</td>
<td>Regularly</td>
</tr>
<tr>
<td>Wastewater quality</td>
<td>pH, TDS, COD</td>
<td>Treated and untreated</td>
<td>Regularly</td>
</tr>
<tr>
<td></td>
<td>General parameters</td>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td>Noise level</td>
<td>Noise levels</td>
<td>At prominent places in the premises</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Occupational Health</td>
<td>All relevant parameters</td>
<td>All workers</td>
<td>Regularly check ups</td>
</tr>
<tr>
<td>Hazardous waste</td>
<td>General parameters</td>
<td>ETP sludge</td>
<td>Annually</td>
</tr>
</tbody>
</table>

5. ADDITIONAL STUDIES

5.1. Risk Assessment

Risk analysis and study have been carried out for identification of accident hazards, selection of credible scenarios, Risk Mitigation measures etc. All the hazardous chemicals will be stored and handled as per MSDS guidelines. The detail study is prescribed in Chapter-7.
6. PROJECT BENEFITS
The Project will create direct & indirect employment opportunities within the surrounding region. The Unit will use good faith efforts to employ local people from the nearby villages depending upon the availability of skilled & un-skilled manpower surrounding the project site. In operation phase, the proposed project would require significant workforce of non-technical and technical persons. Migration of highly educated and skilled experience will result in increase of literacy in the surrounding villages.

7. ENVIRONMENTAL MANAGEMENT PLAN
EMP includes the protection & mitigation measures to be implemented to reduce the adverse impact on the environment. Management plan of impacts identified is detailed below:

7.1. Management of Air Environment
To control fugitive emissions following measures are recommended:
• Controlled emissions and provision of PPE for the workers.
• Adequate measures for the minimization/prevention of the fugitive emission.
• Regular maintenance of valves, pumps and other equipment to prevent leakage.
• Entire process is carried out in the closed reactors with proper maintenance of pressure and temperature.
• Regular periodic monitoring of work area to check the fugitive emission.
• Adequate stack heights as per the CPCB estimation will be provides at all locations to reduce GLCs of pollutants.
• Greenbelt development is implemented to mitigate impacts from fugitive emissions. About 33% of the total area of site area will be developed for greenbelt.
• The air quality surveillance program will be undertaken for proposed and the program may be strengthened properly keeping in view the combined maximum impacts from post-project activities particularly in critical downwind directions.
• Air Pollution Control System will be installed in the plant.

7.2. Management of Noise Environment
To minimize the noise pollution the unit proposes the following noise control measures:
• Manufacturers / suppliers of major noise generating machines / equipments like air compressors, feeder pumps, etc. will be instructed to make required design modifications wherever possible before supply and installation to mitigate the noise generation and to comply with the national / international regulatory norms with respect to noise generation.
• Periodic maintenance of machinery and vehicles will be undertaken to reduce the noise impact.
• Noise suppression measures such as enclosures, buffers and / or protective measures will be provided (wherever noise level is more than 75 dB (A)).
• Employees will be provided with Personal Protective Equipments like earplugs or earmuffs, wherever required.
• Extensive oiling, lubrication and preventive maintenance will be carried out or
the machineries and equipments to reduce noise generation.

- The green belt area will be developed within industrial premises and around the periphery to prevent the noise pollution in surrounding area.
- Noise monitoring will be carried out to check the efficacy of maintenance schedules undertaken to reduce noise levels and noise protection measures.
- Good quality digital sound level meter will be in place to monitor noise level.

### 7.3. Management of Water Environment

The source of water is GIDC water supply. Total water requirement will be 17.0 KLD, out of which 5.0 KLD will be used for domestic use, 8.3 KLD for gardening & 3.7 KLD for industrial purposes. About 4.0 KLD of sewage will be generated, which will be disposed through septic tank & soak pit. Effluent wastewater generation 1.45 KLD. Wastewater to be generated from equipment cleaning, Cooling, Scrubbing and washing activities will be collected in collection cum neutralization tank. After chemical treatment effluent will be filtered in Nutch/Disc Filter. Filtrate water will be collected in treated water tank and then sent to overhead tank for discharge to CETP.

The mitigation measures for minimizing the impacts on water environment in general includes following:

- Optimum utilization of water resource.
- Minimize waste generation.
- Reuse/recycle and disposal.
- Use of high-pressure hoses for cleaning the floor to reduce the amount of wastewater generated.
- Reducing the actual process water consumption by way of improvement in operation of processing units.
- Unit proposed to recharge ground water during the monsoon to balance the water table to make a recharge sump in own premises.
- Advance controls and instrumentation for operations and control and leak detection techniques shall be implemented for this project.
- The domestic sewage will be disposed in soak-pits and septic tanks.

### 7.4. Management of Land Environment

The management plan for this component of environment lays emphasis on development of greenbelt comprising of appropriately selected species of shrubs and trees. It is recommended that plantation be made on sites, road sides and on barren land. Such a development of greenbelt and plantation of shrubs and trees will not only significantly reduce or mitigate adverse impacts due to aerosols and gaseous pollutants, noise, odour and nuisance etc, but also, serve as shelter belts for avifauna, stabilize and improve soil permeability and aesthetic environment.

### 7.5. Management of Solid Waste

The Hazardous waste like Discarded Containers, Domestic, Bags with liner and Ash will be handled as per Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016. Discarded Containers and Bags will be sold to registered recycler under Rule-9.

The Waste Management plan includes:

- Waste Inventory
• Classification of waste
• Packaging, Storing and Transporting Wastes to Disposal site
• Data Management and Reporting - Personnel Training
• Waste Minimization
Annexure-IV
Plot Allotment Letter
Office Order

Sub: Transfer of Industrial Plot No. D-2-CH-102 at Dahej-II Industrial Estate

A Industrial Plot No. D-2-CH-102 admeasuring about 5000.00 Sq.mt in Dahej-II estate was allotted to PRADEEP NANAKCHAND NARANG. The Lease Deed / Conveyance Deed / Licence Agreement was executed on 03/03/2016. The Lessee had applied to the Corporation for transfer of the said Industrial Plot in favour of Sanjivani Pharma Partnership directors / shareholders (1) Pintubhai Patel : 35.00 % (2) Rajendrakumar Patel : 30.00 % (3) Sandeep Patel : 35.00 %. Certain terms and conditions have been stipulated by the Regional Manager, Ankleshwar as per Provisional Transfer Order no. GIDC/RM/ANK/TRF/PTO/DAH5/66 dtd. 09/10/2018

Lessee has paid all dues of the Corporation up to Date. Lessee has also paid the Corporation's share in Transfer fee amounting to Rs. 2973600.00 calculated @30.00% with GST, NU Penalty amounting to Rs. 1189440.00 calculated @12.00% with GST and additional transfer fees amounting to Rs. (Nil) @ Rs. 1680.00 per Sq.mt. The Deed of Assignment has therefore been executed on 28/11/2018 between the Corporations, transferor & transferee. The plot now therefore stands transferred in the name of Sanjivani Pharma Partnership Sandeep Patel, Pintubhai Patel, Rajendrakumar Patel with effect from 28/11/2018 for establishment of Chemical industry. This transfer permission shall not be considered as valid under the building bye-laws of the Corporation, if any unauthorized construction is carried out by Transferee. If any unauthorized construction is carried out, the same shall not be considered that Corporation has regularized the same. Transferee shall have to remove/demolish non violative construction or shall have to get approved from the Competent Authority. The water requirement as per transfer application is KLD per year only.

Thanking you,

Yours faithfully,

Regional Manager,
G.I.D.C., Ankleshwar.
To,

1. Sanjivani Pharma  
   30/Abhishek Avenue  
   Zadeshwar - Swaminarayan temple Road  
   Zadeshwer Bharuch-392001  
   Along with a copy of Deed of Assignment

2. PRADEEP NANAKCHAND NARANG  
   h-no-47  
   nanadwani Nagar  
   sonepat  
   hariyana-131001

Copy To:

1. The Executive Engineer, GIDC, Ankleshwar.  
2. Accounts Officer, GIDC, Ankleshwar.  
3. Deputy Executive Engineer, GIDC, Ankleshwar.  
4. EDP, GIDC, Ankleshwar.
DEED OF ASSIGNMENT

FIRST PARTY: Pradeep Manekchand Naray

SECOND PARTY: Sagarveer Phani

Whereas the party has agreed to transfer his interest of possession and put in possession situated in Doha Industrial Estate of the GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION, within the village limit of Taluka Vagad Dist. Bhar under the following terms and conditions.

1. That as per Agreement between the first party and GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION entered into on ____________ and the first party is occupying possession of the plot/shed No. D-2-CH-106 situated in the Doha estate of GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION ... As a hirer/licensee/lessee for the period of ____________ years.

2. That as per the terms and conditions of the said Agreement executed on ____________ for plot/shed No. D-2-CH-106 made between the first party and the GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION, the first party has paid all the installments upto ____________

3. As per the terms and conditions of the said Agreement executed on ____________ between the first party and Gujarat Industrial Development Corporation, the First Party has obtained necessary permission from GIDC, vide letter No. ____________ dated ____________ and that by virtue of the said permission given by Gujarat Industrial Development Corporation, that the second party has become the permitted transferee in respect of the said property in the form of shed/plot No. ____________ of Gujarat Industrial Development Corporation and as such the second party hereby agree to abide by all terms and conditions of the Agreement and Terms of letter.

Possession of the property within 10 days with all document thereon to the second party shall be liable for all the cost and damages. The second party which might be suffered by the first party in this regards.
4. Then after becoming the permitted transferee of the said Corporation, the second party is bound by the said Agreement dated 2-3-2011 to the said Corporation and the terms and conditions of letter No. 

5. That after accepting the second party as permitted transferee by the said Corporation, the second party is / are liable and responsible for all remaining installments, service charges, N.A. Assessment, Lease Rent, taxes and all other further taxes if any which may become due and payable to the Corporation in future as per the terms.

6. The party of the Second party / the Lessee that have to fill up at least 80% post by that persons in their industrial unit and for Manager and Supervisor cadres at least 50% posts are to be filled up by local persons the expression "Local Person" shall mean and person domiciled in Gujarat State for minimum 15 Years shall be considered as local person.

In witness whereof the parties of this transfer deed have subscribed their hands and seal on.

SIGNED, SEALED & DELIVERED

BY THE FIRST PARTY

IN THE PRESENCE OF

1. 
2. 

SIGNED, SEALED & DELIVERED

BY THE SECOND PARTY

IN THE PRESENCE OF

1. Manoj H. Doshi
2. 

SANJIVANI PHARMA
PARTNER

SANJIVANI PHARMA
PARTNER

SANJIVANI PHARMA
PARTNER
SUPPLEMENTARY AGREEMENT

THIS AGREEMENT made at Ahmedabad on __________ between

The Gujarat Industrial Development Corporation, having its Head Office at Udyogbhavan, Gandhinagar, (hereinafter referred to as “the corporation” which expression shall, unless the context does not so admit, include its successors, and assignees) of the First Part

and Shri/M/s. __________ (hereinafter referred to as the ‘HIRER’ which expression shall, unless the context does not so admit, include their successors and assigns) of the Second Part and

Shri __________ (hereinafter referred to as “the licensee” which expression shall, unless the context does not so admit include his/her successors and assigns) of the Third Part.

WHEREAS in the __________ Industrial Estate of the Corporation within the Village limits of __________ Taluka __________ of Abhapur and Dist. __________ Bearing Plot No. __________ containing __________ sq. mtrs. having been allotted to the licensee has executed the Lease Deed on __________ (hereinafter referred to as “the License Agreement”) and the occupied the said plot on the terms and conditions specified in the said License Agreement.

AND WHEREAS with the previous consent of the Corporation as conveyed to the licensee under letter No. __________ dt. __________ The Licensee has transferred his interest under and benefits of the said License Agreement to the transferee by a DEED OF ASSIGNMENT dt. __________ made between the transferee and licensee.

AND WHEREAS the Corporation has given the aforesaid consent on condition that the Transferee shall execute an Agreement with the Corporation accepting the terms and conditions of the said License Agreement.

Now, therefore, it is hereby agreed by and between the parties hereto as under:
(1) The Transferee, as successors of the Licensee accepted the terms and conditions of the said License Agreement and undertakes to fulfill the said terms and conditions.

(2) With effect from __________ the rights and liabilities of the Licensee under the said License Agreement shall be rights and liabilities of the transferee and the said License Agreement shall be read and constructed as if for words M/s./Shri ___________ were substituted.

(3) The Transferee shall pay to the Corporation the outstanding capital value of Rs. __________ with interest at the rate of 18% per annum. The payment will be made by _______ quarterly/half/yearly installments each installment being of Rs. __________ plus interest. The first installment will become due on __________ and subsequent installment will be paid at the interval of three/six months thereafter.

(4) And whereas the transferee shall consume water for his unit of following rates from year to year:

<table>
<thead>
<tr>
<th>With effect from Date</th>
<th>Year</th>
<th>Consumption per day (Liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

(5) The Transferee shall not change the product latter on without permission of the Corporation

(6) The Transferee shall have to keep reserved the fund/land for E.T.P.

(7) The water supply will be disconnected if party fails to comply any of the above conditions.

For the water requirement of than 50,000 Lit/day, even if fails to consume water to the extent mentioned above, he would pay the water charges for the quantity equal to 70% of the above agreed quantity irrespective of consumption. The water charges would be payable at the rates as may be fixed by the Corporation from time to time and on his failure to pay the minimum charges, the Agreement would be terminated.

IN WITNESS WHEREOF Shri

The Officer, authorized by the Corporation has set his hand and seal on behalf of the Corporation and the Transferee and the Licensee have set their respective hands and seal hereto the day and year first hereinabove written.
 Signed, Sealed and Delivered:

By Shri Premkumar Advani
Gujarat Industrial Development Corporation.
In the presence of :-

(1) 

(2) 

Signed, Sealed and Delivered:

By the First Party

In the presence of :

(1) 

(2) 

Signed, Sealed & Delivered:

By the Second Party: SANJIVANI PHARMA SANJIVANI PHARMA

In the presence of :

(1) Manoj Doshi

(2) 

SANJIVANI PHARMA

PARTNER

PARTNER

PARTNER
Annexure-V
GIDC Water Supply Letter
GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION

Receipt

Received from M/s./Shri. SHRI PRADEEP NAKKORDHARAN

Address: PLOT NO.- D-2/CH/102

Rs. 920,400.00

Invoice No.: 75M1819000021

GSTRIN:

In Words: Nine Lakh Twenty Thousand Four Hundred Only.

By D.D./Cheque No.: RTGS Dated 30-10-18

Drawn on HDFC BANK

Deposited By: CENTRAL BANK OF INDIA

AGAINT PAYMENT AS UNDER

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<th>No.</th>
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<td>1</td>
<td>RECEIVED AMOUNT FOR CONTRIBUTION CHARGES FOR WS DAHEJ</td>
<td>WATER CONTRIBUTION</td>
<td>7,80,000.00</td>
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* Subject to Realisation of Cheque or D.D.

Cashier/Div. Accountant/
Executive Engineer
GIDC BHARUCH
**GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION**

**TAX-INVOICE**

**GIDC Details**

Region: 75MG-DIVISION
Address: 1st floor, Narmada Commercial Complex, Panch Batti, Bharuch-392001
GIDC GSTIN: 24AABC98033D7Z2

**Invoice Details**

Nature of Invoice: Original for Recipient/ Duplicate for Supplier
Invoice Number: 75MGG190000021
Invoice Date : 30-10-2018

**Bill To**

Name: Shri Pradeep Nanakchand Narang
Address: Plot No.: D-2/CH/162

**Allottee Details**

Name: Shri Pradeep Nanakchand Narang
Address: Plot No.: D-2/CH/162

**Invoice Details**

Nature of Transaction: Intra-State Supply
Customer Type: Unregistered
Nature of Supply: Services
Place of Supply: Gujarat

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<th>SR Code</th>
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<th>SGST Rate</th>
<th>CGST Rate</th>
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Invoice Total: 700000

Whether Tax is payable on reverse charges: No

Cashier/Div. Accountant/
Executive Engineer,
GIDC, 75MG-DIVISION
Annexure-VI

Undertaking of Project Proponent
I, Mr. Sandip Patel, Director of M/s. Sanjivani Pharma to be located at Plot no.: D-2-CH-102, GIDC Dahej-II, Taluka: Vagra, District: Bharuch, Gujarat do hereby undertake as follows:

We had applied for the environment clearance for the proposed Project to the State Level Expert Appraisal Committee - Gujarat. Hereby I undertake this,

✓ We will not dig any bore well within our premises
✓ We will provide separate electric meter for the ETP and will maintain a logbook for operation of incinerator.
✓ Our EIA report is prepared by M/s. Enviro Fluid Consultants, & we are taking the ownership of the EIA report as per the MoEF&CC OM dated 5-10-2011.

What is stated above here is true to the best of my knowledge and the same I believed to be true.

Date:

Time:

Sign & Stamp

SANJIVANI PHARMA

PARTNER
IN THE HIGH COURT OF GUJARAT AT AHMEDABAD

SPECIAL CIVIL APPLICATION NO. 11208 of 2017

==========================================================================
SEEMA DHIENDRAKUMAR OZA....Petitioner(s)
Versus
UNION OF INDIA....Respondent(s)
==========================================================================

Appearance:
ANSHUL N SHAH, ADVOCATE for the Petitioner(s) No. 1
MR NILESH P SHAH, ADVOCATE for the Petitioner(s) No. 1

==========================================================================

CORAM:
HONOURABLE THE CHIEF JUSTICE MR. R.SUBHASH REDDY
and
HONOURABLE MR. JUSTICE VIPUL M. PANCHOLI

Date : 14/06/2017

ORAL ORDER
(PER : HONOURABLE THE CHIEF JUSTICE MR. R.SUBHASH REDDY)

Issue notice to the respondent returnable on 3.7.2017. Implementation of the impugned Notification dated 3.3.2016 shall stand deferred till further orders. To be heard with Special Civil Application No. 5312 of 2016. Direct service permitted, to be served through Registered Post A.D. at the cost of the petitioner.

(R. SUBHASH REDDY, CJ)
Srilatha
Annexure-VIII

Undertaking of Consultant
UNDEARTAKING

I, Seema Oza, Partner of Enviro Fluid Consultants, located at Office no. 205, Ganesh Glory, Nr. BSNL office, S. G. Highway, Jagatpur, Ahmedabad-382481 undertake that;

✓ We have carried out EIA/EMP study for M/s. Sanjivani Pharma and prescribed TORs have been complied with and the data submitted are factually correct as per the MoEF & CC OM dated 04/08/2009.

What is stated above here is true to the best of my knowledge and the same I believed to be true.

Date: 29/05/2019
Place: Ahmedabad

Seema Oza
Annexure-IX
Membership certificate from BEIL, CETP
GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
(A GOVTL OF GUJARAT UNDERTAKING)
Office of the Dy. Executive Engineer (DREG)
1st FLOOR, NARMADA COMEX COMPLEX,
STATION ROAD, PANCHPATI,
BHARUCH -392201
Ph: 242432/242434  Fax: (02672) 241302
Mail ID: giddwhr@mail.com

To,
M/s. Sanjivani Pharma,
Plot no D/6/CH/102 at Dahej II
GIDC Estate Dahej

Sub: Assurance letter to discharge of Total 01.00 kpd of Treated Industrial Effluent by M/s. Sanjivani Pharma Plot no. D/6/CH/102 at Dahej II

Ref: Your letter no. NIL dated 17/12/2018

Dear Sir,

Vide letter under reference, you have demanded an assurance letter to discharge of total quantity of 01.00 kpd of Treated Industrial Effluent.

In this regard, this office assures that total 01.00 kpd of Treated Industrial Effluent can be discharged by M/s. Sanjivani Pharma, Plot no D/6/CH/102 subject to the following conditions:

1. Availability of infrastructure.
2. Availability of spare quantity in design capacity of sewer line, if the effluent quantity exceeds the entitled quantity, you will have to lay the pipeline up to collection well as directed by engineer in-charge.
3. You shall have to become a member of Dahej CETP after commissioning of the same.
4. You will have to pay the contribution and other applicable charge for the said quantity of Treated Industrial Effluent.
5. You will have to make your own arrangement to discharge Treated Industrial Effluent in to GIDC’s sewer line or in to collection wells directed by GIDC.
6. The Treated Industrial Effluent discharge connection would only be released after the approvals from the competent authority.
7. The Drainage connection shall only be released after the submission of CPCB consent as per approved quantity.

This is for your information please.

Dy. Executive Engineer (DREG),
GIDC Bharuch.

A-81
To,
Sanjivani Pharma
Plot No.D2/CH/102,
GIDC Estate,
Tal: Vagra,
Dahej.


Dear Sir,

We have received your letter dtd.11-01-2019. We would like to inform you that we have no objection in granting you our membership. We shall be accepting your hazardous landfill Waste Qty.8.5 MT /Year at Bharuch Enviro Infrastructure Ltd., Dahej, Site Plot No. D-43, GIDC, Dahej, hazardous Incinerable / Co-Process waste Qty.10 MT/Year at Bharuch Enviro Infrastructure Ltd., Ankleshwar, Site Plot No. 9701-16, GIDC, Ankleshwar and MEE Waste Qty.530 MT /Year at Bharuch Enviro Infrastructure Ltd., Dahej, Site Plot No. D-43, GIDC, Dahej.

The Hazardous waste acceptance is subject to verification of quality and it should be as per GPCB authorization.

Thanking you,

Yours faithfully,
For, BHARUCH ENVIRO INFRASTRUCTURE LTD.

[Signature]

AUTHORISED SIGNATORY
Annexure-X
MSDS
2-FUROYL CHLORIDE
CAS No 527-69-5

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
   Product name: 2-Furoyl Chloride
   CAS-No.: 527-69-5

1.2 Relevant identified uses of the substance or mixture and uses advised against
   Identified uses: Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
   Company: Central Drug House (P) Ltd
   7/28 Varadaan House
   New Delhi -110002
   INDIA
   Telephone: +91 11 49404040
   Email: care@cdhfinechemical.com

1.4 Emergency telephone number
   Emergency Phone #: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
   Classification according to Regulation (EC) No 1272/2008
   Skin corrosion (Category 1B), H314
   For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements
   Labelling according Regulation (EC) No 1272/2008
   Pictogram
   Signal word: Danger
   Hazard statement(s): Causes severe skin burns and eye damage.
   Precautionary statement(s): Wear protective gloves/ protective clothing/ eye protection/ face protection.
   P280
   P305 + P351 + P338
   IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.
Lachrymator.

SECTION 3: Composition/information on ingredients

3.1 Substances
Synonyms: Furan-2-carbonyl chloride

Formula: C₄H₅ClO₂
Molecular weight: 130.53 g/mol
CAS-No.: 527-69-5
EC-No.: 208-422-9

Hazardous ingredients according to Regulation (EC) No 1272/2008

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<tr>
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<th>Classification</th>
<th>Concentration</th>
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<tr>
<td>2-Furoyl chloride</td>
<td>Skin Corr. 1B; H314</td>
<td>&lt;= 100 %</td>
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<tr>
<td>CAS-No.</td>
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<tr>
<td>EC-No.</td>
<td>208-422-9</td>
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</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas
5.3  **Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

5.4  **Further information**
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1  **Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2  **Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3  **Methods and materials for containment and cleaning up**
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal.

6.4  **Reference to other sections**
For disposal see section 13.

SECTION 7: Handling and storage

7.1  **Precautions for safe handling**
Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2  **Conditions for safe storage, including any incompatibilities**
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Moisture sensitive.
Storage class (TRGS 510): Combustible, corrosive hazardous materials

7.3  **Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1  **Control parameters**

8.2  **Exposure controls**

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

**Eye/face protection**
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
**Body Protection**
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineer protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

**SECTION 9: Physical and chemical properties**

**9.1 Information on basic physical and chemical properties**

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<td>g)</td>
<td>Flash point</td>
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<td>Evaporation rate</td>
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<td>i)</td>
<td>Flammability (solid, gas)</td>
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<td>j)</td>
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<td>k)</td>
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<td>s)</td>
<td>Explosive properties</td>
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<tr>
<td>t)</td>
<td>Oxidizing properties</td>
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<td></td>
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</tr>
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</table>

**9.2 Other safety information**
No data available
SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents, Strong bases, Alcohols

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available (2-Furoyl chloride)

Skin corrosion/irritation
No data available (2-Furoyl chloride)

Serious eye damage/eye irritation
No data available (2-Furoyl chloride)

Respiratory or skin sensitisation
No data available (2-Furoyl chloride)

Germ cell mutagenicity
No data available (2-Furoyl chloride)

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available (2-Furoyl chloride)

Specific target organ toxicity - single exposure
No data available (2-Furoyl chloride)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available (2-Furoyl chloride)

Additional Information
RTECS: Not available
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea (2-Furoyl chloride)
SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available (2-Furoyl chloride)

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 3265
IMDG: 3265
IATA: 3265

14.2 UN proper shipping name
ADR/RID: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (2-Furoyl chloride)
IMDG: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (2-Furoyl chloride)
IATA: Corrosive liquid, acidic, organic, n.o.s. (2-Furoyl chloride)

14.3 Transport hazard class(es)
ADR/RID: 8
IMDG: 8
IATA: 8

14.4 Packaging group
ADR/RID: II
IMDG: II
IATA: II

14.5 Environmental hazards
ADR/RID: no
IMDG Marine pollutant: no
IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment
For this product a chemical safety assessment was not carried out
SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H314 Causes severe skin burns and eye damage.

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
MSDS for (3-Phenylpropionyl chloride)

Section 1 - Chemical Product and Company Identification

MSDS Name 3-Phenylpropionyl chloride
Catalog Numbers 393594
Synonyms Hydrocinnamoyl chloride
Company Identification J&K SCIENTIFIC LTD.
18AEF, Building-D, Majestic Garden 6 Bei-Si-Huan-Zhong Road Beijing China 100029
For information, call North America: (435)-753-1901
China: (86 10) 82848833
For emergencies, call North America: (800) 424-9300

Section 2 - Composition, Information on Ingredients

<table>
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<tr>
<th>CAS#</th>
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Haz Symbols C
Risk Phrases 20 34

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Harmful by inhalation. Causes burns.

POTENTIAL HEALTH EFFECTS

Eye Causes severe eye burns.
Skin May be harmful if absorbed through skin. Causes skin burns.
Ingestion Harmful if swallowed. Causes burns.
Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Chronic
**MSDS for (3-Phenylpropionyl chloride)**

**** MATERIAL SAFETY DATA SHEET ****

Section 4 - First aid Measures

**Eyes**
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

**Skin**
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

**Ingestion**
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

**Inhalation**
If breathed in, move person into fresh air. If not breathing give artificial respiration. Consult a physician.

Notes to Physician

Section 5 - Fire Fighting Measures

**General Information**
Wear self contained breathing apparatus for fire fighting if necessary.

**Extinguishing Media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Section 6 - Accidental Release Measures

**General Information**
Use proper personal protective equipment as indicated in section 8.

**Spills/Leaks**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

Section 7 - Handling and Storage

**Handling**
Avoid inhalation of vapour or mist. Normal measures for preventive fire protection.

**Storage**
Store in a cool, dry place. Store in a tightly closed container. Moisture sensitive.

Section 8 - Exposure Controls, Personal Protection

**Engineering Controls**
Not available.

PERSONAL PROTECTIVE EQUIPMENT
MSDS for (3-Phenylpropionyl chloride)

Eyes
- Chemical safety goggles.

Skin
- Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Clothing
- Wear appropriate protective clothing to prevent skin exposure.

Respirators
- Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Section 9 - Physical and Chemical Properties

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<tr>
<td>Flash Point</td>
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</table>

Section 10 - Stability and Reactivity

| Chemical Stability            | Stable under recommended storage conditions. |
| Conditions to Avoid           | Incompatible materials. |
| Incompatibilities with Other Materials | Water, Alcohols, Oxidizing agents, Strong bases. |
| Hazardous Decomposition Products | Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas. |
| Hazardous Polymerization      | Will not occur. |
MSDS for (3-Phenylpropionyl chloride)

Section 11 - Toxicological Information

RTECS#: CAS#645-45-4:MW5652395.
LD50/LC50: Not available.
Carcinogenicity: 3-Phenylpropionyl chloride - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Section 12 - Ecological Information

Not available.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

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<th>IMO</th>
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<td>CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (3-Phenylpropionyl chloride)</td>
<td>CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (3-Phenylpropionyl chloride)</td>
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</table>

Section 15 - Regulatory Information

European/International Regulations

Hazard Symbols: C
Risk Phrases
R 20: Harmful by inhalation.
R 34: Causes burns.
Safety Phrases
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39: Wear suitable protective clothing, gloves and eye/face protection.
S 45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
MSDS for (3-Phenylpropionyl chloride)

**** MATERIAL SAFETY DATA SHEET ****

CAS#645-45-4:3.

Section 16 - Additional Information

MSDS Creation Date 2009-12-29
Revision #1 Date Original

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.
Material Safety Data Sheet
4-Dimethylaminopyridine

ACC# 60863

Section 1 - Chemical Product and Company Identification

MSDS Name: 4-Dimethylaminopyridine
Catalog Numbers: BP596-100
Synonyms: gamma-(Dimethylamino)pyridine; p-Dimethylaminopyridine; DMAP; 4-DMAP; N,N-Dimethyl-4-pyridinamine.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

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<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1122-58-3</td>
<td>4-Dimethylaminopyridine</td>
<td>99</td>
<td>214-353-5</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white crystals.

Danger! May be fatal if absorbed through the skin. Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed. Harmful if inhaled. May cause central nervous system effects.

Target Organs: Central nervous system, eyes, skin, mucous membranes.

Potential Health Effects
Eye: Causes eye burns.
Skin: May be fatal if absorbed through the skin. Causes skin burns. Substance is readily absorbed through the skin.
Ingestion: Harmful if swallowed. May cause severe and permanent damage to the digestive tract.
Inhalation: Harmful if inhaled. May cause severe irritation of the respiratory tract with possible burns. Symptoms of overexposure may include headache, nausea, disorientation, weakness, convulsions, and possibly, death.
Chronic: No information found.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is...
difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire-Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.

Flash Point: 110 deg C (230.00 deg F)

Autoignition Temperature: 420 deg C (788.00 deg F)

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 3; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Minimize dust generation and accumulation. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes. Use only with adequate ventilation.

Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Dimethylaminopyridine</td>
<td>none listed</td>
<td>none listed</td>
<td>none listed</td>
</tr>
</tbody>
</table>

OSHA Vacated PELs: 4-Dimethylaminopyridine: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Crystals

Appearance: white

Odor: characteristic odor
Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents, strong acids.
Hazardous Decomposition Products: Nitrogen oxides, carbon monoxide, carbon dioxide, cyanides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#: 
CAS# 1122-58-3: US9230000
LD50/LC50:
CAS# 1122-58-3: 
   Oral, rat: LD50 = 250 mg/kg;
   Skin, rabbit: LD50 = 13 mg/kg;

Oral, rat: LD50 = 95-140 mg/kg (Bayer); Dermal, rabbit: LD50 = 95 mg/kg (Bayer)
Carcinogenicity: 
CAS# 1122-58-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Mutagenicity: No data available.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information
US DOT

<table>
<thead>
<tr>
<th>Shipping Name:</th>
<th>TOXIC SOLIDS, CORROSIVE, ORGANIC, N.O.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class:</td>
<td>6.1</td>
</tr>
<tr>
<td>UN Number:</td>
<td>UN2928</td>
</tr>
<tr>
<td>Packing Group:</td>
<td>II</td>
</tr>
</tbody>
</table>

Canada TDG

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No information available.</td>
</tr>
</tbody>
</table>

Section 15 - Regulatory Information

US FEDERAL

TSCA

- CAS# 1122-58-3 is listed on the TSCA inventory.

Health & Safety Reporting List

- None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

- None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

- None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

- None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

- None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

- None of the chemicals in this product have a TPQ.

SARA Codes


Section 313

- No chemicals are reportable under Section 313.

Clean Air Act:

- This material does not contain any hazardous air pollutants.
- This material does not contain any Class 1 Ozone depletors.
- This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

- None of the chemicals in this product are listed as Hazardous Substances under the CWA.
- None of the chemicals in this product are listed as Priority Pollutants under the CWA.
- None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

- None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

- CAS# 1122-58-3 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

- T C

Risk Phrases:

- R 34 Causes burns.
- R 24/25 Toxic in contact with skin and if swallowed.

Safety Phrases:

- S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
- S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water.

WGK (Water Danger/Protection)
CAS# 1122-58-3: No information available.

Canada - DSL/NDSL
CAS# 1122-58-3 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D1A, E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

Section 16 - Additional Information

MSDS Creation Date: 6/02/1998
Revision #10 Date: 6/29/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
### Material Safety Data Sheet

**Section 1. Chemical Product and Company Identification**

<table>
<thead>
<tr>
<th>NFPA</th>
<th>HMIS</th>
<th>Personal Protective Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>See Section 15.</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chemical Name**
Hydroxyprogesterone Caproate

**Chemical Family**
Not available.

**Chemical Formula**
C27-H40-O4

**Synonym**
- 17-((1-Oxohexyl)oxy)pregn-4-ene-3,20-dione
- 17-alpha-Hexanoyloxypregn-4-ene-3,20-dione
- 17-alpha-Hydroxyprogesterone n-caproate
- 17-alpha-Hydroxyprogesterone caproate
- 17-alpha-Hydroxyprogesterone hexanoate
- 17-Hydroxypregn-4-ene-3,20-dione hexanoate

**CAS#**
630-56-8

**RTECS**
TU5085000

**TSCA**
TSCA 8(b) inventory: No products were found.

**Manufacturer**
SPECTRUM LABORATORY PRODUCTS INC.
14422 S. SAN PEDRO STREET
GARDENA, CA 90248

**Supplier**
SPECTRUM LABORATORY PRODUCTS INC.
14422 S. SAN PEDRO STREET
GARDENA, CA 90248

**Section 2. Composition and Information on Ingredients**

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>TWA (mg/m³)</th>
<th>STEL (mg/m³)</th>
<th>CEIL (mg/m³)</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Hydroxyprogesterone Caproate</td>
<td>630-56-8</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

**Exposure Limits**

**Toxicological Data on Ingredients**
Not applicable.

---

**Note:**
Consult the Material Safety Data Sheet for complete information. This summary provides a brief overview and may not cover all aspects of the material. For detailed and comprehensive information, refer to the full Material Safety Data Sheet.
### Section 3. Hazards Identification

**Potential Acute Health Effects**
Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

**Potential Chronic Health Effects**

- **CARCINOGENIC EFFECTS:** Not available.
- **MUTAGENIC EFFECTS:** Not available.
- **TERATOGENIC EFFECTS:** Not available.
- **DEVELOPMENTAL TOXICITY:** Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE].
  The substance may be toxic to the reproductive system.
  Repeated or prolonged exposure to the substance can produce target organs damage.

### Section 4. First Aid Measures

**Eye Contact**
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact**
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

**Serious Skin Contact**
Not available.

**Inhalation**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation**
Not available.

**Ingestion**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion**
Not available.

### Section 5. Fire and Explosion Data

**Flammability of the Product**
May be combustible at high temperature.

**Auto-Ignition Temperature**
Not available.

**Flash Points**
Not available.

**Flammable Limits**
Not available.

**Products of Combustion**
These products are carbon oxides (CO, CO2).

**Fire Hazards in Presence of Various Substances**
Slightly flammable to flammable in presence of heat.

**Explosion Hazards in Presence of Various Substances**
Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions**
- **SMALL FIRE:** Use DRY chemical powder.
- **LARGE FIRE:** Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards**
As with most organic solids, fire is possible at elevated temperatures

**Special Remarks on Explosion Hazards**
Not available.

---

Continued on Next Page
# Section 6. Accidental Release Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Spill</td>
<td>Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.</td>
</tr>
<tr>
<td>Large Spill</td>
<td>Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.</td>
</tr>
</tbody>
</table>

# Section 7. Handling and Storage

<table>
<thead>
<tr>
<th>Precautions</th>
<th>Storage</th>
</tr>
</thead>
</table>

# Section 8. Exposure Controls/Personal Protection

<table>
<thead>
<tr>
<th>Engineering Controls</th>
<th>Personal Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.</td>
<td>Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.</td>
</tr>
</tbody>
</table>

**Personal Protection in Case of a Large Spill**

- Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

<table>
<thead>
<tr>
<th>Exposure Limits</th>
<th>Not available.</th>
</tr>
</thead>
</table>

# Section 9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state and appearance</td>
<td>Solid.</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>428.6 g/mole</td>
</tr>
<tr>
<td>pH (1% soln/water)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Melting Point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Critical Temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Not available.</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not available.</td>
</tr>
<tr>
<td>Volatility</td>
<td>Not available.</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>Not available.</td>
</tr>
<tr>
<td>Ionicity (in Water)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Dispersion Properties</td>
<td>Not available.</td>
</tr>
<tr>
<td>Solubility</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

Continued on Next Page
## Section 10. Stability and Reactivity Data

<table>
<thead>
<tr>
<th>Stability</th>
<th>The product is stable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instability Temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>Conditions of Instability</td>
<td>Excess heat</td>
</tr>
<tr>
<td>Incompatibility with various substances</td>
<td>Not available.</td>
</tr>
<tr>
<td>Corrosivity</td>
<td>Not available.</td>
</tr>
<tr>
<td>Special Remarks on Reactivity</td>
<td>Sensitive to light.</td>
</tr>
<tr>
<td>Special Remarks on Corrosivity</td>
<td>Not available.</td>
</tr>
<tr>
<td>Polymerization</td>
<td>Will not occur.</td>
</tr>
</tbody>
</table>

## Section 11. Toxicological Information

<table>
<thead>
<tr>
<th>Routes of Entry</th>
<th>Inhalation. Ingestion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity to Animals</td>
<td>LD50: Not available.</td>
</tr>
<tr>
<td></td>
<td>LC50: Not available.</td>
</tr>
<tr>
<td>Chronic Effects on Humans</td>
<td>DEVELOPMENTAL TOXICITY: Classifed Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. May cause damage to the following organs: the reproductive system.</td>
</tr>
<tr>
<td>Other Toxic Effects on Humans</td>
<td>Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.</td>
</tr>
<tr>
<td>Special Remarks on Toxicity to Animals</td>
<td>Not available.</td>
</tr>
<tr>
<td>Special Remarks on Chronic Effects on Humans</td>
<td>May cause adverse reproductive effects. IARC did not assign an overall evaluation for carcinogenicity. IARC evidence of carcinogenicity in animals is I (Inadequate data).</td>
</tr>
<tr>
<td>Special Remarks on other Toxic Effects on Humans</td>
<td>Acute Potential Health Effects: Skin: May cause skin irritation. Eyes: Dust may cause eye irritation. Inhalation: Dust may cause respiratory tract irritation. Ingestion: May cause gastrointestinal tract irritation including diarrhea and nausea. May affect behavior/central nervous system, liver, and metabolism.</td>
</tr>
</tbody>
</table>

## Section 12. Ecological Information

<table>
<thead>
<tr>
<th>Ecotoxicity</th>
<th>Not available.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD5 and COD</td>
<td>Not available.</td>
</tr>
<tr>
<td>Products of Biodegradation</td>
<td>Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.</td>
</tr>
<tr>
<td>Toxicity of the Products of Biodegradation</td>
<td>The product itself and its products of degradation are not toxic.</td>
</tr>
<tr>
<td>Special Remarks on the Products of Biodegradation</td>
<td>Not available.</td>
</tr>
</tbody>
</table>
Section 13. Disposal Considerations

Waste Disposal
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14. Transport Information

DOT Classification
Not a DOT controlled material (United States).

Identification
Not applicable.

Special Provisions for Transport
Not applicable.

DOT (Pictograms)

Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations
No products were found.

California Proposition 65
Warnings
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: No products were found.
California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: No products were found.

Other Regulations
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications
| WHMIS (Canada) | Not controlled under WHMIS (Canada). |
| DSCL (EEC) | This product is not classified according to the EU regulations. |

HMIS (U.S.A.)

| Health Hazard | 1 |
| Fire Hazard | 1 |
| Reactivity | 0 |

WHMIS (Canada) (Pictograms)

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

Continued on Next Page
Hydroxyprogesterone Caproate

ADR (Europe) (Pictograms)

Protective Equipment

- Gloves.
- Lab coat.
- Dust respirator. Be sure to use an approved/certified respirator or equivalent.
- Safety glasses.

Section 16. Other Information

| MSDS Code | H0006 |
| References | Not available. |
| Other Special Considerations | Not available. |

Verified by Sonia Owen.  
Printed 9/12/2006.

CALL (310) 516-8000

Notice to Reader

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.
Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: THIOPHENE-2-CARBOXALDEHYDE
CAS number: 98-03-3
EINECS number: 202-629-8
Product code: OR5053
Synonyms: 2-FORMYLTHIOPHENE
THENALDEHYDE

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.3. Details of the supplier of the safety data sheet

Company name: Apollo Scientific Ltd
Units 3 & 4
Parkway
Denton
Manchester
M34 3SG
UK
Tel: 0161 337 9971
Fax: 0161 336 6932
Email: david.tideswell@apolloscientific.co.uk

1.4. Emergency telephone number

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CHIP: Xn: R22; Xi: R36/37/38
Classification under CLP: Acute Tox. 4: H302; STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrit. 2: H315

Most important adverse effects: Harmful if swallowed. Irritating to eyes, respiratory system and skin.

2.2. Label elements

Label elements under CLP:

Hazard statements: H302: Harmful if swallowed.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.

Signal words: Warning
SAFETY DATA SHEET
THIOPHENE-2-CARBOXALDEHYDE

Hazard pictograms: GHS07: Exclamation mark

Precautionary statements:
P271: Use only outdoors or in a well-ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection.

Label elements under CHIP:

Hazard symbols: Harmful.

Risk phrases: R22: Harmful if swallowed.
R36/37/38: Irritating to eyes, respiratory system and skin.

Safety phrases: S23: Do not breathe vapour.
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S28: After contact with skin, wash immediately with plenty of water.
S36/37/39: Wear suitable protective clothing, gloves and eye / face protection.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

2.3. Other hazards

Other hazards: Stench

PBT: This substance is not identified as a PBT substance.

Section 3: Composition/information on ingredients

3.1. Substances

Chemical identity: THIOPHENE-2-CARBOXALDEHYDE

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Remove all contaminated clothes and footwear immediately unless stuck to skin. Wash immediately with plenty of soap and water.

Eye contact: Bathe the eye with running water for 15 minutes. Consult a doctor.

Ingestion: Wash out mouth with water. Consult a doctor.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so. Consult a doctor.

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: There may be irritation and redness at the site of contact.

Eye contact: There may be irritation and redness. The eyes may water profusely.
SAFETY DATA SHEET
THIOPHENE-2-CARBOXALDEHYDE

4.3. Indication of any immediate medical attention and special treatment needed

Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media: Carbon dioxide, dry chemical powder, foam. Suitable extinguishing media for the surrounding fire should be used. Use water spray to cool containers.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: In combustion emits toxic fumes. Carbon oxides. Sulphur oxides (SOx).

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Refer to section 8 of SDS for personal protection details. If outside do not approach from downwind. If outside keep bystanders upwind and away from danger point. Mark out the contaminated area with signs and prevent access to unauthorised personnel. Turn leaking containers leak-side up to prevent the escape of liquid.

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method.

6.4. Reference to other sections

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Do not handle in a confined space. Avoid the formation or spread of mists in the air. Only use in fume hood.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in cool, well ventilated area. Keep container tightly closed. Air sensitive. Store under Argon. Recommended storage temp 2-8 °C.

Suitable packaging: Must only be kept in original packaging.
SAFETY DATA SHEET
THIOPHENE-2-CARBOXYALDEHYDE

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Workplace exposure limits: Not applicable.

8.2. Exposure controls

Engineering measures: Ensure there is sufficient ventilation of the area.
Respiratory protection: Self-contained breathing apparatus must be available in case of emergency.
Hand protection: Protective gloves.
Eye protection: Safety glasses. Ensure eye bath is to hand.
Skin protection: Protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Liquid
Colour: Pale yellow
Odour: STENCH
Solubility in water: Insoluble
Boiling point/range°C: 196-198
Flash point°C: 77
Relative density: 1.22 g/cm³

9.2. Other information

Other information: Not applicable.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

10.4. Conditions to avoid

Conditions to avoid: Heat. Air.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.
10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes of carbon dioxide / carbon monoxide. Sulfur oxides (SOx)

Section 11: Toxicological information

11.1. Information on toxicological effects

Toxicity values:

<table>
<thead>
<tr>
<th>Route</th>
<th>Species</th>
<th>Test</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORAL</td>
<td>MUS</td>
<td>LD50</td>
<td>565</td>
<td>mg/kg</td>
</tr>
<tr>
<td>ORAL</td>
<td>RAT</td>
<td>LD50</td>
<td>915</td>
<td>mg/kg</td>
</tr>
<tr>
<td>DERMAL</td>
<td>GPG</td>
<td>LD50</td>
<td>&gt;10</td>
<td>mL/kg</td>
</tr>
<tr>
<td>SKIN IRRITATION</td>
<td>RBT</td>
<td>mild</td>
<td>500</td>
<td>mg/24H</td>
</tr>
<tr>
<td>EYE IRRITATION</td>
<td>RBT</td>
<td>moderate</td>
<td>100</td>
<td>mg</td>
</tr>
</tbody>
</table>

Relevant hazards for substance:

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Route</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity (ac. tox. 4)</td>
<td>ING</td>
<td>Based on test data</td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>DRM</td>
<td>Based on test data</td>
</tr>
<tr>
<td>Serious eye damage/irritation</td>
<td>OPT</td>
<td>Based on test data</td>
</tr>
<tr>
<td>STOT-single exposure</td>
<td>INH</td>
<td>Based on test data</td>
</tr>
</tbody>
</table>

Symptoms / routes of exposure

- **Skin contact**: There may be irritation and redness at the site of contact.
- **Eye contact**: There may be irritation and redness. The eyes may water profusely.
- **Ingestion**: There may be soreness and redness of the mouth and throat.
- **Inhalation**: There may be irritation of the throat with a feeling of tightness in the chest. Exposure may cause coughing or wheezing.

Other information: RTECS: XM8135000

Section 12: Ecological information

12.1. Toxicity

Ecotoxicity values: Not applicable.

12.2. Persistence and degradability

Persistence and degradability: No data available.

12.3. Bioaccumulative potential

Bioaccumulative potential: No data available.

12.4. Mobility in soil

Mobility: No data available.

(cont...)
12.5. Results of PBT and vPvB assessment

PBT identification: This substance is not identified as a PBT substance.

12.6. Other adverse effects

Other adverse effects: No data available.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: MATERIAL SHOULD BE DISPOSED OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS

Disposal of packaging: Dispose of as special waste in compliance with local and national regulations. Observe all federal, state, and local environmental regulations.

NB: The user’s attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

Transport class: This product does not require a classification for transport.

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 453/2010.

c=TOXTREE

Phrases used in s.2 and 3:

H302: Harmful if swallowed.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.
R22: Harmful if swallowed.
R36/37/38: Irritating to eyes, respiratory system and skin.
Legal disclaimer: The material is intended for research purposes only and should be handled exclusively by those who have been fully trained in safety, laboratory and chemical handling procedures. The above information is believed to be correct to the best of our knowledge. The above information is believed to be correct to the best of our knowledge at the date of its publication, but should not be considered to be all inclusive. It should be used only as a guide for safe handling, storage, transportation and disposal. We cannot guarantee that the hazards detailed in this document are the only hazards that exist for this product. This is not a warranty and Apollo Scientific Ltd shall not be held liable for any damage resulting from handling or from contact with the above product.
SECTION 1: Identification

1.1. Identification

Product form: Substance
Substance name: Acetic Acid
CAS No: 64-19-7
Product code: LC10100
Formula: C2H4O2
Synonyms: Acetic acid, glacial / alcohol of vinegar / carboxylic acid C2 / ethanoic acid / ethylic acid / methanecarboxylic acid / pyroligneous acid / vinegar acid

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture: Chemical intermediate
Solvent
Food industry: additive
Laboratory chemical
Photographic chemical

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification
Flammable liquids Category 3  H226
Skin corrosion/irritation Category 1B  H314
Serious eye damage/eye irritation Category 1  H318
Hazardous to the aquatic environment - Acute Hazard Category 3  H402

Full text of H statements: see section 16

2.2. Label elements

GHS-US labeling
Hazard pictograms (GHS-US): 

Signal word (GHS-US): Danger

Hazard statements (GHS-US): H226 - Flammable liquid and vapor
H314 - Causes severe skin burns and eye damage
H402 - Harmful to aquatic life

Precautionary statements (GHS-US): P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical, ventilating, lighting equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe mist, vapors, spray
P264 - Wash exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective clothing, protective gloves, eye protection, face protection
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center or doctor/physician
P363 - Wash contaminated clothing before reuse
P370 + P378 - In case of fire: Use carbon dioxide (CO2), powder, alcohol-resistant foam to extinguish
P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards

Other hazards not contributing to the classification: None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type: Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid (Main constituent)</td>
<td>(CAS No) 64-19-7</td>
<td>100</td>
<td>Flam. Liq. 3, H226</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Skin Corr. 1B, H314</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eye Dam. 1, H318</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aquatic Acute 3, H402</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures


First-aid measures after inhalation: Remove the victim into fresh air. Immediately consult a doctor/medical service. Doctor: administration of corticoid spray.

First-aid measures after skin contact: Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to an ophthalmologist.

First-aid measures after eye contact: Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.


4.2. Most important symptoms and effects, both acute and delayed


Symptoms/injuries after skin contact: Caustic burns/corrosion of the skin.

Symptoms/injuries after eye contact: Corrosion of the eye tissue. Permanent eye damage.


4.3. Indication of any immediate medical attention and special treatment needed
Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media
Unsuitable extinguishing media: No unsuitable extinguishing media known.

5.2. Special hazards arising from the substance or mixture
Fire hazard: DIRECT FIRE HAZARD. Flammable. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard: DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. May be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity: On heating: release of corrosive/combustible gases/vapours (acetic acid vapours). Upon combustion: CO and CO2 are formed. Violent to explosive reaction with many compounds e.g.: with (strong) oxidizers: (increased) risk of fire/explosion. Reacts violently with (some) bases. Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

5.3. Advice for firefighters
Firefighting instructions: Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
6.1.1. For non-emergency personnel

6.1.2. For emergency responders
Protective equipment: Equip cleanup crew with proper protection.
Emergency procedures: Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions
Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up
For containment: Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute combustible/toxic gases/vapours with water spray. Take account of toxic/corrosive precipitation water. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
Methods for cleaning up: Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite or kieselguhr, powdered limestone. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections
No additional information available
SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling: Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Use corrosion-proof equipment. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosion-proof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation. Exhaust gas must be neutralised.

Hygiene measures: Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible materials: Direct sunlight. Heat sources. Sources of ignition.
Storage temperature: > 17 °C
Heat-ignition: KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.
Special rules on packaging: SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials: SUITABLE MATERIAL: aluminium. glass. MATERIAL TO AVOID: steel. iron. zinc. lead. copper. bronze.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Acetic Acid (64-19-7)</th>
<th>ACGIH</th>
<th>ACGIH TWA (ppm)</th>
<th>10 ppm (Acetic acid; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ACGIH</td>
<td>ACGIH STEL (ppm)</td>
<td>15 ppm (Acetic acid; USA; Short time value; TLV - Adopted Value)</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (mg/m³)</td>
<td>25 mg/m³</td>
<td></td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (ppm)</td>
<td>10 ppm</td>
<td></td>
</tr>
<tr>
<td>IDLH</td>
<td>US IDLH (ppm)</td>
<td>50 ppm</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (mg/m³)</td>
<td>25 mg/m³</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (ppm)</td>
<td>10 ppm</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (STEL) (mg/m³)</td>
<td>37 mg/m³</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (STEL) (ppm)</td>
<td>15 ppm</td>
<td></td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Material should be handled in a laboratory hood whenever possible.

Personal protective equipment: Protective goggles. Gloves. Protective clothing. Face shield. Gas mask with filter type E.
Materials for protective clothing:

- GIVE EXCELLENT RESISTANCE: butyl rubber, polyethylene/ethylenevinylalcohol, viton.
- GIVE GOOD RESISTANCE: neoprene.
- GIVE LESS RESISTANCE: natural rubber, PVC.
- GIVE POOR RESISTANCE: polyethylene, PVA.

Hand protection: Gloves.

Eye protection: Safety glasses.

Skin and body protection: Head/neck protection. Corrosion-proof clothing.


Thermal hazard protection: None necessary.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Colourless</td>
</tr>
<tr>
<td>Odor</td>
<td>Irritating/pungent odour Vinegar odour</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>1 ppm</td>
</tr>
<tr>
<td></td>
<td>2.5 mg/m³</td>
</tr>
<tr>
<td>pH</td>
<td>2.4 (6 %)</td>
</tr>
<tr>
<td>pH solution</td>
<td>6 %</td>
</tr>
<tr>
<td>Melting point</td>
<td>17 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>118 °C</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>322 °C</td>
</tr>
<tr>
<td>Critical pressure</td>
<td>45300 hPa</td>
</tr>
<tr>
<td>Flash point</td>
<td>40 °C</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>0.97</td>
</tr>
<tr>
<td>Relative evaporation rate (ether=1)</td>
<td>11</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>16 hPa (20 °C)</td>
</tr>
<tr>
<td>Vapor pressure at 50 °C</td>
<td>75 hPa (50 °C)</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>2.1</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.0</td>
</tr>
<tr>
<td>Relative density of saturated gas/air mixture</td>
<td>1.0</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>1049 kg/m³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>60.05 g/mol</td>
</tr>
<tr>
<td>Log Pow</td>
<td>-0.17 (Experimental value; 25 °C)</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>485 °C</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>1.168 cSt</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>0.0012 Pa.s (20 °C)</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>4 - 19 vol %</td>
</tr>
<tr>
<td></td>
<td>100 - 430 g/m³</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available.</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available.</td>
</tr>
</tbody>
</table>

9.2. Other information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific conductivity</td>
<td>600000 pS/m</td>
</tr>
<tr>
<td>VOC content</td>
<td>100 %</td>
</tr>
<tr>
<td>Other properties</td>
<td>Gas/vapour heavier than air at 20°C. Clear. Hygroscopic. Volatile. Substance has acid reaction.</td>
</tr>
</tbody>
</table>
SECTION 10: Stability and reactivity

10.1. Reactivity
On heating: release of corrosive/combustible gases/vapours (acetic acid vapours). Upon combustion: CO and CO2 are formed. Violent to explosive reaction with many compounds e.g.: with (strong) oxidizers: (increased) risk of fire/explosion. Reacts violently with (some) bases. Reacts with (some) metals: release of highly flammable gases/vapours (hydrogen).

10.2. Chemical stability
Hygroscopic.

10.3. Possibility of hazardous reactions
Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid
Extremely high or low temperatures. Incompatible materials.

10.5. Incompatible materials
May react violently with alkalis. May react with bases, copper, silver, mercury, magnesium, zinc and their alloys.

10.6. Hazardous decomposition products
Carbon dioxide. Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

<table>
<thead>
<tr>
<th>Likely routes of exposure</th>
<th>Inhalation; Skin and eye contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

Acetic Acid (64-19-7)

| LD50 oral rat | 3310 mg/kg body weight (Rat; Other; Read-across) |
| ATE US (oral) | 3310.000 mg/kg body weight |

<table>
<thead>
<tr>
<th>Skin corrosion/irritation</th>
<th>Causes severe skin burns and eye damage. pH: 2.4 (6 %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/irritation</td>
<td>Causes serious eye damage. pH: 2.4 (6 %)</td>
</tr>
<tr>
<td>Respiratory or skin sensitization</td>
<td>Not classified</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

(Based on available data, the classification criteria are not met)

<table>
<thead>
<tr>
<th>Reproductive toxicity</th>
<th>Not classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity (repeated exposure)</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aspiration hazard</th>
<th>Not classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms/injuries after skin contact</td>
<td>Caustic burns/corrosion of the skin.</td>
</tr>
<tr>
<td>Symptoms/injuries after eye contact</td>
<td>Corrosion of the eye tissue. Permanent eye damage.</td>
</tr>
</tbody>
</table>


SECTION 12: Ecological information

12.1. Toxicity

| Ecology - general | Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008. |
**Ecology - air**: Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of substances which may contribute to the greenhouse effect (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.5/I.

**Ecology - water**: Slightly harmful to fishes (LC50(96h) > 100 mg/l). Slightly harmful to invertebrates (Daphnia) (EC50 (48h) > 100 mg/l). Not harmful to algae (EC50 (72h) >1000 mg/l). pH shift. Inhibition of activated sludge.

### 12.2. Persistence and degradability

**Acetic Acid (64-19-7)**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical oxygen demand (BOD)</td>
<td>0.6 - 0.74 g O₂/g substance</td>
</tr>
<tr>
<td>Chemical oxygen demand (COD)</td>
<td>1.03 g O₂/g substance</td>
</tr>
<tr>
<td>ThOD</td>
<td>1.07 g O₂/g substance</td>
</tr>
</tbody>
</table>

### 12.3. Bioaccumulative potential

**Acetic Acid (64-19-7)**

| BCF fish 1 | 3.16 (BCF; Pisces) |
| Log Pow | -0.17 (Experimental value; 25 °C) |
| Bioaccumulative potential | Low potential for bioaccumulation (Log Kow < 4). |

### 12.4. Mobility in soil

**Acetic Acid (64-19-7)**

| Surface tension | 0.028 N/m (20 °C) |
| Log Koc | log Koc,0.06; QSAR |

**Ecology - soil**: May be harmful to plant growth, blooming and fruit formation.

### 12.5. Other adverse effects

No additional information available

### SECTION 13: Disposal considerations

#### 13.1. Waste treatment methods

**Waste disposal recommendations**: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Remove for physico-chemical/biological treatment. Remove to an authorized waste incinerator for solvents with energy recovery. Do not discharge into drains or the environment. May be discharged to wastewater treatment installation.

**Additional information**: LWCA (the Netherlands): KGA category 06. Hazardous waste according to Directive 2008/98/EC.

### SECTION 14: Transport information

**Department of Transportation (DOT)**

In accordance with DOT

**Transport document description**: UN2789 Acetic acid, glacial (with more than 80 percent acid, by mass), 8, II

**UN-No.(DOT)**: UN2789

**Proper Shipping Name (DOT)**: Acetic acid, glacial with more than 80 percent acid, by mass

**Transport hazard class(es) (DOT)**: 8 - Class 8 - Corrosive material 49 CFR 173.136

**Packing group (DOT)**: II - Medium Danger
Hazard labels (DOT) : 
- 8 - Corrosive
- 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202
DOT Packaging Bulk (49 CFR 173.xxx) : 243
DOT Special Provisions (49 CFR 172.102) : A3  - For combination packaging, if glass inner packaging (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packaging
- A6  - For combination packaging, if plastic inner packaging are used, they must be packed in tightly closed metal receptacles before packing in outer packaging
- A7  - Steel packaging must be corrosion-resistant or have protection against corrosion
- A10 - When aluminum or aluminum alloy construction materials are used, they must be resistant to corrosion
- B2  - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks are not authorized
- IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized
- TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively

DOT Packaging Exceptions (49 CFR 173.xxx) : 154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 30 L
DOT Vessel Stowage Location : A - The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel
Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

**Acetic Acid (64-19-7)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed on the United States TSCA (Toxic Substances Control Act) inventory</td>
<td></td>
</tr>
<tr>
<td>Not subject to reporing requirements of the United States SARA Section 313</td>
<td></td>
</tr>
<tr>
<td>RQ (Reportable quantity, section 304 of EPA's List of Lists)</td>
<td>5000 lb</td>
</tr>
</tbody>
</table>

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

**CANADA**

**Acetic Acid (64-19-7)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed on the Canadian DSL (Domestic Substances List)</td>
<td>Class B Division 3 - Combustible Liquid&lt;br&gt;Class E - Corrosive Material</td>
</tr>
</tbody>
</table>
EU-Regulations
No additional information available

National regulations

<table>
<thead>
<tr>
<th>Acetic Acid (64-19-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed on the Canadian IDL (Ingredient Disclosure List)</td>
</tr>
</tbody>
</table>

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 09/06/2016

Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H226</th>
<th>Flammable liquid and vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>H314</td>
<td>Causes severe skin burns and eye damage</td>
</tr>
<tr>
<td>H318</td>
<td>Causes serious eye damage</td>
</tr>
<tr>
<td>H402</td>
<td>Harmful to aquatic life</td>
</tr>
</tbody>
</table>

NFPA health hazard : 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard : 2 - Must be moderately heated or exposed to relatively high temperature before ignition can occur.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 2 Moderate Hazard - Materials which must be moderately heated or exposed to high ambient temperatures before ignition will occur. Includes liquids having a flash point at or above 100 F but below 200 F. (Classes II & IIIA)

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal protection : H

H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
SECTION 1: Identification

1.1. Identification

Product form: Substance
Substance name: Acetone
Chemical name: 2-Propanone
CAS No: 67-64-1
Product code: LC10420, LC10425
Formula: C3H6O
Synonyms: 2-propanone / beta-ketopropane / dimethyl formaldehyde / dimethyl ketone / dimethyiketal / DMK (=dimethyl ketone) / keto propane / methyl ketone / pyroacetic acid / pyroacetic ether / pyroacetic spirit

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture: Solvent, Cleaning product, Chemical raw material

1.3. Details of the supplier of the safety data sheet

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification
- Flammable liquids Category 2 H225
- Serious eye damage/eye irritation Category 2A H319
- Specific target organ toxicity (single exposure) Category 3 H336

Full text of H statements: see section 16

2.2. Label elements

GHS-US labeling
- Hazard pictograms (GHS-US):
  - GHS02
  - GHS07
- Signal word (GHS-US): Danger
- Hazard statements (GHS-US):
  - H225 - Highly flammable liquid and vapor
  - H319 - Causes serious eye irritation
  - H336 - May cause drowsiness or dizziness
- Precautionary statements (GHS-US):
  - P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
  - P233 - Keep container tightly closed
  - P240 - Ground/bond container and receiving equipment
  - P241 - Use explosion-proof electrical, lighting, ventilating equipment
  - P242 - Use only non-sparking tools
  - P243 - Take precautionary measures against static discharge
  - P261 - Avoid breathing mist, spray, vapors
  - P264 - Wash exposed skin thoroughly after handling
  - P271 - Use only outdoors or in a well-ventilated area
  - P280 - Wear eye protection, face protection, protective clothing, protective gloves
  - P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
  - P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position
comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P337 + P313 - If eye irritation persists: Get medical advice/attention.
P370 + P378 - In case of fire: Use dry chemical powder, alcohol-resistant foam, carbon dioxide (CO2) to extinguish
P403 + P233 - Use dry chemical powder, alcohol-resistant foam, carbon dioxide (CO2) to extinguish
P405 - Store locked up
P501 - Dispose of contents/container to comply with local, state and federal regulations

P235 - Keep cool

2.3. Other hazards

Other hazards not contributing to the classification: None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type: Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone (Main constituent)</td>
<td>(CAS No) 67-64-1</td>
<td>100</td>
<td>Flam. Liq. 2, H225, Eye Irrit. 2A, H319, STOT SE 3, H336</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures


First-aid measures after inhalation: Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact: Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Take victim to a doctor if irritation persists.

First-aid measures after eye contact: Rinse immediately with plenty of water. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.


4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries: Not expected to present a significant hazard under anticipated conditions of normal use.


Symptoms/injuries after skin contact: ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.

Symptoms/injuries after eye contact: Irritation of the eye tissue.


Symptoms/injuries upon intravenous administration: Not available.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media


Unsuitable extinguishing media: Solid water jet ineffective as extinguishing medium.

5.2. Special hazards arising from the substance or mixture

Fire hazard: DIRECT FIRE HAZARD. Highly flammable. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Gas/vapor spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard: DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. Heat may cause pressure rise in tanks/drums: explosion risk. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity: Upon combustion: CO and CO2 are formed. Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.

5.3. Advice for firefighters

Firefighting instructions: Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistent risk of physical explosion.


SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel


6.1.2. For emergency responders

Protective equipment: Equip cleanup crew with proper protection.

Emergency procedures: Ventilate area.

6.2. Environmental precautions

Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment: Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.

Methods for cleaning up: Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Spill must not return in its original container. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.
SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling:
- Comply with the legal requirements.
- Remove contaminated clothing immediately.
- Clean contaminated clothing.
- Handle uncleaned empty containers as full ones.
- Thoroughly clean/dry the installation before use.
- Do not discharge the waste into the drain.
- Do not use compressed air for pumping over.
- Use spark-/explosionproof appliances and lighting system.
- Take precautions against electrostatic charges.
- Keep away from naked flames/heat.
- Keep away from ignition sources/sparks.
- Avoid prolonged and repeated contact with skin.
- Keep container tightly closed.
- Measure the concentration in the air regularly.
- Work under local exhaust/ventilation.

Hygiene measures:
- Do not eat, drink or smoke when using this product.
- Wash contaminated clothing before reuse.
- Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions:
- Keep only in the original container in a cool, well ventilated place away from:

Incompatible products:
- Strong bases. Strong acids.

Incompatible materials:
- Sources of ignition. Direct sunlight.

Storage temperature:
- 15 - 20 °C

Heat-ignition:
- KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.

Prohibitions on mixed storage:

Storage area:

Special rules on packaging:
- SPECIAL REQUIREMENTS: closing. with pressure relief valve. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials:
- SUITABLE MATERIAL: steel. stainless steel. carbon steel. aluminium. iron. copper. nickel. bronze. glass. MATERIAL TO AVOID: synthetic material.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Acetone (67-64-1)</th>
<th>ACGIH TWA (ppm)</th>
<th>500 ppm (Acetone; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td>ACGIH STEL (ppm)</td>
<td>750 ppm (Acetone; USA; Short time value; TLV - Adopted Value)</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (mg/m³)</td>
<td>2400 mg/m³</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (ppm)</td>
<td>1000 ppm</td>
</tr>
<tr>
<td>IDLH</td>
<td>US IDLH (ppm)</td>
<td>2500 ppm</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (mg/m³)</td>
<td>590 mg/m³</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (ppm)</td>
<td>250 ppm</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls:
- Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Personal protective equipment:

Materials for protective clothing:
- GIVE EXCELLENT RESISTANCE: No data available. GIVE GOOD RESISTANCE: butyl rubber. tetrafluoroethylene. GIVE LESS RESISTANCE: chlorosulfonated polyethylene. natural rubber. neoprene. polyurethane. PVA. styrene-butadiene rubber. GIVE POOR RESISTANCE: nitrile rubber. polyethylene. PVC. viton. nitrile rubber/PVC.

Hand protection:
- Gloves.
**Eye protection**: Safety glasses.

**Skin and body protection**: Head/neck protection. Protective clothing.

**Respiratory protection**: Wear gas mask with filter type A if conc. in air > exposure limit.

**Other information**: Do not eat, drink or smoke during use.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

- **Physical state**: Liquid
- **Appearance**: Liquid.
- **Color**: Colourless
- **Odor**: Aromatic odour Sweet odour Fruity odour
- **Odor threshold**: 306 - 653 ppm
  - 737 - 1574 mg/m³
- **pH**: 7
- **Melting point**: -95 °C
- **Freezing point**: No data available
- **Boiling point**: 56 °C
- **Critical temperature**: 235 °C
- **Critical pressure**: 47010 hPa
- **Flash point**: -18 °C
- **Relative evaporation rate (butyl acetate=1)**: 6
- **Relative evaporation rate (ether=1)**: 2
- **Flammability (solid, gas)**: Non flammable.
- **Vapor pressure**: 247 hPa (20 °C)
- **Vapor pressure at 50 °C**: 828 hPa (50 °C)
- **Relative vapor density at 20 °C**: 2.0
- **Relative density**: 0.79
- **Relative density of saturated gas/air mixture**: 1.2
- **Specific gravity / density**: 786 kg/m³
- **Molecular mass**: 58.08 g/mol
  - Ethanol: Complete
  - Ether: Complete
- **Log Pow**: -0.24 (Test data)
- **Auto-ignition temperature**: 465 °C
- **Decomposition temperature**: No data available
- **Viscosity, kinematic**: 0.417 mm²/s
- **Viscosity, dynamic**: 32 mPa.s (20 °C; 0.27 mPa.s; 40 °C)
- **Explosion limits**: 2 - 12.8 vol %
  - 60 - 310 g/m³
- **Explosive properties**: No data available.
- **Oxidizing properties**: None.

#### 9.2. Other information

- **Minimum ignition energy**: 1.15 mJ
- **Specific conductivity**: 500000 pS/m
- **Saturation concentration**: 589 g/m³
- **VOC content**: 100 %
- **Other properties**: Gas/vapour heavier than air at 20°C. Clear. Highly volatile. Substance has neutral reaction.

### SECTION 10: Stability and reactivity

#### 10.1. Reactivity

Upon combustion: CO and CO₂ are formed. Violent to explosive reaction with many compounds. Prolonged storage; on exposure to light: release of harmful gases/vapours. Reacts violently with (strong) oxidizers: peroxidation resulting in increased fire or explosion risk.
### 10.2. Chemical stability
Unstable on exposure to light.

### 10.3. Possibility of hazardous reactions
Not established.

### 10.4. Conditions to avoid
Direct sunlight. Extremely high or low temperatures.

### 10.5. Incompatible materials
Strong acids. Strong bases.

### 10.6. Hazardous decomposition products

## SECTION 11: Toxicological information

### 11.1. Information on toxicological effects

#### Likely routes of exposure
- Inhalation; Skin and eye contact

#### Acute toxicity
- Not classified

**Acetone (67-64-1)**

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat (mg/kg)</td>
<td>5800 mg/kg (Rat; Equivalent or similar to OECD 401; Experimental value)</td>
</tr>
<tr>
<td>LD50 dermal rabbit (mg/kg)</td>
<td>20000 mg/kg (Rabbit; Experimental value; Equivalent or similar to OECD 402; &gt;7426 mg/kg bodyweight; Rabbit; Weight of evidence)</td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>71 mg/l/4h (Rat; Experimental value; 76 mg/l/4h; Rat; Experimental value)</td>
</tr>
<tr>
<td>LC50 inhalation rat (ppm)</td>
<td>30000 ppm/4h (Rat; Experimental value)</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>5800.000 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>20000.000 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (gases)</td>
<td>30000.000 ppmV/4h</td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>71.000 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>71.000 mg/l/4h</td>
</tr>
</tbody>
</table>

#### Skin corrosion/irritation
- Not classified
  - pH: 7

#### Serious eye damage/irritation
- Causes serious eye irritation.
  - pH: 7

#### Respiratory or skin sensitization
- Not classified

#### Germ cell mutagenicity
- Not classified
  - Based on available data, the classification criteria are not met

#### Carcinogenicity
- Not classified

#### Reproductive toxicity
- Not classified
  - Based on available data, the classification criteria are not met

#### Specific target organ toxicity (single exposure)
- May cause drowsiness or dizziness.

#### Specific target organ toxicity (repeated exposure)
- Not classified

#### Aspiration hazard
- Not classified

#### Potential Adverse human health effects and symptoms
- Based on available data, the classification criteria are not met.

#### Symptoms/injuries after inhalation

#### Symptoms/injuries after skin contact
- ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.

#### Symptoms/injuries after eye contact
- Irritation of the eye tissue.

#### Symptoms/injuries after ingestion
Symptoms/injuries upon intravenous administration: Not available.


SECTION 12: Ecological information

12.1. Toxicity

Ecology - general: Not classified as dangerous for the environment according to the criteria of Directive 67/548/EEC. Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air: Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of substances which may contribute to the greenhouse effect (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.5.

Ecology - water: Not harmful to fishes (LC50(96h) >1000 mg/l). Not harmful to invertebrates (Daphnia). Not harmful to algae (EC50 >1000 mg/l). Not harmful to plankton. Inhibition of activated sludge.

**Acetone (67-64-1)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 2</td>
<td>5540 mg/l (LC50; EU Method C.1; 96 h; Salmo gairdneri; Static system; Fresh water; Experimental value)</td>
</tr>
<tr>
<td>EC50 Daphnia 2</td>
<td>12600 mg/l (LC50; Other; 48 h; Daphnia magna; Static system; Fresh water; Experimental value)</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

**Acetone (67-64-1)**


- **Biochemical oxygen demand (BOD)**: 1.43 g O₂/g substance
- **Chemical oxygen demand (COD)**: 1.92 g O₂/g substance
- **ThOD**: 2.20 g O₂/g substance
- **BOD (% of ThOD)**: 0.872 (20 days; Literature study)

12.3. Bioaccumulative potential

**Acetone (67-64-1)**

- **BCF fish 1**: 0.69 (BCF)
- **BCF other aquatic organisms 1**: 3 (BCF; BCFWIN)
- **Log Pow**: -0.24 (Test data)
- **Bioaccumulative potential**: Not bioaccumulative.

12.4. Mobility in soil

**Acetone (67-64-1)**

- **Surface tension**: 0.0237 N/m

12.5. Other adverse effects

Other information: Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Remove to an authorized waste incinerator for solvents with energy recovery. Do not discharge into drains or the environment.

Additional information: LWCA (the Netherlands): KGA category 03. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials: Avoid release to the environment.
SECTION 14: Transport information

Department of Transportation (DOT)
In accordance with DOT

Transport document description : UN1090 Acetone, 3, II
UN-No. (DOT) : UN1090
Proper Shipping Name (DOT) : Acetone
Transport hazard class(es) (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : II - Medium Danger
Hazard labels (DOT) : 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized
T4 - 2.65 178.274(d)(2) Normal............. 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling

DOT Packaging Exceptions (49 CFR 173.xxx) : 150
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L
DOT Vessel Stowage Location : B - (i) The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) “On deck only” on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Acetone (67-64-1)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
RQ (Reportable quantity, section 304 of EPA’s List of Lists) : 5000 lb
SARA Section 311/312 Hazard Classes : Immediate (acute) health hazard
Fire hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Acetone (67-64-1)
Listed on the Canadian DSL (Domestic Substances List)
WHMIS Classification : Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision B - Toxic material causing other toxic effects
EU-Regulations
No additional information available

National regulations

| Acetone (67-64-1) | Listed on the Canadian IDL (Ingredient Disclosure List) |

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 09/20/2016
Other information : None.

Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H225</th>
<th>Highly flammable liquid and vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
<tr>
<td>H336</td>
<td>May cause drowsiness or dizziness</td>
</tr>
</tbody>
</table>

NFPA health hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.
NFPA fire hazard   : 3 - Liquids and solids that can be ignited under almost all ambient conditions.
NFPA reactivity    : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

HMIS III Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible
Flammability : 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F, as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)
Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.
Personal protection : C
C - Safety glasses, Gloves, Synthetic apron

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
Material Safety Data Sheet
Acetonitrile

ACC# 00170

Section 1 - Chemical Product and Company Identification

**MSDS Name:** Acetonitrile  
**Product Grade:** SQ, ExcelaR, HPLC, HPLC Gradient  
**Catalog Numbers:** 21105, 21107, 11035, 11037, 44016, 44017, 44006, 44007, 4400P, 4400SP  
**Synonyms:** Acetonitrile  
**Company Identification:**  
Fisher Scientific  
Part of Thermo Fisher Scientific  
Thermo Fisher Scientific India Pvt. Ltd  
403-404, B-wing, Delphi,  
Hiranandani Business Park,  
Powai (E), Mumbai 400076, INDIA.

For information, call: 022 – 6680 3001/2, Call India Toll Free – 1 800 209 7001  
Emergency Number: 022-66803004/14  
For CHEMTREC assistance, call: 800-424-9300 [International]  
For International CHEMTREC assistance, call: 703-527-3887 [International]

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-05-8</td>
<td>Acetonitrile</td>
<td>100</td>
<td>200-835-2</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

**EMERGENCY OVERVIEW**

Appearance: clear, colorless liquid. Flash Point: 2 deg C.  
**Warning! Flammable liquid and vapor.** Causes eye irritation. May be harmful if swallowed, inhaled, or absorbed through the skin. May cause skin and respiratory tract irritation. Metabolized to cyanide in the body, which may cause headache, dizziness, weakness, unconsciousness, convulsions, coma and possible death. May cause liver and kidney damage.  
**Target Organs:** Kidneys, central nervous system, liver, respiratory system, cardiovascular system, eyes.
Potential Health Effects
Eye: Causes eye irritation. Lachrymator (substance which increases the flow of tears). May produce superficial reversible injury.

Skin: Causes mild skin irritation. If absorbed, causes symptoms similar to those of inhalation. May be harmful if absorbed through the skin. May be metabolized to cyanide which in turn acts by inhibiting cytochrome oxidase impairing cellular respiration. A Skin notation is recommended based upon the case report of child poisoning from dermal contact. A LD50 >2000 mg/kg was obtained in a well-conducted acute dermal toxicity study in rabbits.

Ingestion: May cause tissue anoxia, characterized by weakness, headache, dizziness, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heart beat, collapse, unconsciousness, convulsions, coma and death. Metabolism may release cyanide, which may result in headache, dizziness, weakness, collapse, unconsciousness and possible death. Different animal species and individuals of the same species varied widely in susceptibility to acetonitrile in single-dose toxicity studies by various routes. The range of oral LD50 values for acetonitrile in mammals is between 140 - 6762 mg/kg body weight. Mouse and guinea pig seem to be the most sensitive species. In a well-conducted study in mice, the oral LD50 of acetonitrile was calculated to be 617 mg/kg.

Inhalation: May cause respiratory tract irritation. May cause lung damage. May be harmful if inhaled. Acetonitrile breaks down slowly in the body to release the cyanide ion. Exposure to very high concentrations of acetonitrile can result in cyanide poisoning. Symptoms are usually delayed several hours after exposure. Early symptoms include weakness, headache, giddiness, dizziness, confusion, anxiety, nausea and vomiting. In severe cases, breathing is rapid, then becomes slow and gasping. The victim may feel an irregular heart beat and tightness in the chest.

Chronic: May be metabolized to cyanide which in turn acts by inhibiting cytochrome oxidase impairing cellular respiration. Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes. Animal studies indicate that the product may affect the liver and kidneys. Animal evidence for acetonitrile and other cyanide compounds clearly indicates that toxic effects would be expected in the fetus at exposure levels which are toxic to the

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Exposure should be treated as a cyanide poisoning. Effects may be
delayed. For methemoglobinemia, administer oxygen alone or with Methylene Blue depending on the methemoglobin concentration in the blood. May be partially metabolized to cyanide in the body.

**Antidote:** Always have a cyanide antidote kit on hand when working with cyanide compounds. Get medical advice to use. Methylene blue, alone or in combination with oxygen is indicated as a treatment in nitrite induced methemoglobinemia.

### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

**Extinguishing Media:** Use water spray, dry chemical, carbon dioxide, or appropriate foam.

**Flash Point:** 2 deg C (35.60 deg F)

**Autoignition Temperature:** 524 deg C (975.20 deg F)

**Explosion Limits, Lower:** 3.0 vol %

**Explosion Limits, Upper:** 16.00 vol %

**NFPA Rating:** (estimated) Health: 2; Flammability: 3; Instability: 0

### Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Evacuate unnecessary personnel. Approach spill from upwind.

### Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor or mist.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Keep from
contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Store protected from moisture.

Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. **Exposure Limits**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetonitrile</td>
<td>20 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous route</td>
<td>20 ppm TWA; 34 mg/m3 TWA 500 ppm IDLH</td>
<td>40 ppm TWA; 70 mg/m3 TWA</td>
</tr>
</tbody>
</table>

**OSHA Vacated PELs:** Acetonitrile: 40 ppm TWA; 70 mg/m3 TWA

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** A respiratory protection program that meets OSHA’s 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Appearance:** clear, colorless

**Odor:** sweetish odor - ethereal odor

**pH:** Not available.

**Vapor Pressure:** 88.8 mm Hg @ 25 deg C

**Vapor Density:** 1.42 (air=1)

**Evaporation Rate:** 5.79 (Butyl acetate=1)

**Viscosity:** 0.36 cP 20 deg C

**Boiling Point:** 81.6 deg C @ 760 mmHg

**Freezing/Melting Point:** -45 deg C

**Decomposition Temperature:** > 500 deg C

**Solubility:** Soluble.
Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Ignition sources, excess heat, exposure to moist air or water.

**Incompatibilities with Other Materials:** Strong oxidizing agents, strong reducing agents, strong acids.

**Hazardous Decomposition Products:** Hydrogen cyanide, nitrogen oxides, carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** Will not occur.

Section 11 - Toxicological Information

**RTECS#:**

**CAS# 75-05-8: AL7700000**

**LD50/LC50:**

**CAS# 75-05-8:**
- Draize test, rabbit, eye: 100 uL/24H Moderate;
- Inhalation, mouse: LC50 = 2693 ppm/1H;
- Inhalation, rabbit: LC50 = 2828 ppm/4H;
- Inhalation, rat: LC50 = 7551 ppm/8H;
- Oral, mouse: LD50 = 269 mg/kg;
- Oral, rabbit: LD50 = 50 mg/kg;
- Oral, rat: LD50 = 2460 mg/kg;
- Skin, rabbit: LD50 = >2 gm/kg;

In a well-conducted study in mice, the oral LD50 of acetonitrile was calculated to be 617 mg/kg.

**Carcinogenicity:**

**CAS# 75-05-8:** Not listed by ACGIH, IARC, NTP, or CA Prop 65.

**Epidemiology:** Three volunteers were exposed for 4 hours at 40, 80, or 160 ppm acetonitrile. At 40 ppm, odor was detected, after which olfactory fatigue was noted. At this concentration, 2 persons had no signs of response, including no appreciable blood or urinary cyanide or thiocyanate. The third person experienced slight tightness in the chest that evening. A sensation of cooling in the lungs was observed and persisted for 24 hours. Traces of urinary thiocyanate were recorded.

**Teratogenicity:** In most of the available assays, teratogenicity was associated with maternal toxicity. In a well-conducted study, rats exposed by inhalation to acetonitrile did
not result in significant fetal effects, even at concentrations which were overtly toxic to the dam. In this study, a maternal NOAEL of 1200 ppm and NOAEL of 1200 ppm with respect to developmental toxicity were established. A case-control study of pregnancy outcome among Finnish lab workers revealed no association between exposure to acetonitrile and increased risk of spontaneous abortion in mothers, or malformation and birth weight in their children.

**Reproductive Effects:** In relation to fertility, there is no information available in humans and there are no animal studies specifically investigating such effects. However, no changes were seen in weight of the right cauda or right testis and no effect on sperm motility in rats or mice exposed for 13 weeks with 100, 200 and 400 ppm to acetonitrile.

**Mutagenicity:** See actual entry in RTECS for complete information.

**Neurotoxicity:** No information available.

**Other Studies:**

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**Section 12 - Ecological Information**

**Ecotoxicity:** Fish: Fathead Minnow: 1150 ppm; 24 Hr; TLM (hard water) Fish: Fathead Minnow: 1000 mg/L; 96 Hr; TLM (soft water) Fish: Bluegill/Sunfish: 1850 mg/L; 96 Hr; TLM (soft water) Fish: Fathead Minnow: 1640 mg/L; 96 Hr; LC50 (flow-bioassay) Fish: Fathead Minnow: 1640 mg/L; 96 Hr; EC50 (flow-bioassay) No data available.

**Environmental:** Estimated Koc value = 16. Acetonitrile is expected to weakly adsorb to most soils based on the Koc value. Volatilization from soil surfaces and leaching into ground water is expected to be significant. Estimated BCF value = 0.3. This value indicates that acetonitrile will not significantly bioconcentrate in aquatic organisms or adsorb to suspended solids and sediments in water. Acetonitrile is unreactive towards photochemically-generated free radicals and direct photolysis in the gaseous phase.

**Physical:** No information available.

**Other:** Biodegradable.

---

**Section 13 - Disposal Considerations**

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.

**RCRA U-Series:**

CAS# 75-05-8: waste number U003 (Ignitable waste, Toxic waste).

---

**Section 14 - Transport Information**

<table>
<thead>
<tr>
<th>Shipping Name</th>
<th>US DOT</th>
<th>Canada TDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACETONITRILE</td>
<td></td>
<td>ACETONITRILE</td>
</tr>
</tbody>
</table>
Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 75-05-8 is listed on the TSCA inventory.

Health & Safety Reporting List
CAS# 75-05-8: Effective 10/4/82, Sunset 10/4/92

Chemical Test Rules
CAS# 75-05-8: 40 CFR 799.5115

Section 12b
CAS# 75-05-8: Section 4, 1 % de minimus concentration

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 75-05-8: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.

SARA Codes
CAS # 75-05-8: immediate, delayed, fire.

Section 313
This material contains Acetonitrile (CAS# 75-05-8, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
CAS# 75-05-8 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depleters.
This material does not contain any Class 2 Ozone depleters.

Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
CAS# 75-05-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
   XN F
Risk Phrases:
   R 11 Highly flammable.
   R 20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
   R 36 Irritating to eyes.
Safety Phrases:
   S 16 Keep away from sources of ignition - No smoking.
   S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)
   CAS# 75-05-8: 2
Canada - DSL/NDSL
   CAS# 75-05-8 is listed on Canada's DSL List.
Canada - WHMIS
   This product has a WHMIS classification of B2, D1B, D2B.
   This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
   CAS# 75-05-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: October 2013
Revision Date: October 2018

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 **Product identifiers**
   - **Product name**: Acetyl Chloride
   - **CAS-No.**: 75-36-5

1.2 **Relevant identified uses of the substance or mixture and uses advised against**
   - **Identified uses**: Laboratory chemicals, Industrial & for professional use only.

1.3 **Details of the supplier of the safety data sheet**
   - **Company**: Central Drug House (P) Ltd
     7/28 Vardaan House
     New Delhi-10002
     INDIA
   - **Telephone**: +91 11 49404040
   - **Email**: care@cdhfinechemical.com

1.4 **Emergency telephone number**
   - **Emergency Phone #**: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 **Classification of the substance or mixture**
   - **Classification according to Regulation (EC) No 1272/2008**
     - Flammable liquids (Category 2), H225
     - Acute toxicity, Oral (Category 4), H302
     - Skin corrosion (Category 1B), H314
   - For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 **Label elements**
   - **Labelling according Regulation (EC) No 1272/2008**
     - **Pictogram**
       - **Signal word**: Danger
       - **Hazard statement(s)**
         - H225: Highly flammable liquid and vapour.
         - H302: Harmful if swallowed.
         - H314: Causes severe skin burns and eye damage.
Precautionary statement(s)
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 Immediately call a POISON CENTER/doctor.

Supplemental Hazard information (EU)
EUH014 Reacts violently with water.

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.
Lachrymator.
Reacts violently with water.

SECTION 3: Composition/information on ingredients

3.1 Substances
Formula : C\textsubscript{2}H\textsubscript{3}ClO
Molecular weight : 78.50 g/mol
CAS-No. : 75-36-5
EC-No. : 200-865-6
Index-No. : 607-011-00-5

Hazardous ingredients according to Regulation (EC) No 1272/2008
Component Classification Concentration
Acetyl chloride Flam. Liq. 2; Acute Tox. 4; <= 100 %
CAS-No. 75-36-5
EC-No. 200-865-6
Index-No. 607-011-00-5
Skin Corr. 1B; H225, H302, H314

For the full text of the H-Stories mentioned in this Section, see Section 16.

SECTION 4: First aid measures
4.1 Description of first aid measures
General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available
SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Water hydrolyzes material liberating acidic gas which in contact with meta hydrogen gas.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Flash back possible over considerable distance. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep away from water. Never allow product to get in contact with water during storage. Hydrolyses readily. Handle and store under inert gas. Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls
Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.
Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engine protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance
   Form: liquid, clear
   Colour: colourless

b) Odour
   No data available

c) Odour Threshold
   No data available

d) pH
   No data available

e) Melting point/freezing point
   Melting point/range: -112 °C - lit.

f) Initial boiling point and boiling range
   52 °C - lit.

g) Flash point
   5 °C - closed cup

h) Evaporation rate
   No data available

i) Flammability (solid, gas)
   No data available

j) Upper/lower flammability or explosive limits
   Upper explosion limit: 19 %(V)
   Lower explosion limit: 7.3 %(V)

k) Vapour pressure
   604.373 mmHg at 20 °C
   1,671.461 mmHg at 55 °C

l) Vapour density
   2.71 - (Air = 1.0)

m) Relative density
   1.104 g/cm3 at 25 °C
n) Water solubility No data available
o) Partition coefficient: n-octanol/water No data available
p) Auto-ignition temperature No data available
q) Decomposition temperature No data available
r) Viscosity No data available
s) Explosive properties No data available
t) Oxidizing properties No data available

9.2 Other safety information
Relative vapour density 2.71 - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to avoid
Heat, flames and sparks. Exposure to moisture

10.5 Incompatible materials
Water, Alcohols, Oxidizing agents, Strong bases

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available(Acetyl chloride)

Skin corrosion/irritation
No data available(Acetyl chloride)

Serious eye damage/eye irritation
No data available(Acetyl chloride)

Respiratory or skin sensitisation
No data available(Acetyl chloride)

Germ cell mutagenicity
No data available(Acetyl chloride)
Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available (Acetyl chloride)

Specific target organ toxicity - single exposure
No data available (Acetyl chloride)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available (Acetyl chloride)

Additional Information
RTECS: AO6390000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. (Acetyl chloride)

SECTION 12: Ecological information

12.1 Toxicity
Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 42 mg/l - 96 h (Acetyl chloride)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available (Acetyl chloride)

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
Harmful to aquatic life.
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.
SECTION 14: Transport information

14.1 UN number
ADR/RID: 1717  
IMDG: 1717  
IATA: 1717

14.2 UN proper shipping name
ADR/RID: ACETYL CHLORIDE  
IMDG: ACETYL CHLORIDE  
IATA: Acetyl chloride

14.3 Transport hazard class(es)
ADR/RID: 3 (8)  
IMDG: 3 (8)  
IATA: 3 (8)

14.4 Packaging group
ADR/RID: II  
IMDG: II  
IATA: II

14.5 Environmental hazards
ADR/RID: no  
IMDG Marine pollutant: no  
IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.
EUH014 Reacts violently with water.
H225 Highly flammable liquid and vapour.
H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
Section 1 - Chemical Product and Company Identification

MSDS Name: Benzoyl chloride
Catalog Numbers: 10575-0000, 10575-0010, 10575-0025, 40203-0000, 40203-0025, 40203-0050, 40203-5000
Synonyms:

Company Identification: Acros Organics BVBA
Janssen Pharmaceuticaan 3a
2440 Geel, Belgium

Company Identification: (USA)
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

For information in the US, call: 800-ACROS-01
For information in Europe, call: +32 14 57 52 11
Emergency Number, Europe: +32 14 57 52 99
Emergency Number US: 201-796-7100
CHEMTREC Phone Number, US: 800-424-9300
CHEMTREC Phone Number, Europe: 703-527-3887

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name:</th>
<th>%</th>
<th>EINECS#</th>
</tr>
</thead>
<tbody>
<tr>
<td>98-88-4</td>
<td>Benzoyl chloride</td>
<td>99%</td>
<td>202-710-8</td>
</tr>
</tbody>
</table>

Hazard Symbols: C

Risk Phrases: 34

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Causes burns.

Potential Health Effects

Eye: Causes eye burns. Lachrymator (substance which increases the flow of tears). Causes redness and pain.

Skin: Harmful if absorbed through the skin. Causes skin burns.

Ingestion: Harmful if swallowed. Causes gastrointestinal tract burns. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. Ingestion may cause headache, nausea, and vomiting.

Inhalation: Harmful if inhaled. Causes chemical burns to the respiratory tract. May cause pulmonary
edema and severe respiratory disturbances. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema. Causes sore throat, coughing, shortness of breath, and dental corrosion. May cause headache. May cause nausea and possible vomiting. May cause respiratory difficulty and coughing.

### Chronic:

#### Section 4 - First Aid Measures

**Eyes:** Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

**Skin:** Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

**Ingestion:** Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

**Inhalation:** Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

**Notes to Physician:**

#### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Will burn if involved in a fire. Combustible liquid.

**Extinguishing Media:** Use carbon dioxide or dry chemical. DO NOT USE WATER OR FOAM.

#### Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Do not let this chemical enter the environment.

#### Section 7 - Handling and Storage

**Handling:** Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood.

**Storage:** Keep away from sources of ignition. Store in a cool, dry place. Do not store in direct sunlight. Store in a tightly closed container. Keep under a nitrogen blanket. Corrosives area.

#### Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.

**Exposure Limits**

- **CAS# 98-88-4:**
  - Belgium - STEL: 0.5 ppm VLE; 2.8 mg/m3 VLE
  - Germany: 2.8 mg/m3 TWA
  - Malaysia: 0.5 ppm Ceiling; 2.8 mg/m3 Ceiling
  - Spain: 0.5 ppm VLA-EC; 2.9 mg/m3 VLA-EC

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid

Color: Clear liquid (< 40 apha)

Odor: pungent odor

pH: 2 (1 g/L (20°C))

Vapor Pressure: 0.5hPa @20 deg C

Viscosity: 0.0012 Pa.s @30 deg C

Boiling Point: 198 deg C @760mmHg (388.40°F)

Freezing/Melting Point: -1 deg C (30.20°F)

Autoignition Temperature: 600 deg C (1,112.00 deg F)

Flash Point: 93 deg C (199.40 deg F)

Explosion Limits: Lower: 2.5 Vol %

Explosion Limits: Upper: 27 Vol %

Decomposition Temperature: Not available

Solubility in water: reacts, 2 mg/ml

Specific Gravity/Density: 1.210

Molecular Formula: C7H5ClO

Molecular Weight: 140.57

Section 10 - Stability and Reactivity

Chemical Stability: Air sensitive. Moisture sensitive.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat, temperatures above 65°C, exposure to moist air or water.

Incompatibilities with Other Materials Water, strong oxidizing agents, strong bases, alcohols, alkali metals, alkaline earth metals, aluminum, amines, dimethyl sulfoxide, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide), explosives (e.g. ammonium nitrate, hydrazoic acid, sodium azide), potassium hydroxide, sodium azide, sulfur oxides.

Hazardous Decomposition Products Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization Will not occur.

Section 11 - Toxicological Information

RTECS#: CAS# 98-88-4: DM6600000

LD50/LC50: RTECS: CAS# 98-88-4: Inhalation, rat: LC50 = 1870 mg/m3/2H; Oral, rat: LD50 = 1900 mg/kg;

Other: Oral rat LD50 = 2460 mg/kg Inh rat LC50 > 2.343 mg/L/1H Inh rat LC50 = 1.45 mg/L/4H Inh rat LC50 > 1.98 mg/L/4H Skin rabb LD50 = 790 mg/kg

Carcinogenicity: Benzoyl chloride - IARC: Group 2A carcinogen

Other: The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.
Section 12 - Ecological Information

Ecotoxicity:
- Fish: Fathead Minnow: 43-35 mg/l; 24-96 h
- Fish: Leuciscus idus: 200mg/L; 72H; LC0
- Fish: Zebrafish: 7.5mg/L; 96H; LC0

Other: Readily biodegradable.
95% / 20d (OECD 301D)Log Pow = 2.2 (calculated)

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th>Shipping Name</th>
<th>IATA</th>
<th>IMO</th>
<th>RID/ADR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CORROSIVE LIQUID, TOXIC, N.O.S.*</td>
<td>CORROSIVE LIQUID, TOXIC, N.O.S.</td>
<td>CORROSIVE LIQUID, TOXIC, N.O.S.</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>8 (6.1)</td>
<td>8 (6.1)</td>
<td>8 (6.1)</td>
</tr>
<tr>
<td>UN Number</td>
<td>2922</td>
<td>2922</td>
<td>2922</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
<td>II</td>
<td>II</td>
</tr>
</tbody>
</table>

USA RQ: CAS# 98-88-4: 1000 lb final RQ; 454 kg final RQ

Section 15 - Regulatory Information

European/International Regulations
European Labeling in Accordance with EC Directives
- Hazard Symbols: C
- Risk Phrases:
  - R 34 Causes burns.
- Safety Phrases:
  - S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
  - S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
- CAS# 98-88-4: 2

Canada
- CAS# 98-88-4 is listed on Canada's DSL List

US Federal
- TSCA
- CAS# 98-88-4 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 7/16/1996
Revision #2 Date: 7/28/2005

Revisions were made in Sections: General revision.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own
investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.
Material Safety Data Sheet

### Section 1. Chemical Product and Company Identification

<table>
<thead>
<tr>
<th>Common Name/Trade Name</th>
<th>Betamethasone acetate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>SPECTRUM QUALITY PRODUCTS INC.</td>
</tr>
<tr>
<td></td>
<td>14422 S. SAN PEDRO STREET</td>
</tr>
<tr>
<td></td>
<td>GARDENA, CA 90248</td>
</tr>
<tr>
<td>Commercial Name(s)</td>
<td>Not available.</td>
</tr>
<tr>
<td>Synonym</td>
<td>9-Fluoro-11,17,21-trihydroxy-16-methylpregna-1,4-diene-3,20-dione acetate</td>
</tr>
<tr>
<td>Chemical Name</td>
<td>Not available.</td>
</tr>
<tr>
<td>Chemical Family</td>
<td>Not available.</td>
</tr>
<tr>
<td>Chemical Formula</td>
<td>C24H31FO6</td>
</tr>
<tr>
<td>Supplier</td>
<td>SPECTRUM QUALITY PRODUCTS INC.</td>
</tr>
<tr>
<td></td>
<td>14422 S. SAN PEDRO STREET</td>
</tr>
<tr>
<td></td>
<td>GARDENA, CA 90248</td>
</tr>
</tbody>
</table>

### Section 2. Composition and Information on Ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>TWA (mg/m³)</th>
<th>STEL (mg/m³)</th>
<th>CEIL (mg/m³)</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Betamethasone acetate</td>
<td>987-24-6</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Section 3. Hazards Identification

**Potential Acute Health Effects**: Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

**Potential Chronic Health Effects**: Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of inhalation.

**Carcinogenic Effects**: Not available.

**Mutagenic Effects**: Not available.

**Teratogenic Effects**: Not available.

**Developmental Toxicity**: Not available.

---

**NFPA**

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Fire Hazard</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**HMIS**

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Fire Hazard</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Personal Protective Equipment**

See Section 15.
### Section 4. First Aid Measures

<table>
<thead>
<tr>
<th>Eye Contact</th>
<th>Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Contact</td>
<td>Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.</td>
</tr>
<tr>
<td>Serious Skin Contact</td>
<td>Not available.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.</td>
</tr>
<tr>
<td>Serious Inhalation</td>
<td>Not available.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.</td>
</tr>
<tr>
<td>Serious Ingestion</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

### Section 5. Fire and Explosion Data

<table>
<thead>
<tr>
<th>Flammability of the Product</th>
<th>May be combustible at high temperature.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-Ignition Temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flash Points</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flammable Limits</td>
<td>Not available.</td>
</tr>
<tr>
<td>Products of Combustion</td>
<td>These products are carbon oxides (CO, CO2), halogenated compounds.</td>
</tr>
<tr>
<td>Fire Hazards in Presence of Various Substances</td>
<td>Not available.</td>
</tr>
<tr>
<td>Fire Fighting Media and Instructions</td>
<td>SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.</td>
</tr>
<tr>
<td>Special Remarks on Fire Hazards</td>
<td>Not available.</td>
</tr>
<tr>
<td>Special Remarks on Explosion Hazards</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

### Section 6. Accidental Release Measures

<table>
<thead>
<tr>
<th>Small Spill</th>
<th>Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Spill</td>
<td>Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.</td>
</tr>
</tbody>
</table>
Betamethasone acetate

Section 7. Handling and Storage

Precautions
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust.

Storage
Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection
Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits
Not available.

Section 9. Physical and Chemical Properties

Physical state and appearance
Solid. (Powdered solid.)

Odor
Not available.

Taste
Not available.

Color
Not available.

Molecular Weight
434.5 g/mole

pH (1% soln/water)
Not applicable.

Boiling Point
Decomposes.

Melting Point
206.5°C (403.7°F)

Critical Temperature
Not available.

Specific Gravity
Not available.

Vapor Pressure
Not applicable.

Vapor Density
Not available.

Volatility
Not available.

Odor Threshold
Not available.

Water/Oil Dist. Coeff.
Not available.

Ionicity (in Water)
Not available.

Dispersion Properties
See solubility in water, methanol.

Solubility
Partially soluble in methanol. Insoluble in cold water.

Section 10. Stability and Reactivity Data

Stability
The product is stable.

Instability Temperature
Not available.

Conditions of Instability
Not available.

Incompatibility with various substances
Not available.

Corrosivity
Non-corrosive in presence of glass.

Continued on Next Page
### Section 11. Toxicological Information

<table>
<thead>
<tr>
<th>Routes of Entry</th>
<th>Ingestion.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity to Animals</td>
<td>LD50: Not available. LC50: Not available.</td>
</tr>
<tr>
<td>Chronic Effects on Humans</td>
<td>Not available.</td>
</tr>
<tr>
<td>Other Toxic Effects on Humans</td>
<td>Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of inhalation.</td>
</tr>
<tr>
<td>Special Remarks on Toxicity to Animals</td>
<td>Not available.</td>
</tr>
<tr>
<td>Special Remarks on Chronic Effects on Humans</td>
<td>Not available.</td>
</tr>
<tr>
<td>Special Remarks on other Toxic Effects on Humans</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

### Section 12. Ecological Information

| Ecotoxicity | Not available. |
| BOD5 and COD | Not available. |
| Products of Biodegradation | Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise. |
| Toxicity of the Products of Biodegradation | The products of degradation are more toxic. |
| Special Remarks on the Products of Biodegradation | Not available. |

### Section 13. Disposal Considerations

| Waste Disposal | |

### Section 14. Transport Information

| DOT Classification | Not a DOT controlled material (United States). |
| Identification | Not applicable. |
| Special Provisions for Transport | Not applicable. |
| DOT (Pictograms) | 🔴 |

**Continued on Next Page**
Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations

TSCA 8(b) inventory: No products were found.

California Proposition 65 Warnings

Other Regulations Not available.

Other Classifications

<table>
<thead>
<tr>
<th>Other Classifications</th>
<th>WHMIS (Canada)</th>
<th>DSCL (EEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not controlled under WHMIS (Canada).</td>
<td>This product is not classified according to the EU regulations.</td>
</tr>
</tbody>
</table>

HMIS (U.S.A.)

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Fire Hazard</th>
<th>Reactivity</th>
<th>Personal Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>E</td>
</tr>
</tbody>
</table>

National Fire Protection Association (U.S.A.)

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Reactivity</th>
<th>Specific hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

WHMIS (Canada) (Pictograms)

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

ADR (Europe) (Pictograms)

Protective Equipment

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent.

Safety glasses.

Continued on Next Page
# Section 16. Other Information

| MSDS Code | B3507 |
| References | Not available. |
| Other Special Considerations | Not available. |

Verified by Sonia Owen.  

**Notice to Reader**

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.
SAFETY DATA SHEET
Betamethasone
according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 20363
Product Name: Betamethasone
Synonyms: 9-fluoro-11.beta.,17,21-trihydroxy-16.beta.-methyl-pregna-1,4-diene-3,20-dione; NSC 39470; SCH 4831;

1.2 Relevant identified uses of the substance or mixture and uses advised against:
Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108
Web site address: www.caymanchem.com
Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:
Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:
Toxic To Reproduction, Category 1B
Specific Target Organ Toxicity (repeated exposure), Category 2

2.2 Label Elements:

GHS Signal Word: Danger

GHS Hazard Phrases:
H360: May damage fertility or the unborn child.
H373: May cause damage to (organs) through prolonged or repeated exposure.

GHS Precaution Phrases:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe (dust/fume/gas/mist/vapors/spray).
P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:
P308+313: IF exposed or concerned: Get medical attention/advice.
P314: Get medical attention/advice if you feel unwell.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.
2.3 Adverse Human Health Effects and Symptoms:
Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation, ingestion, or skin absorption.
May cause damage to (kidney, liver) through prolonged or repeated exposure.
May cause eye, skin, or respiratory system irritation.
May damage fertility or the unborn child.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/ REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./ EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>378-44-9 TU4000000</td>
<td>Betamethasone</td>
<td>100.0 %</td>
<td>206-825-4 NA</td>
<td>Toxic Repro. 1B: H360 STOT (RE) 2: H373</td>
</tr>
</tbody>
</table>

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media:
Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.

Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media:
A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards:
No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions:
As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.
Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures:

- Avoid raising and breathing dust, and provide adequate ventilation.
- As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions:

- Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning:

- Contain spill and collect, as appropriate.
- Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling:

- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing:

- Keep container tightly closed.
- Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

- Eye Protection: Safety glasses
- Protective Gloves: Compatible chemical-resistant gloves
- Other Protective Clothing: Lab coat
- Respiratory Equipment: NIOSH approved respirator, as conditions warrant.
- Work/Hygienic/Maintenance Practices: Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling. No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties:

- Physical States: [ ] Gas [ ] Liquid [X] Solid
- Appearance and Odor: A crystalline solid
- pH: No data.
- Melting Point: No data.
- Boiling Point: No data.
- Flash Pt: No data.
- Evaporation Rate: No data.
- Flammability (solid, gas): No data available.
- Explosive Limits: LEL: No data. UEL: No data.
- Vapor Pressure (vs. Air or mm Hg): No data.
- Vapor Density (vs. Air = 1): No data.
**Section 10. Stability and Reactivity**

10.1 Reactivity: No data available.
10.2 Stability: Unstable [    ] Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
10.4 Conditions To Avoid: No data available.
10.5 Incompatibility - Materials: strong oxidizing agents
To Avoid:
10.6 Hazardous Decomposition or Byproducts: carbon dioxide, carbon monoxide, hydrogen fluoride

**Section 11. Toxicological Information**

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.

**Toxicological Effects:**
Betamethasone - Toxicity Data: Oral LD50 (mouse): >4500 mg/kg; Intraperitoneal TDLO (rat): 150 ug/kg female 16-18 day(s) after conception;

**Chronic Toxicological Effects:**
Betamethasone - Investigated as a drug, hormone, primary irritant, and reproductive effector. Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information.

**Betamethasone RTECS Number:** TU4000000

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>378-44-9</td>
<td>Betamethasone</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

**Section 12. Ecological Information**

12.1 Toxicity: Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.
12.2 Persistence and Degradability: No data available.
12.3 Bioaccumulative Potential: No data available.
12.4 Mobility in Soil: No data available.
12.5 Results of PBT and vPvB assessment: No data available.
12.6 Other adverse effects: No data available.
Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

- DOT Proper Shipping Name: Not dangerous goods.
- DOT Hazard Class:
- UN/NA Number:

14.1 LAND TRANSPORT (European ADR/RID):

- ADR/RID Shipping Name: Not dangerous goods.
- UN Number:
- Hazard Class:

14.3 AIR TRANSPORT (ICAO/IATA):

- ICAO/IATA Shipping Name: Not dangerous goods.
- Additional Transport Information: Transport in accordance with local, state, and federal regulations.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>378-44-9</td>
<td>Betamethasone</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>Other US EPA or State Lists</th>
</tr>
</thead>
<tbody>
<tr>
<td>378-44-9</td>
<td>Betamethasone</td>
<td>CAA HAP,ODC: No; CWA NPDES: No; TSCA: No; CA PROP.65: No</td>
</tr>
</tbody>
</table>

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 11/28/2016

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.
1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: CALCIUM CHLORIDE
CHEMICAL CLASS: Inorganic salts.
APPLICATIONS: Oil well drilling fluid additive. Oil well completion fluid additive. Weighting agent.
EMERGENCY TELEPHONE: 281-561-1600
SUPPLIER: Supplied by a Business Unit of M-I L.L.C. P.O. Box 42842, Houston, Texas 77242-2842
See cover sheet for local supplier.
TELEPHONE: 281-561-1509
FAX: 281-561-7240
CONTACT PERSON: Sam Hoskin - Manager, Occupational Health

2. COMPOSITION, INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT NAME</th>
<th>CAS No.</th>
<th>CONTENTS</th>
<th>EPA RQ</th>
<th>TPQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium chloride</td>
<td>10043-52-4</td>
<td>60-100 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:
CAUTION! MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION. Avoid contact with eyes, skin and clothing. Avoid breathing airborne product. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling.

This product is a/an white powder. A nuisance dust. Dike and contain spills. Keep out of sewers and waterways. No significant immediate hazards for emergency response personnel are known.

ACUTE EFFECTS:
HEALTH HAZARDS, GENERAL:
Particulates may cause mechanical irritation to the eyes, nose, throat and lungs. Particulate inhalation may lead to pulmonary fibrosis, chronic bronchitis, emphysema and bronchial asthma. Dermatitis and asthma may result from short contact periods.

INHALATION: Irritating to the respiratory tract if inhaled.
INGESTION: Harmful if swallowed. May cause gastric distress, nausea and vomiting if ingested.
SKIN: Irritating to the skin.
EYES: Irritating to the eyes.

CHRONIC EFFECTS:
4. FIRST AID MEASURES

GENERAL: Persons seeking medical attention should carry a copy of this MSDS with them.

INHALATION: Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Get medical attention.

INGESTION: Drink a couple of glasses water or milk. Do not give victim anything to drink if he is unconscious. Get medical attention.

SKIN: Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.

EYES: Promptly wash eyes with lots of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

FLAMMABILITY LIMIT - LOWER(%): N/D
FLAMMABILITY LIMIT - UPPER(%): N/D

EXTINGUISHING MEDIA: Use extinguishing media appropriate for surrounding fire. Carbon dioxide (CO2). Dry chemicals. Foam. Water spray, fog or mist.

SPECIAL FIRE FIGHTING PROCEDURES: No specific fire fighting procedure given.

UNUSUAL FIRE & EXPLOSION HAZARDS: No unusual fire or explosion hazards noted.

HAZARDOUS COMBUSTION PRODUCTS: This material is not combustible. No specific hazardous combustion products noted.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Wear proper personal protective equipment (see MSDS Section 8).

SPILL CLEAN-UP PROCEDURES: Avoid generating and spreading of dust. Shovel into dry containers. Cover and move the containers. Flush the area with water. Do not contaminate drainage or waterways. Repackage or recycle if possible.
7. HANDLING AND STORAGE

HANDLING PRECAUTIONS:
Avoid handling causing generation of dust. Wear full protective clothing for prolonged exposure and/or high concentrations. Eye wash and emergency shower must be available at the work place. Wash hands often and change clothing when needed. Provide good ventilation. Mechanical ventilation or local exhaust ventilation is required.

STORAGE PRECAUTIONS:
Store at moderate temperatures in dry, well ventilated area. Keep in original container.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

<table>
<thead>
<tr>
<th>INGREDIENT NAME:</th>
<th>CAS No.:</th>
<th>OSHA PEL:</th>
<th>ACGIH TLV:</th>
<th>OTHER:</th>
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<tbody>
<tr>
<td>Calcium chloride</td>
<td>10043-52-4</td>
<td>5</td>
<td>3</td>
<td>TWA:</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>STEL:</td>
<td>STEL:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>mg/m3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>resp.dus</td>
</tr>
</tbody>
</table>

INGREDIENT COMMENTS:
No exposure limits noted for ingredient(s). Exposure limits are for Particulates Not Otherwise Classified (PNOC).

PROTECTIVE EQUIPMENT:

ENGINEERING CONTROLS:
Use appropriate engineering controls such as, exhaust ventilation and process enclosure, to reduce air contamination and keep worker exposure below the applicable limits.

VENTILATION:
Supply natural or mechanical ventilation adequate to exhaust airborne product and keep exposures below the applicable limits.

RESPIRATORS:
Use at least a NIOSH-approved N95 half-mask disposable or reusable particulate respirator. In work environments containing oil mist/aerosol use at least a NIOSH-approved P95 half-mask disposable or reusable particulate respirator.

PROTECTIVE GLOVES:
Use suitable protective gloves if risk of skin contact.

EYE PROTECTION:
Wear dust resistant safety goggles where there is danger of eye contact.

PROTECTIVE CLOTHING:
Wear appropriate clothing to prevent repeated or prolonged skin contact.

HYGIENIC WORK PRACTICES:
Wash promptly with soap and water if skin becomes contaminated. Change work clothing daily if there is any possibility of contamination.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE/PHYSICAL STATE: Powder, dust.
COLOR: White.
ODOR: Odorless or no characteristic odor.
SOLUBILITY DESCRIPTION: Very soluble in water.
10109 - CALCIUM CHLORIDE

SOLUBILITY VALUE (g/100g H2O 68°F): 75
DENSITY/SPECIFIC GRAVITY (g/ml): 2.2
VAPOUR DENSITY (air=1): N/D
VAPOUR PRESSURE: N/D
pH-VALUE, DILUTED SOLUTION: N/D

10. STABILITY AND REACTIVITY

STABILITY: Normally stable.

CONDITIONS TO AVOID: Avoid contact with water.

HAZARDOUS POLYMERIZATION: Will not polymerize.

POLYMERIZATION DESCRIPTION: Not relevant.

MATERIALS TO AVOID: Sulfuric acid

HAZARDOUS DECOMPOSITION PRODUCTS: No specific hazardous decomposition products noted.

11. TOXICOLOGICAL INFORMATION

TOXIC DOSE - LD 50: 1000 mg/kg (oral rat)

12. ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: Contact M-I Environmental Affairs for ecological information.

13. DISPOSAL CONSIDERATIONS

WASTE MANAGEMENT: This product, should it become a waste, is not hazardous by U.S. RCRA criteria.

DISPOSAL METHODS: Recover and reclaim or recycle, if practical. Should this product become a waste, dispose of in a permitted industrial landfill. Ensure that containers are empty by RCRA criteria prior to disposal in a permitted industrial landfill.

14. TRANSPORT INFORMATION

PRODUCT RQ: N/A
U.S. DOT: Not regulated.
U.S. DOT CLASS: Not regulated.
CANADIAN TRANSPORT: TDGR CLASS: Not regulated.
SEA TRANSPORT:
IMDG CLASS: Not regulated.

AIR TRANSPORT:
ICAO CLASS: Not regulated.

15. REGULATORY INFORMATION

REGULATORY STATUS OF INGREDIENTS:

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS No:</th>
<th>TSCA:</th>
<th>CERCLA:</th>
<th>SARA 302:</th>
<th>SARA 313:</th>
<th>DSL(CAN):</th>
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<tbody>
<tr>
<td>Calcium chloride</td>
<td>10043-52-4</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

US FEDERAL REGULATIONS:

REGULATORY STATUS: This Product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

SECTION 313: This product does not contain toxic chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR Part 372.

SARA 311 Categories:
1: Immediate (Acute) Health Effects.

The components of this product are listed on or are exempt from the following international chemical registries:
TSCA (U.S.)
DSL (Canada)
EINECS (Europe)

STATE REGULATIONS:
STATE REGULATORY STATUS: This product or its components, if a mixture, is subject to following regulations (Not meant to be all inclusive - selected regulations represented):

None.
PROPOSITION 65: This product does not contain chemicals considered by the State of California's Safe Drinking Water and Toxic Enforcement Act of 1986 as causing cancer or reproductive toxicity, and for which warnings are now required.

CANADIAN REGULATIONS:
LABELS FOR SUPPLY: REGULATORY STATUS: This Material Safety Data Sheet has been prepared in compliance with the Controlled Product Regulations.

Canadian WHMIS Classification: D2B - Other Toxic Effects: Toxic Material

16. OTHER INFORMATION

NPCA HMIS HAZARD INDEX: 1 Slight Hazard
FLAMMABILITY: 0 Minimal Hazard
REACTIVITY: 1 Slight Hazard

NPCA HMIS PERS. PROTECT. INDEX: E - Safety Glasses, Gloves, Dust Respirator

USER NOTES: N/A = Not applicable N/D = Not determined

INFORMATION SOURCES:
- ACGIH Threshold Limit Values and Biological Exposure Indices for Chemical Substances and Physical Agents (latest edition).
- Product information provided by the commercial vendor(s).

PREPARED BY: Sam Hoskin

REVISION No./Repl. MSDS of: 1 / September 7, 1995

MSDS STATUS: Approved.

DATE: August 19, 1998

DISCLAIMER:
MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.
Material Safety Data Sheet
Chloroform

1. Product and company identification

- **Product name**: Chloroform
- **Product code**: CX1050
- **Supplier**: EMD Chemicals Inc.
  
  480 S. Democrat Rd.
  Gibbstown, NJ 08027
  856-423-6300 Technical Service
  Monday-Friday: 8:00 - 5:00 PM
- **Synonym**: Trichloromethane
- **Material uses**: Other non-specified industry: Analytical reagent.
- **Validation date**: 4/2/2009.
- **In case of emergency**: 800-424-9300 CHEMTREC (USA)
  613-996-6666 CANUTEC (Canada)
  24 Hours/Day: 7 Days/Week

2. Hazards identification

- **Emergency overview**: WARNING!
  
  HARMFUL IF INHALED OR SWALLOWED.
  CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
  SUSPECT CANCER HAZARD - MAY CAUSE CANCER.
  MAY CAUSE DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, LIVER, HEART,
  SKIN, EYES, CENTRAL NERVOUS SYSTEM.
  WARNING: This product contains a chemical known to the State of California to cause
cancer.
  Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing.
  Use only with adequate ventilation. Keep container tightly closed and sealed until ready
for use. Wash thoroughly after handling.

- **Physical state**: Liquid. [Colorless.]

- **OSHA/HCS status**: This material is considered hazardous by the OSHA Hazard Communication Standard

- **Routes of entry**: Dermal contact. Eye contact. Inhalation. Ingestion.

- **Potential acute health effects**
  
  **Inhalation**: Toxic by inhalation. Irritating to respiratory system. Exposure to decomposition products
  may cause a health hazard. Serious effects may be delayed following exposure.

  **Ingestion**: Toxic if swallowed. Aspiration hazard if swallowed. Can enter lungs and cause damage.

  **Skin**: Irritating to skin.

  **Eyes**: Irritating to eyes.

- **Potential chronic health effects**
  
  **Carcinogenicity**: May cause cancer. Risk of cancer depends on duration and level of exposure.

  **Mutagenicity**: No known significant effects or critical hazards.

  **Teratogenicity**: No known significant effects or critical hazards.

  **Developmental effects**: No known significant effects or critical hazards.

  **Fertility effects**: No known significant effects or critical hazards.

  **Target organs**: May cause damage to the following organs: kidneys, liver, heart, skin, eyes, central
  nervous system (CNS).

  **Medical conditions aggravated by over-exposure**: Pre-existing disorders involving any target organs mentioned in this MSDS as being at
  risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)
3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>% by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>67-66-3</td>
<td>100</td>
</tr>
</tbody>
</table>

4. First aid measures

Eye contact: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product: In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media: Use an extinguishing agent suitable for the surrounding fire.

Not suitable: None known.

Special exposure hazards: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products: Decomposition products may include the following materials:
- carbon dioxide
- carbon monoxide
- halogenated compounds
- carbonyl halides

Special protective equipment for fire-fighters: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards: Emits very toxic fumes when heated to decomposition.

6. Accidental release measures

Personal precautions: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Spill: Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container.

Continued on next page
7. Handling and storage

Handling: Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage: Store in accordance with local regulations. Store in original container, protected from direct sunlight. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage.

8. Exposure controls/personal protection

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>ACGIH (United States, 1996). TWA: 49 mg/m³</td>
</tr>
<tr>
<td></td>
<td>OSHA (United States, 1989). TWA: 9.78 mg/m³</td>
</tr>
<tr>
<td></td>
<td>ACGIH TLV (United States, 1/2008). TWA: 10 ppm 8 hour(s).</td>
</tr>
<tr>
<td></td>
<td>TWA: 49 mg/m³ 8 hour(s).</td>
</tr>
<tr>
<td></td>
<td>TWA: 9.78 mg/m³ 8 hour(s).</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL (United States, 6/2008). STEL: 2 ppm 60 minute(s).</td>
</tr>
<tr>
<td></td>
<td>STEL: 9.78 mg/m³ 60 minute(s).</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (United States, 11/2006). CEIL: 50 ppm</td>
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<tr>
<td></td>
<td>CEIL: 240 mg/m³</td>
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</tbody>
</table>

Consult local authorities for acceptable exposure limits.

Engineering measures: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. 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.

Personal protection

Respiratory: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: Viton

Eyes: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. Recommended: splash goggles

Skin: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: lab coat

Environmental exposure controls: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Continued on next page
9. Physical and chemical properties

Physical state: Liquid. [Colorless.]
Color: Colorless.
Molecular weight: 119.37 g/mole
Molecular formula: CHCl3
pH: Not available.
Boiling/condensation point: 60.5°C (140.9°F)
Melting/freezing point: -63°C (-81.4°F)
Critical temperature: 263.3°C (505.9°F)
Relative density: 1.49
Vapor pressure: 22.3 kPa (167 mm Hg)
Vapor density: 4.1 [Air = 1]
Volatility: 100% (v/v)
Odor threshold: 205 ppm
Evaporation rate: 10.2 (Butyl acetate. = 1)
VOC: 100 (%)
Solubility: Partially soluble in the following materials: water

10. Stability and reactivity

Chemical stability: The product is stable.
Possibility of hazardous reactions: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid: Avoid exposure - obtain special instructions before use. Do not swallow.
Materials to avoid: Reactive or incompatible with the following materials: oxidizing materials, metals and alkalis.
Hazardous decomposition products: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity: Emits very toxic fumes when heated to decomposition.

11. Toxicological information

Acute toxicity

<table>
<thead>
<tr>
<th>Test Route</th>
<th>Species</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50</td>
<td>Rat</td>
<td>894 mg/kg</td>
</tr>
<tr>
<td>LD50 Oral</td>
<td>Rat</td>
<td>695 mg/kg</td>
</tr>
<tr>
<td>LD50 Oral</td>
<td>Rat</td>
<td>300 mg/kg</td>
</tr>
<tr>
<td>LD50 Oral</td>
<td>Mouse</td>
<td>36 mg/kg</td>
</tr>
<tr>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>&gt;20 g/kg</td>
</tr>
<tr>
<td>LD50 Oral</td>
<td>Rat</td>
<td>1250 mg/kg</td>
</tr>
<tr>
<td>LDLo Oral</td>
<td>Man</td>
<td>2514 mg/kg</td>
</tr>
<tr>
<td>LDLo Oral</td>
<td>Rabbit</td>
<td>500 mg/kg</td>
</tr>
<tr>
<td>TDL0 Oral</td>
<td>Rat</td>
<td>0.5 mL/kg</td>
</tr>
<tr>
<td>TDL0 Oral</td>
<td>Rat</td>
<td>14.9 mg/kg</td>
</tr>
<tr>
<td>TDL0 Oral</td>
<td>Rat</td>
<td>119.37 mg/kg</td>
</tr>
<tr>
<td>TDL0</td>
<td>Rat</td>
<td>0.5 mL/kg</td>
</tr>
<tr>
<td>TDL0 Intraperitoneal</td>
<td>Rat</td>
<td>180 mg/kg</td>
</tr>
<tr>
<td>LC50 Inhalation</td>
<td>Rat</td>
<td>6000 mg/m3</td>
</tr>
<tr>
<td>Vapor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC50 Inhalation</td>
<td>Rat</td>
<td>47702 mg/m3</td>
</tr>
</tbody>
</table>

Continued on next page
11. Toxicological information

Carcinogenicity

Classification

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>EPA</th>
<th>NIOSH</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>A3</td>
<td>2B</td>
<td>-</td>
<td>+</td>
<td></td>
<td>Possible</td>
</tr>
</tbody>
</table>

May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity

No known significant effects or critical hazards.

Teratogenicity

No known significant effects or critical hazards.

12. Ecological information

Aquatic ecotoxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>Acute EC50 950 mg/L</td>
<td>Algae</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 560 mg/L</td>
<td>Algae</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 81.5 to 106 mg/L Marine water</td>
<td>Crustaceans - Northern pink shrimp - Penaeus duorarum - 35 to 50 mm</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 65.7 mg/L Fresh water</td>
<td>Daphnia - Water flea - Daphnia magna</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 17.1 mg/L Fresh water</td>
<td>Fish</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 16.2 mg/L Fresh water</td>
<td>Fish</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 15.1 mg/L Fresh water</td>
<td>Fish</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13.3 mg/L Fresh water</td>
<td>Fish</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 17.1 ppm Fresh water</td>
<td>Fish - Rainbow trout, donaldson trout - Oncorhynchus mykiss</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 16.2 ppm Fresh water</td>
<td>Fish - Bluegill - Lepomis macrochirus</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 15.1 ppm Fresh water</td>
<td>Fish - Rainbow trout, donaldson trout - Oncorhynchus mykiss</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13.3 ppm Fresh water</td>
<td>Fish - Bluegill - Lepomis macrochirus</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13300 ug/L Fresh water</td>
<td>Fish - Bluegill - Lepomis macrochirus - 17.1 cm - 126.4 g</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 758000 to 850000 ug/L Fresh water</td>
<td>Daphnia - Water flea - Daphnia magna - Young - &lt;=24 hours</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 353000 to 512000 ug/L Fresh water</td>
<td>Daphnia - Water flea - Daphnia magna - Neonate - &lt;12 hours</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 290000 to 512000 ug/L Fresh water</td>
<td>Daphnia - Water flea - Ceriodaphnia dubia - Neonate - &lt;12 hours</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 66800 to 71900 ug/L Fresh water</td>
<td>Daphnia - Water flea - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 66500 to 78500 ug/L Fresh water</td>
<td>Daphnia - Water flea - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 16200 ug/L Fresh water</td>
<td>Fish - Bluegill - Lepomis macrochirus - 16.9 cm - 129.9 g</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 63800 to 48 hours</td>
<td>Daphnia - Water flea - 48 hours</td>
<td></td>
</tr>
</tbody>
</table>
12. Ecological information

Environmental effects: No known significant effects or critical hazards.
Other adverse effects: No known significant effects or critical hazards.

13. Disposal considerations

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national and local laws and regulations.

14. Transport information

<table>
<thead>
<tr>
<th>Regulatory information</th>
<th>UN number</th>
<th>Proper shipping name</th>
<th>Classes</th>
<th>PG*</th>
<th>Label</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT Classification</td>
<td>UN1888</td>
<td>CHLOROFORM</td>
<td>6.1</td>
<td>III</td>
<td></td>
<td>Reportable quantity</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 lbs. (4.54 kg)</td>
</tr>
<tr>
<td>PG*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. Regulatory information

United States

HCS Classification: Toxic material
Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations: United States inventory (TSCA 8b): This material is listed or exempted.
TSCA 8(d) H and S data reporting: Chloroform: 1987
TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
SARA 302/304/311/312 extremely hazardous substances: Chloroform
SARA 302/304 emergency planning and notification: Chloroform
SARA 302/304/311/312 hazardous chemicals: Chloroform
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Chloroform: Immediate (acute) health hazard, Delayed (chronic) health hazard
Clean Water Act (CWA) 307: Chloroform
Clean Water Act (CWA) 311: Chloroform

Continued on next page
15. Regulatory information

Clean Air Act (CAA) 112 accidental release prevention: Chloroform
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: Chloroform

DEA List I Chemicals (Precursor Chemicals) : Not listed
DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 313

<table>
<thead>
<tr>
<th>Form R - Reporting requirements</th>
<th>Product name</th>
<th>CAS number</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier notification</td>
<td>Chloroform</td>
<td>67-66-3</td>
<td>100</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

Massachusetts Substances : This material is listed.
New Jersey Hazardous Substances : This material is listed.
New York Acutely Hazardous Substances : This material is listed.
Pennsylvania RTK Hazardous Substances : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Cancer</th>
<th>Reproductive</th>
<th>No significant risk level</th>
<th>Maximum acceptable dosage level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloroform</td>
<td>Yes.</td>
<td>No.</td>
<td>20 μg/day (ingestion)</td>
<td>40 μg/day (inhalation)</td>
</tr>
</tbody>
</table>

Canada

WHMIS (Canada) : Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canadian lists : CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

CEPA DSL / CEPA NDSL : This material is listed or exempted.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

EU regulations

Hazard symbol or symbols : R

Risk phrases : R40- Limited evidence of a carcinogenic effect.
R22- Harmful if swallowed.
R48/20/22- Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R38- Irritating to skin.

Continued on next page
15. Regulatory information

Safety phrases:
- S2: Keep out of the reach of children.
- S36/37: Wear suitable protective clothing and gloves.

International regulations:

International lists:
- **Australia inventory (AICS):** This material is listed or exempted.
- **China inventory (IECSC):** This material is listed or exempted.
- **Japan inventory (ENCS):** This material is listed or exempted.
- **Japan inventory (ISHL):** Not determined.
- **Korea inventory (KECI):** This material is listed or exempted.
- **New Zealand Inventory of Chemicals (NZIoC):** This material is listed or exempted.
- **Philippines inventory (PICCS):** This material is listed or exempted.

16. Other information

National Fire Protection Association (U.S.A.):

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Other special considerations:
- Contains stabilizer. (<1% wt/wt)

Notice to reader:

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.
SECTION 1: Identification

1.1. Identification
Product form: Substance
Substance name: Chromium Trioxide, ACS
CAS-No.: 1333-82-0
Product code: LC13090
Formula: CrO3
Synonyms: chromia / chromium (VI) oxide / chromic anhydride / chromic trioxide / chromic acid / chromium anhydride / chromium oxide,red / monochromium oxide / red oxide of chromium

1.2. Recommended use and restrictions on use
Use of the substance/mixture: Oxidant
Restrictions on use: Not for food, drug or household use

1.3. Supplier
LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number
Emergency number: CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture
GHS-US classification
- Oxidizing solids Category 1 H271 May cause fire or explosion; strong oxidizer
- Acute toxicity (oral) H301 Toxic if swallowed
- Acute toxicity (dermal) Category 3 H311 Toxic in contact with skin
- Acute toxicity (inhalation:dust,mist) Category 2 H330 Fatal if inhaled
- Skin corrosion/irritation Category 1A H314 Causes severe skin burns and eye damage
- Respiratory sensitization, Category 1 H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
- Skin sensitization, Category 1 H317 May cause an allergic skin reaction
- Germ cell mutagenicity Category 1B H340 May cause genetic defects
- Carcinogenicity Category 1A H350 May cause cancer (Inhalation)
- Reproductive toxicity Category 2 H361 Suspected of damaging fertility or the unborn child
- Specific target organ toxicity (repeated exposure) Category 1 H372 Causes damage to organs (kidneys, liver, respiratory system, Skin, eyes) through prolonged or repeated exposure
- Hazardous to the aquatic environment - Acute Hazard Category 1 H400 Very toxic to aquatic life
- Hazardous to the aquatic environment - Chronic Hazard Category 1 H410 Very toxic to aquatic life with long lasting effects

Full text of H statements: see section 16
2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US):

- GHS03
- GHS05
- GHS06
- GHS08
- GHS09

Signal word (GHS-US): Danger

Hazard statements (GHS-US):
- H271 - May cause fire or explosion; strong oxidizer
- H301+H311 - Toxic if swallowed or in contact with skin
- H314 - Causes severe skin burns and eye damage
- H317 - May cause an allergic skin reaction
- H330 - Fatal if inhaled
- H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H340 - May cause genetic defects
- H350 - May cause cancer (Inhalation)
- H361 - Suspected of damaging fertility or the unborn child
- H372 - Causes damage to organs (kidneys, liver, respiratory system, Skin, eyes) through prolonged or repeated exposure
- H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (GHS-US):
- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P210 - Keep away from heat, sparks, open flames. - No smoking
- P220 - Keep/Store away from clothing, combustible materials
- P221 - Take any precaution to avoid mixing with combustibles
- P260 - Do not breathe dust
- P264 - Wash exposed skin thoroughly after handling
- P270 - Do not eat, drink or smoke when using this product
- P271 - Use only outdoors or in a well-ventilated area
- P272 - Contaminated work clothing should not be allowed out of the workplace
- P273 - Avoid release to the environment
- P280 - Wear protective gloves, protective clothing, eye protection, face protection
- P283 - Wear fire/flame resistant/retardant clothing
- P284 - Wear respiratory protection
- P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
- P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
- P304+P341 - If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing
- P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- P306+P360 - If on clothing: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes
- P308+P313 - IF exposed or concerned: Get medical advice/attention
- P310 - Immediately call a poison center or doctor/physician
- P312 - IF symptoms or effects occur: Consult a doctor/physician immediately (show label where available)
- P341+P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
- P361+P364 - Take off immediately all contaminated clothing and wash it before reuse
- P363 - Wash contaminated clothing before reuse
- P370+P378 - In case of fire: Use carbon dioxide (CO2), powder, alcohol-resistant foam to extinguish
- P371+P380+P375 - In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion
- P391 - Collect spillage
- P403+P353 - Store in a well-ventilated place. Keep container tightly closed
- P405 - Store locked up
- P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification: None.

2.4. Unknown acute toxicity (GHS US)

Not applicable
**SECTION 3: Composition/Information on ingredients**

### 3.1. Substances

**Name**: Chromium Trioxide, ACS (Main constituent)

<table>
<thead>
<tr>
<th>Substance type</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(CAS-No.) 1333-82-0</td>
<td>100</td>
<td>Ox. Sol. 1, H271</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute Tox. 3 (Oral), H301</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute Tox. 3 (Dermal), H311</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute Tox. 2 (Inhalation), H330</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute Tox. 2 (Inhalation:dust,mist), H330</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Skin Corr. 1A, H314</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Resp. Sens. 1, H334</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Skin Sens. 1, H317</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mut. 1B, H340</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Carc. 1A, H350</td>
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<td></td>
<td>Repr. 2, H361</td>
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<td></td>
<td>STOT RE 1, H372</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Aquatic Acute 1, H400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aquatic Chronic 1, H410</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

### 3.2. Mixtures

Not applicable

**SECTION 4: First-aid measures**

#### 4.1. Description of first aid measures


**First-aid measures after inhalation**: Remove the victim into fresh air. Immediately consult a doctor/medical service.

**First-aid measures after skin contact**: Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

**First-aid measures after eye contact**: Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.

**First-aid measures after ingestion**: Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Do not give chemical antidote.

#### 4.2. Most important symptoms and effects (acute and delayed)


**Symptoms/effects after skin contact**: Caustic burns/corrosion of the skin.

**Symptoms/effects after eye contact**: Corrosion of the eye tissue. Inflammation/damage of the eye tissue.


#### 4.3. Immediate medical attention and special treatment, if necessary

No additional information available

**SECTION 5: Fire-fighting measures**

#### 5.1. Suitable (and unsuitable) extinguishing media

**Suitable extinguishing media**: Adapt extinguishing media to the environment.

**Unsuitable extinguishing media**: No unsuitable extinguishing media known.
5.2. Specific hazards arising from the chemical

Fire hazard
- DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Promotes combustion. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard
- INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity
- Reacts on exposure to water (moisture) with (some) metals. Reacts violently on exposure to water (moisture) with (some) bases. When decomposing on exposure to temperature rise: oxidation which increases fire hazard. Risk of explosion with combustible materials. Reacts with organic material: risk of spontaneous ignition. Reacts violently with many compounds e.g.: with (strong) reducers, with (some) acids and with oils/fats: (increased) risk of fire/explosion.

5.3. Special protective equipment and precautions for fire-fighters

Precautionary measures fire
- Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: have neighbourhood close doors and windows.

Firefighting instructions
- Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.

Protection during firefighting
- Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment

Emergency procedures

Measures in case of dust release
- In case of dust production: keep upwind. In case of dust production: consider evacuation. Dust production: have neighbourhood close doors and windows.

6.1.2. For emergency responders

Protective equipment
- Do not breathe dust. Equip cleanup crew with proper protection.

Emergency procedures
- If a major spill occurs, all personnel should be immediately evacuated and the area ventilated. Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment
- Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Knock down/dilute dust cloud with water spray. Take account of toxic/corrosive precipitation water.

Methods for cleaning up
- Spill must not return in its original container. Prevent dispersion by covering with dry sand/earth. Do not take up in combustible material such as: saw dust. Wetted substance: mix with dry sand or powdered lime. Scoop solid spill into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leakage. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed
- Pulverization rapidly increases toxic concentration.

Precautions for safe handling
- Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Use corrosion-proof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Avoid raising dust. Keep away from naked flames/heat. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.

Hygiene measures
- Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse.
7.2. Conditions for safe storage, including any incompatibilities

Incompatible products: aluminum, combustible materials, metals, strong oxidizers, strong reducing agents.

Incompatible materials: moisture.

Heat-ignition: KEEP SUBSTANCE AWAY FROM: heat sources.

Prohibitions on mixed storage: KEEP SUBSTANCE AWAY FROM: combustible materials, reducing agents, (strong) bases, oils, fats, metals, halogens, organic materials, alcohols, strong acids.


Special rules on packaging: SPECIAL REQUIREMENTS: hermetical, watertight, corrosion-proof, dry, clean, shock-absorbing, correctly labelled, meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials: MATERIAL TO AVOID: paper, wood, steel, aluminium, iron, copper, nickel, bronze, plastics.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Source</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td>ACGIH TWA (mg/m³)</td>
<td>0.05 mg/m³ (Chromium, water-soluble inorgan. Cr VI compounds; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (mg/m³)</td>
<td>0.005 mg/m³</td>
</tr>
<tr>
<td>IDLH</td>
<td>US IDLH (mg/m³)</td>
<td>15 mg/m³</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (mg/m³)</td>
<td>0.001 mg/m³</td>
</tr>
</tbody>
</table>

8.2. Appropriate engineering controls

Appropriate engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:


Materials for protective clothing:

GIVE GOOD RESISTANCE: butyl rubber, PVC

Hand protection:

Gloves

Eye protection:

Face shield. In case of dust production: protective goggles

Skin and body protection:

Corrosion-proof clothing. In case of dust production: head/neck protection

Respiratory protection:

Dust production: dust mask with filter type P3. High dust production: self-contained breathing apparatus
SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
</tr>
<tr>
<td>Color</td>
<td>Dark red to red-violet</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point</td>
<td>196 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>&lt; 0.1 hPa (20 °C)</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>2.7</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>2700 kg/m³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>99.99 g/mol</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>&gt; 196 °C</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>May cause fire or explosion; strong oxidiser.</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>May cause fire or explosion; strong oxidiser.</td>
</tr>
</tbody>
</table>

9.2. Other information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SADT</td>
<td>Not applicable</td>
</tr>
<tr>
<td>VOC content</td>
<td>0 %</td>
</tr>
<tr>
<td>Other properties</td>
<td>Hygroscopic. Substance has acid reaction.</td>
</tr>
</tbody>
</table>

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts on exposure to water (moisture) with (some) metals. Reacts violently on exposure to water (moisture) with (some) bases. When decomposing on exposure to temperature rise: oxidation which increases fire hazard. Risk of explosion with combustible materials. Reacts with organic material: risk of spontaneous ignition. Reacts violently with many compounds e.g.: with (strong) reducers, with (some) acids and with oils/fats: (increased) risk of fire/explosion.

10.2. Chemical stability

Unstable on exposure to moisture.

10.3. Possibility of hazardous reactions

May react violently with reducing agents.

10.4. Conditions to avoid


10.5. Incompatible materials


10.6. Hazardous decomposition products

No additional information available
SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure: Inhalation; Skin and eye contact

**Chromium Trioxide, ACS (1333-82-0)**

<table>
<thead>
<tr>
<th>Toxicity Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>50 mg/kg (Rat)</td>
</tr>
<tr>
<td>LD50 dermal rat</td>
<td>55 mg/kg (Rat)</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>57 mg/kg (Rabbit)</td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>0.217 mg/l/4h (Rat)</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>50 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>55 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (gases)</td>
<td>100 ppm/4h</td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>0.217 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>0.217 mg/l/4h</td>
</tr>
</tbody>
</table>

Additional information: An oral toxicity study of chromium trioxide conducted on rats in 1989 found the average LD50 to be 51.9 mg/kg.

Skin corrosion/irritation: Causes severe skin burns and eye damage.
Serious eye damage/irritation: Not classified
Respiratory or skin sensitization: May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction.
Germ cell mutagenicity: May cause genetic defects.
Carcinogenicity: May cause cancer (Inhalation).

**Chromium Trioxide, ACS (1333-82-0)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IARC group</td>
<td>3 - Not classifiable</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Suspected of damaging fertility or the unborn child.</td>
</tr>
<tr>
<td>Specific target organ toxicity – single exposure</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity – repeated exposure</td>
<td>Causes damage to organs (kidneys, liver, respiratory system, Skin, eyes) through prolonged or repeated exposure.</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>Not classified</td>
</tr>
<tr>
<td>Symptoms/effects after skin contact</td>
<td>Caustic burns/corrosion of the skin.</td>
</tr>
<tr>
<td>Symptoms/effects after eye contact</td>
<td>Corrosion of the eye tissue. Inflammation/damage of the eye tissue.</td>
</tr>
</tbody>
</table>

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general: Dangerous for the environment.

**Chromium Trioxide, ACS (1333-82-0)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 1</td>
<td>40 mg/l (LC50; 96 h; Colisa fasciatus)</td>
</tr>
<tr>
<td>EC50 Daphnia 2</td>
<td>0.01 - 2.5 mg/l (LC50; 96 h)</td>
</tr>
</tbody>
</table>
12.2. Persistence and degradability

**Chromium Trioxide, ACS (1333-82-0)**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical oxygen demand (BOD)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Chemical oxygen demand (COD)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>ThOD</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential

**Chromium Trioxide, ACS (1333-82-0)**

| BCF fish 1                     | 4.6 - 72 (BCF)                |
| BCF fish 2                     | 16 (BCF)                      |
| BCF other aquatic organisms 1  | 192 (BCF)                     |
| BCF other aquatic organisms 2  | 125 (BCF)                     |

- Bioaccumulative potential: Not bioaccumulative.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

- **Waste disposal recommendations**: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized dump (Class I). Treat using the best available techniques before discharge into drains or the aquatic environment.

- **Additional information**: LWCA (the Netherlands): KGA category 06. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

**Department of Transportation (DOT)**

- In accordance with DOT
- Transport document description: UN1463 Chromium trioxide, anhydrous, 5.1, II
- UN-No.(DOT): UN1463
- **Proper Shipping Name (DOT)**: Chromium trioxide, anhydrous
- **Packing group (DOT)**: II - Medium Danger
- **Hazard labels (DOT)**: 5.1 - Oxidizer, 6.1 - Poison inhalation hazard, 8 - Corrosive

- **Dangerous for the environment**: Yes
- **Marine pollutant**: Yes

- DOT Packaging Non Bulk (49 CFR 173.xxx): 212
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.

IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : None
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 kg
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 25 kg
DOT Vessel Stowage Location : A - The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other : 66 - Stow “separated from” flammable solids, 90 - Stow “separated from” radioactive materials
Other information : No supplementary information available.

SECTION 15: Regulatory information
15.1. US Federal regulations
Chromium Trioxide, ACS (1333-82-0)  Listed on the United States TSCA (Toxic Substances Control Act) inventory
Subject to reporting requirements of United States SARA Section 313
EPA TSCA Regulatory Flag : R - R - indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
RQ (Reportable quantity, section 304 of EPA’s List of Lists) : 10 lb
SARA Section 311/312 Hazard Classes : Physical hazard - Oxidizer (liquid, solid or gas)
Health hazard - Acute toxicity (any route of exposure)
Health hazard - Carcinogenicity
Health hazard - Respiratory or skin sensitization
Health hazard - Germ cell mutagenicity
Health hazard - Reproductive toxicity
Health hazard - Skin corrosion or Irritation
Health hazard - Specific target organ toxicity (single or repeated exposure)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory
Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Chromium Trioxide, ACS  CAS-No. 1333-82-0  100%

15.2. International regulations
CANADA
No additional information available
EU-Regulations
No additional information available
National regulations
No additional information available

15.3. US State regulations

<table>
<thead>
<tr>
<th>Chromium Trioxide, ACS (1333-82-0)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. - California - Proposition 65 - Carcinogens List</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Developmental Toxicity</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</td>
<td>Yes</td>
</tr>
<tr>
<td>No significant risk level (NSRL)</td>
<td>0.001 µg/day</td>
</tr>
</tbody>
</table>

California Proposition 65 - This product contains, or may contain, trace quantities of a substance(s) known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date: 10/13/2017

Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H271</th>
<th>May cause fire or explosion; strong oxidizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>H301</td>
<td>Toxic if swallowed</td>
</tr>
<tr>
<td>H311</td>
<td>Toxic in contact with skin</td>
</tr>
<tr>
<td>H314</td>
<td>Causes severe skin burns and eye damage</td>
</tr>
<tr>
<td>H317</td>
<td>May cause an allergic skin reaction</td>
</tr>
<tr>
<td>H330</td>
<td>Fatal if inhaled</td>
</tr>
<tr>
<td>H334</td>
<td>May cause allergy or asthma symptoms or breathing difficulties if inhaled</td>
</tr>
<tr>
<td>H340</td>
<td>May cause genetic defects</td>
</tr>
<tr>
<td>H350</td>
<td>May cause cancer</td>
</tr>
<tr>
<td>H361</td>
<td>Suspected of damaging fertility or the unborn child</td>
</tr>
<tr>
<td>H372</td>
<td>Causes damage to organs through prolonged or repeated exposure</td>
</tr>
<tr>
<td>H400</td>
<td>Very toxic to aquatic life</td>
</tr>
<tr>
<td>H410</td>
<td>Very toxic to aquatic life with long lasting effects</td>
</tr>
</tbody>
</table>

NFPA health hazard: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity: 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.

NFPA specific hazard: OX - Materials that posses oxidizing properties.
Hazard Rating

Health: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability: 0 Minimal Hazard - Materials that will not burn

Physical: 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection: J

J - Splash goggles, Gloves, Synthetic apron, Dust & vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
Product name: Cuprous Chloride
CAS-No.: 7758-89-6

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
Company: Central Drug House (P) Ltd
7/28 Vardaan House
New Delhi-10002
INDIA
Telephone: +91 11 49404040
Email: care@cdhfinechemical.com

1.4 Emergency telephone number
Emergency Phone #: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No 1272/2008
Acute toxicity, Oral (Category 4), H302
Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements
Labelling according Regulation (EC) No 1272/2008
Pictogram

Signal word: Danger
Hazard statement(s)
H302 Harmful if swallowed.
H315 Causes skin irritation.
Precautionary statement(s)

P273 Avoid release to the environment.
P280 Wear protective gloves/ eye protection/ face protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P501 Dispose of contents/ container to an approved waste disposal plant.

Supplemental Hazard Statements

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Synonyms</th>
<th>Cuprous chloride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>ClCu</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>99.00 g/mol</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7758-89-6</td>
</tr>
<tr>
<td>EC-No.</td>
<td>231-842-9</td>
</tr>
<tr>
<td>Index-No.</td>
<td>029-001-00-4</td>
</tr>
</tbody>
</table>

Hazardous ingredients according to Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuprous chloride</td>
<td>Acute Tox. 4; Skin Irrit. 2; Eye</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7758-89-6</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>231-842-9</td>
<td></td>
</tr>
<tr>
<td>Index-No.</td>
<td>029-001-00-4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam. 1; Aquatic Acute 1; Aquatic Chronic 1;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H302, H315, H318, H400, H410</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M-Factor - Aquatic Acute: 10 - Aquatic Chronic: 1</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available
SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Hydrogen chloride gas, Copper oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.
Air, light, and moisture sensitive.
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use (EN 143) respirator cartridges as a backup to engineering controls. If the full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance
Form: Beads
Colour: beige

b) Odour
No data available

c) Odour Threshold
No data available

d) pH
5 at 50 g/l at 20 °C

e) Melting point/freezing point
Melting point/range: 430 °C - lit.

f) Initial boiling point and boiling range
1,490 °C - lit.

g) Flash point
Not applicable

h) Evaporation rate
No data available

i) Flammability (solid, gas)
No data available

j) Upper/lower flammability or explosive limits
No data available

k) Vapour pressure
1.3 mmHg at 546 °C

l) Vapour density
No data available

m) Relative density
4.140 g/cm3

n) Water solubility
0.047 g/l at 20 °C - slightly soluble

o) Partition coefficient: n-octanol/water
No data available

p) Auto-ignition temperature
No data available

q) Decomposition temperature
No data available

r) Viscosity
No data available

s) Explosive properties
No data available

t) Oxidizing properties
No data available
9.2 Other safety information

| Bulk density | 1.7 g/l at 20 °C |

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Air Avoid moisture. Light.

10.5 Incompatible materials
Oxidizing agents, Alkali metals

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hydrogen chloride gas, Copper oxides
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 336 mg/kg(Cuprous chloride)
LC50 Inhalation - Mouse - 1,008 mg/m3(Cuprous chloride)

Skin corrosion/irritation
Skin - Rabbit(Cuprous chloride)
Result: Irritating to skin.

Serious eye damage/eye irritation
Eyes - Rabbit(Cuprous chloride)
Result: Risk of serious damage to eyes.

Respiratory or skin sensitisation
Maximisation Test - Guinea pig(Cuprous chloride)
Does not cause skin sensitisation.
(OECD Test Guideline 406)

Germ cell mutagenicity
Rat(Cuprous chloride)
Ascites tumor
Cytogenetic analysis

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available(Cuprous chloride)

Specific target organ toxicity - single exposure
No data available(Cuprous chloride)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available(Cuprous chloride)
Additional Information
RTECS: GL6990000

Symptoms of systemic copper poisoning may include: capillary damage, headache, central nervous system excitation followed by depression, jaundice, convulsion, renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, copper deposition in the cornea as exemplified by humans with Wilson's disease lead to hemolytic anemia and accelerates arteriosclerosis. (Cuprous chloride)

SECTION 12: Ecological information

12.1 Toxicity
Toxicity to fish LC50 - Oncorhynchus mykiss (rainbow trout) - 0.05 - 0.36 mg/l - 96.0 h (Cuprous chloride)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available (Cuprous chloride)

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chem scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 2802
IMDG: 2802
IATA: 2802

14.2 UN proper shipping name
ADR/RID: COPPER CHLORIDE
IMDG: COPPER CHLORIDE
IATA: Copper chloride

14.3 Transport hazard class(es)
ADR/RID: 8
IMDG: 8
IATA: 8

14.4 Packaging group
ADR/RID: III
IMDG: III
IATA: III

14.5 Environmental hazards
ADR/RID: no
IMDG Marine pollutant: yes
IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.
15.2 **Chemical safety assessment**
For this product a chemical safety assessment was not carried out

**SECTION 16: Other information**

Full text of H-Statements referred to under sections 2 and 3.

- **H302** Harmful if swallowed.
- **H315** Causes skin irritation.
- **H318** Causes serious eye damage.
- **H400** Very toxic to aquatic life.
- **H410** Very toxic to aquatic life with long lasting effects.

**Further information**
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
   Product name: Cyanocobalamin
   CAS-No.: 68-19-9

1.2 Relevant identified uses of the substance or mixture and uses advised against
   Identified uses: Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
   Company: Central Drug House (P) Ltd
   7/28 Vardaan House
   New Delhi-10002
   INDIA
   Telephone: +91 11 49404040
   Email: care@cdhfinechemical.com

1.4 Emergency telephone number
   Emergency Phone #: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
   Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements
   Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.3 Other hazards
   This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances
   Synonyms: CN-Cbl
   α-(5,6-Dimethylbenzimidazolyl)cyanocobamide
   Cyanocobalamin
   Cyanocob(III)alamin
   Formula: C63H88CoN14O14P
   molecular weight: 1,355.37 g/mol
   CAS-No.: 68-19-9
No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Nitrogen oxides (NOx), Oxides of phosphorus, Cobalt/cobalt oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.
Recommended storage temperature 2 - 8 °C
Storage class (TRGS 510): Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance dust (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

CONTROL OF ENVIRONMENTAL EXPOSURE
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Appearance</td>
<td>Form: powder</td>
</tr>
<tr>
<td></td>
<td>Colour: dark red</td>
</tr>
<tr>
<td>b) Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>c) Odour Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>d) pH</td>
<td>No data available</td>
</tr>
<tr>
<td>e) Melting point/freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>No data available</td>
</tr>
<tr>
<td>g) Flash point</td>
<td>No data available</td>
</tr>
<tr>
<td>h) Evaporation rate</td>
<td>No data available</td>
</tr>
<tr>
<td>i) Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>j) Upper/lower flammability or explosive limits</td>
<td>No data available</td>
</tr>
<tr>
<td>k) Vapour pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>No data available</td>
</tr>
<tr>
<td>m) Relative density</td>
<td>No data available</td>
</tr>
</tbody>
</table>
n) Water solubility No data available
o) Partition coefficient: n-octanol/water No data available
p) Auto-ignition temperature No data available
q) Decomposition temperature No data available
r) Viscosity No data available
s) Explosive properties No data available
t) Oxidizing properties No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Decomposes on exposure to light.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong mineral acids

10.6 Hazardous decomposition products
Other decomposition products - No data available
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Nitrogen oxides (NOx), Oxides of phosphorus, Cobalt/cobalt oxides
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Mouse - > 5,000 mg/kg(Cyanocobalamin)
LD50 Intravenous - Mouse - 2 g/kg(Cyanocobalamin)

Skin corrosion/irritation
No data available(Cyanocobalamin)

Serious eye damage/eye irritation
No data available(Cyanocobalamin)

Respiratory or skin sensitisation
Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.(Cyanocobalamin)

Germ cell mutagenicity
No data available(Cyanocobalamin)
Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available(Cyanocobalamin)

Specific target organ toxicity - single exposure
No data available(Cyanocobalamin)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available(Cyanocobalamin)

Additional Information
RTECS: GG3750000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.(Cyanocobalamin)

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Bioaccumulation Chasmichthys gulosus - 3 d (Cyanocobalamin)

Bioconcentration factor (BCF): 3

12.4 Mobility in soil
No data available(Cyanocobalamin)

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.
SECTION 14: Transport information

14.1 UN number
ADR/RID: -    IMDG: -    IATA: -

14.2 UN proper shipping name
ADR/RID: Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

14.3 Transport hazard class(es)
ADR/RID: -    IMDG: -    IATA: -

14.4 Packaging group
ADR/RID: -    IMDG: -    IATA: -

14.5 Environmental hazards
ADR/RID: no    IMDG Marine pollutant: no    IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 11015
Product Name: Dexamethasone
Synonyms: 9-fluoro-11.beta.,17,21-trihydroxy-16.alpha.-methyl-pregna-1,4-diene-3,20-dione; MK-125; NSC 34521;

1.2 Relevant identified uses of the substance or mixture and uses advised against:
Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:
Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI  48108
Web site address: www.caymanchem.com
Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:
Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:
Toxic To Reproduction, Category 2
Specific Target Organ Toxicity (repeated exposure), Category 2

2.2 Label Elements:

GHS Signal Word: Warning
GHS Hazard Phrases:
H361: Suspected of damaging fertility or the unborn child.
H373: May cause damage to {organs} through prolonged or repeated exposure.

GHS Precaution Phrases:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe (dust/fume/gas/mist/vapors/spray).
P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:
P308+313: IF exposed or concerned: Get medical attention/advice.
P314: Get medical attention/advice if you feel unwell.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.
2.3 Adverse Human Health Effects and Symptoms:

Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by inhalation, ingestion, or skin absorption.
May cause damage to (organs) through prolonged or repeated exposure.
May cause eye, skin, or respiratory system irritation.
Suspected of damaging fertility or the unborn child.

To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

### Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-02-2 TU3980000</td>
<td>Dexamethasone</td>
<td>100.0 %</td>
<td>200-003-9 NA</td>
<td>Toxic Repro. 2: H361 STOT (RE) 2: H373 H335</td>
</tr>
</tbody>
</table>

### Section 4. First Aid Measures

4.1 Description of First Aid Measures:

**In Case of Inhalation:** Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

**In Case of Skin Contact:** Immediately wash skin with soap and plenty of water for at least 20 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

**In Case of Eye Contact:** Hold eyelids apart and flush eyes with plenty of water for at least 20 minutes. Have eyes examined and tested by medical personnel.

**In Case of Ingestion:** Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

### Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.

**Unsuitable Extinguishing Media:** A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards:

No data available.

**Flash Pt:** No data.

**Explosive Limits:**

<table>
<thead>
<tr>
<th>LEL</th>
<th>UEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td>No data</td>
</tr>
</tbody>
</table>

**Autoignition Pt:** No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.
Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid raising and breathing dust, and provide adequate ventilation. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

- Eye Protection: Safety glasses
- Protective Gloves: Compatible chemical-resistant gloves
- Other Protective Clothing: Lab coat
- Respiratory Equipment: NIOSH approved respirator, as conditions warrant.
- (Specify Type):
- Work/Hygienic/Maintenance Practices: Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling. No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

- Physical States: [ ] Gas [ ] Liquid [X] Solid
- Appearance and Odor: A crystalline solid
- pH: No data.
- Melting Point: No data.
- Boiling Point: No data.
- Flash Pt: No data.
- Evaporation Rate: No data.
- Flammability (solid, gas): No data available.
- Explosive Limits: LEL: No data. UEL: No data.
- Vapor Pressure (vs. Air or mm Hg): No data.
- Vapor Density (vs. Air = 1): No data.
Specific Gravity (Water = 1): No data.
Solubility in Water: No data.
Solubility Notes: ~0.1 mg/ml in a 1:10 solution of DMSO:PBS (pH 7.2); ~3 mg/ml in EtOH; ~30 mg/ml in DMSO, ~25 mg/ml in DMF;
Octanol/Water Partition Coefficient: No data.
Autoignition Pt: No data.
Decomposition Temperature: No data.
Viscosity: No data.

9.2 Other Information
Percent Volatile: No data.
Molecular Formula & Weight: C22H29FO5  392.5

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ] Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
Polymerization: Will occur [ ] Will not occur [ X ]
10.4 Conditions To Avoid: Protect from light.
10.5 Incompatibility - Materials strong oxidizing agents
To Avoid:
10.6 Hazardous carbon dioxide
Decomposition or carbon monoxide
Byproducts: hydrogen fluoride

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
Dexamethasone - Toxicity Data: Oral LD50 (rat): >3,000 mg/kg; Intraperitoneal LD50 (rat): 54 mg/kg; Subcutaneous LD50 (rat): 14 mg/kg; Subcutaneous LD50 (mouse): 4400 mg/kg; Oral TDLO (man): 0.0143 mg/kg;
Chronic Toxicological Effects: Dexamethasone - Investigated as a drug, hormone, mutagen, natural product, and reproductive effector.
Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here.
See actual entry in RTECS for complete information.
Dexamethasone RTECS Number: TU3980000

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-02-2</td>
<td>Dexamethasone</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.
12.2 Persistence and Degradability: No data available.
12.3 Bioaccumulative Potential: No data available.
12.4 Mobility in Soil: No data available.
12.5 Results of PBT and vPvB assessment: No data available.
Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):
- DOT Proper Shipping Name: Not dangerous goods.
- DOT Hazard Class:
- UN/NA Number:

14.1 LAND TRANSPORT (European ADR/RID):
- ADR/RID Shipping Name: Not dangerous goods.
- UN Number:
- Hazard Class:

14.3 AIR TRANSPORT (ICAO/IATA):
- ICAO/IATA Shipping Name: Not dangerous goods.

Additional Transport Information:
Transport in accordance with local, state, and federal regulations.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-02-2</td>
<td>Dexamethasone</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>Other US EPA or State Lists</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-02-2</td>
<td>Dexamethasone</td>
<td>CAA HAP,ODC: No; CWA NPDES: No; TSCA: Yes - Inventory; CA PROP.65: No</td>
</tr>
</tbody>
</table>

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 03/01/2018
Additional Information About This Product: No data available.
Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.
SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Date of issue: 27.05.2014 Version 1.0

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Catalogue No. 100867
Product name Diisopropyl ether for analysis EMSURE® ACS, Reag. Ph Eur
REACH Registration Number A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No. 108-20-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses Reagent for analysis, Chemical production
For additional information on uses please refer to the Merck Chemicals portal (www.merck-chemicals.com).

1.3 Details of the supplier of the safety data sheet

Company Merck Life Science Private Limited * 8th Floor, Godrej One, Pirojshanagar, Eastern Express Highway-Vikhroli (E),Mumbai – 400079 India * Tel: 0091 22 6210 9000
Responsible Department Quality Assurance * Merck Life Science Private Limited *
e-mail: quality.chemicals@merckgroup.com *
Tel : +91-2267863131-6

1.4 Emergency telephone number

Please contact the regional company representation in your country.

SECTION 2. Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)
Flammable liquid, Category 2, H225
Specific target organ toxicity - single exposure, Category 3, H336
For the full text of the H-Statements mentioned in this Section, see Section 16.

Classification (67/548/EEC or 1999/45/EC)
F Highly flammable
R11
R19
R66
R67
For the full text of the R-phrases mentioned in this Section, see Section 16.
2.2 Label elements
Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms

Signal word
Danger

Hazard statements
H225 Highly flammable liquid and vapour.
H336 May cause drowsiness or dizziness.
EUH019 May form explosive peroxides.
EUH066 Repeated exposure may cause skin dryness or cracking.

Precautionary statements
Prevention
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
Storage
P403 + P235 Store in a well-ventilated place. Keep cool.

Reduced labelling (≤125 ml)
Hazard pictograms

Signal word
Danger

CAS-No. 108-20-3

2.3 Other hazards
None known.

SECTION 3. Composition/information on ingredients

3.1 Substance

Formula \([(\text{CH}_3)\text{CH}]_2\text{O}\) \(\text{C}_6\text{H}_{14}\text{O}\) (Hill)
EC-No. 203-560-6
Molar mass 102.18 g/mol

For the full text of the H-Statements mentioned in this Section, see Section 16.

Remarks No disclosure requirement according to Regulation (EC) No. 1907/2006.
3.2 Mixture
   not applicable

SECTION 4. First aid measures

4.1 Description of first aid measures
After inhalation: fresh air. Call in physician.

After skin contact: wash off with plenty of water. Remove contaminated clothing.

After eye contact: rinse out with plenty of water.


4.2 Most important symptoms and effects, both acute and delayed
irritant effects, Cough, Shortness of breath, Drowsiness, Nausea, Vomiting, Headache, drowsiness, agitation, Unconsciousness, respiratory arrest
Repeated exposure may cause skin dryness or cracking.

4.3 Indication of any immediate medical attention and special treatment needed
No information available.

SECTION 5. Firefighting measures

5.1 Extinguishing media
   Suitable extinguishing media
   Carbon dioxide (CO2), Dry powder, Foam

   Unsuitable extinguishing media
   For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Combustible.
Vapours are heavier than air and may spread along floors.
Forms explosive mixtures with air at ambient temperatures.
Pay attention to flashback.
Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters
   Special protective equipment for firefighters
   In the event of fire, wear self-contained breathing apparatus.

   Further information
   Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid substance contact. Do not breathe vapours, aerosols. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, consult an expert.

Advice for emergency responders: Protective equipment see section 8.

6.2 Environmental precautions
Do not let product enter drains. Risk of explosion.
6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills.
Observe possible material restrictions (see sections 7 and 10).
Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

Indications about waste treatment see section 13.

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Observe label precautions.

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Protected from light.

Recommended storage temperature see product label.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Engineering measures
Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

See section 7.1.

Individual protection measures
Protective clothing needs to be selected specifically for the workplace, depending on concentrations and quantities of the hazardous substances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.

Eye/face protection
Safety glasses
Hand protection

Full contact:
- Glove material: butyl-rubber
- Glove thickness: 0.7 mm
- Breakthrough time: > 480 min

Splash contact:
- Glove material: Nitrile rubber
- Glove thickness: 0.40 mm
- Breakthrough time: > 240 min

The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374, for example KCL 898 Butoject® (full contact), KCL 730 Camatril® -Velours (splash contact).

The breakthrough times stated above were determined by KCL in laboratory tests acc. to EN374 with samples of the recommended glove types.

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Other protective equipment

Flame retardant antistatic protective clothing

Respiratory protection

Required when vapours/aerosols are generated.

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds.

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Environmental exposure controls

Do not let product enter drains.

Risk of explosion.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>liquid</td>
</tr>
<tr>
<td>Colour</td>
<td>colourless</td>
</tr>
<tr>
<td>Odour</td>
<td>ether-like</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>0.02 - 296.6 ppm</td>
</tr>
<tr>
<td>pH</td>
<td>at 20 °C, neutral</td>
</tr>
<tr>
<td>Melting point</td>
<td>-86 °C</td>
</tr>
<tr>
<td>Boiling point/boiling range</td>
<td>67 - 70 °C, at 1,013 hPa</td>
</tr>
</tbody>
</table>
Flash point -28 °C  
Method: c.c.

Evaporation rate No information available.

Flammability (solid, gas) No information available.

Lower explosion limit 1.0 %(V)

Upper explosion limit 21 %(V)

Vapour pressure 175 hPa  
at 20 °C

Relative vapour density 3.5

Density 0.72 g/cm³  
at 20 °C

Relative density No information available.

Water solubility 12 g/l  
at 20 °C

Partition coefficient: n-octanol/water log Pow: 1.52 (20 °C)  
(experimental)  
Bioaccumulation is not expected. (IUCLID)

Auto-ignition temperature No information available.

Decomposition temperature Distillable in an undecomposed state at normal pressure.

Viscosity, dynamic 0.3 mPa.s  
at 20 °C

Explosive properties Not classified as explosive.

Oxidizing properties none

Peroxides May form explosive peroxides.

9.2 Other data

Ignition temperature 405 °C  
Method: DIN 51794

SECTION 10. Stability and reactivity

10.1 Reactivity
Vapours may form explosive mixture with air.

10.2 Chemical stability
Sensitivity to light
Sensitive to air.
Stabilizer
butyl hydroxytoluene (BHT)

10.3 Possibility of hazardous reactions
Risk of explosion with:
Aldehydes, Amines, mineral acids, Oxidizing agents, Zinc

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
various plastics

10.6 Hazardous decomposition products
Peroxides

SECTION 11. Toxicological information
11.1 Information on toxicological effects
Acute oral toxicity
LD50 rat: 5,880 mg/kg (RTECS)
Symptoms: Nausea, Vomiting, Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract., Risk of aspiration upon vomiting.

Acute inhalation toxicity
Symptoms: mucosal irritations, Cough, Shortness of breath

Acute dermal toxicity
LD50 rabbit: > 2,000 mg/kg
OECD Test Guideline 402

Skin irritation
Result: No irritation
Human Skin Model Test

Eye irritation
rabbits
Result: No eye irritation
OECD Test Guideline 405

Sensitisation
This information is not available.

Germ cell mutagenicity
This information is not available.

Carcinogenicity
This information is not available.

Reproductive toxicity
This information is not available.

Teratogenicity
This information is not available.

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
This information is not available.
**11.2 Further information**

After absorption of large quantities:
- Headache, narcosis, agitation, Unconsciousness, respiratory arrest, drop in blood pressure
- Handle in accordance with good industrial hygiene and safety practice.

**SECTION 12. Ecological information**

**12.1 Toxicity**

*Toxicity to fish*
- LC50 *Pimephales promelas* (fathead minnow): 91.7 mg/l; 96 h
  - OECD Test Guideline 203

*Toxicity to daphnia and other aquatic invertebrates*
- EC50 *Daphnia magna* (Water flea): 190 mg/l; 48 h
  - OECD Test Guideline 202

**Toxicity to algae**
- EC50 *Pseudokirchneriella subcapitata* (green algae): > 1,000 mg/l; 96 h
  - OECD Test Guideline 201

**Toxicity to bacteria**
- NOEC activated sludge: 370 mg/l; 3 h
  - OECD Test Guideline 209

**12.2 Persistence and degradability**

*Biodegradability*
- 0 %; 28 d
  - OECD Test Guideline 301D
- Not biodegradable.
- 7 %; 5 d
  - (IUCLID)
- Not readily biodegradable.

*Theoretical oxygen demand (ThOD)*
- 2,833 mg/g
  - (Lit.)

**12.3 Bioaccumulative potential**

*Partition coefficient: n-octanol/water*
- log Pow: 1.52 (20 °C)
  - (experimental)
- Bioaccumulation is not expected. (IUCLID)

**12.4 Mobility in soil**

No information available.

**12.5 Results of PBT and vPvB assessment**

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

**12.6 Other adverse effects**

*Henry constant*
- 259.3 Pa*m³/mol
- Distribution preferentially in air. (Lit.)
Additional ecological information
Discharge into the environment must be avoided.

SECTION 13. Disposal considerations

Waste treatment methods
Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14. Transport information

Land transport (ADR/RID)
14.1 UN number UN 1159
14.2 Proper shipping name DIISOPROPYL ETHER
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous --
14.6 Special precautions for user yes
Tunnel restriction code D/E

Inland waterway transport (ADN)
Not relevant

Air transport (IATA)
14.1 UN number UN 1159
14.2 Proper shipping name DIISOPROPYL ETHER
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous --
14.6 Special precautions for user no

Sea transport (IMDG)
14.1 UN number UN 1159
14.2 Proper shipping name DIISOPROPYL ETHER
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous --
14.6 Special precautions for user yes
EmS F-E S-D

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not relevant
SECTION 15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National legislation
Storage class 3

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out.

SECTION 16. Other information

Full text of H-Statements referred to under sections 2 and 3.

H225 Highly flammable liquid and vapour.
H336 May cause drowsiness or dizziness.

Full text of R-phrases referred to under sections 2 and 3

R11 Highly flammable.
R19 May form explosive peroxides.
R66 Repeated exposure may cause skin dryness or cracking.
R67 Vapours may cause drowsiness and dizziness.

Training advice

Provide adequate information, instruction and training for operators.

Labelling (67/548/EEC or 1999/45/EC)

Symbol(s) F Highly flammable

R-phrase(s) 11-19-66-67 Highly flammable. May form explosive peroxides. Repeated exposure may cause skin dryness or cracking. Vapours may cause drowsiness and dizziness.

S-phrase(s) 9-16-29-33 Keep container in a well-ventilated place. Keep away from sources of ignition - No smoking. Do not empty into drains. Take precautionary measures against static discharges.

EC-No. 203-560-6

Reduced labelling (≤125 ml)

Symbol(s) F Highly flammable

Key or legend to abbreviations and acronyms used in the safety data sheet

Used abbreviations and acronyms can be looked up at www.wikipedia.org.

The information contained herein is based on the present state of our knowledge. It characterises the product with regard to the appropriate safety precautions. It does not represent a guarantee of any properties of the product.
1. Chemical Product and Company Identification

Product Name: N,N-Dimethylformamide
Catalog Codes: SLD4261, SLD3331
CAS#: 68-12-2
RTECS: LQ2100000
TSCA: TSCA 8(b)
Inventory: N,N-Dimethylformamide
CI#: Not applicable.
Synonym: DMF; Dimethyl Formamide
Chemical Name: N,N-Dimethylformamide
Chemical Formula: HCON(CH3)2

COMPANY IDENTIFICATION

Supplier: Pon Pure Chemicals Group
CHENNAI, TAMILNADU, INDIA

24 Hour Health Emergency
(91) 8939878447
(91) 9444038694

Transportation Emergency Phone
(91) 8939768680

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Place</th>
<th>EMERGENCY TELEPHONE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pon Pure Chemicals</td>
<td>India</td>
<td>Day Emergency – 044-26161803-26161809</td>
</tr>
</tbody>
</table>

2. Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>{N,N-}Dimethylformamide</td>
<td>68-12-2</td>
<td>100</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: N,N-Dimethylformamide: ORAL (LD50): Acute: 2800 mg/kg [Rat]. 2900 mg/kg [Mouse]. 5000 mg/kg [Rabbit]. DERMAL (LD50): Acute: 4720 mg/kg [Rabbit].

3. Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. The substance is toxic to kidneys, liver, central nervous system (CNS). The substance may be toxic to blood, the nervous system. Repeated or prolonged exposure to the substance can produce target organs damage.

4. First Aid Measures

**Eye Contact:**
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an antibacterial cream. Seek immediate medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

**Ingestion:**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.
5: Fire and Explosion Data

Flammability of the Product  : Flammable.
Auto-Ignition Temperature  : 445°C (833°F)
Flash Points    : CLOSED CUP: 57.778°C (136°F). (Tagliabue.)
                    : OPEN CUP: 67°C (152.6°F).
Flammable Limits   : LOWER: 2.2%  UPPER: 15.2%
Products of Combustion : These products are carbon oxides (CO, CO\textsubscript{2}),
                                      nitrogen oxides (NO, NO\textsubscript{2}...).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
A mixture of triethylaluminum and DMF explodes when heated. DMF + potassium permanganate may explode.

6. Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.
7. Handling and Storage

Precautions:
Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

8. Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 (ppm) from ACGIH (TLV) [United States] TWA: 30 (mg/m3) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

9. Physical and Chemical Properties

Physical state and appearance : Liquid.
Odor : Amine like. (Slight.)
Taste : Not available.
Molecular Weight : 73.09 g/mole
Color : Colorless to light yellow.
pH (1% soln/water) : Not available.
Boiling Point : 153°C (307.4°F)
**Melting Point**: -61°C (-77.8°F)

**Critical Temperature**: 374°C (705.2°F)

**Specific Gravity**: 0.949 (Water = 1)

**Vapor Pressure**: 0.3 kPa (@ 20°C)

**Vapor Density**: 2.51 (Air = 1)

**Volatile**: Not available.

**Odor Threshold**: 100 ppm

**Water/Oil Dist. Coeff.**: The product is more soluble in water; log(oil/water) = -1

**Ionicity (in Water)**: Not available.

**Dispersion Properties**: See solubility in water, diethyl ether, acetone.

**Solubility**: Easily soluble in cold water, hot water. Soluble in diethyl ether, acetone. Miscible organic solvents. Soluble in benzene, and chloroform.

### 10: Stability and Reactivity Data

**Stability**: The product is stable.

**Instability Temperature**: Not available.

**Conditions of Instability**: Heat, ignition sources (sparks, flames), incompatible materials

**Incompatibility with various substances**: Reactive with oxidizing agents, acids.

**Corrosivity**: Non-corrosive in presence of glass.

**Special Remarks on Reactivity**: Can react vigorously with oxidizing agents, halogenated hydrocarbons, and inorganic nitrates.

Incompatible with carbon tetrachloride, alkyl aluminums, sodium tetrahydroborate, nitrates, chromic acid, diisocyanatomethane, triethylaluminum, sodium hydride, lithium azide, metallic sodium, bromine, magnesium nitrate, potassium permanganate, nitric acid, chromium trioxide, borohydrides, phosphorus trioxide, diborane, octafluoroisobutyrate, sodium nitrite, perchloryl fluoride, postassium methyl 4,4'-dinitrobutyrate. Reaction with inorganic acid chlorides, such as phosphorous oxychloride and thionyl chloride, may form dimethylcarbamoyl, a suspect carcinogen.

May release dimethylamine and carbon monoxide if heated above 350 C (662 F).

**Special Remarks on Corrosivity**: Pure dimethylformamide is essentially non-corrosive to metals. However copper, tin and their alloys should be avoided.

**Polymerization**: Will not occur.
11. Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2800 mg/kg [Rat]. Acute dermal toxicity (LD50): 4720 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 9400 1 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Classified POSSIBLE for human. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [POSSIBLE]. Causes damage to the following organs: kidneys, liver, central nervous system (CNS). May cause damage to the following organs: blood, the nervous system.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LCL[Rat] - Route: Inhalation; Dose: 5000 ppm/6H

Special Remarks on Chronic Effects on Humans:
May affect genetic material. May cause adverse reproductive effects(paternal and maternal) and birth defects. Embryotoxic and/or foetotoxic in animal. Passes through the placental barrier in animal. May cause cancer although IARC evidence for cancer in humans shows inadequate data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with itching, burning, redness, swelling, or rash. It may be absorbed through the skin in toxic amounts and cause systemic effects similar to that of ingestion. It may facilitate the absorption of other chemical substances through the skin. If there is significant potential for skin contact, monitoring should be done to measure the level of DMF metabolites in urine specimens at the end of the shift. It is common practice to limit end-of-shift metabolites at or below 40 ppm expressed as n-monomethylformamide or a single individual or at or below 20 ppm MMF for several workers doing the same job. Eyes: Causes eye irritation (possibly severe) with tearing pain or blurred vision. Inhalation: May cause respiratory tract irritation. Short-term overexposure by inhalation may affect
behavior/central nervous system (convulsions, muscle weakness and other symptoms similar to that of acute ingestion), respiration (dyspnea). Ingestion: It can cause gastrointestinal tract irritation with heartburn, abdominal pain, nausea, vomiting or diarrhea. It may also affect the cardiovascular system (hypertension, tachycardia, ECG abnormalities), blood (elevated white blood cell counts), and liver damage (hepatomegaly, jaundice, altered liver enzymes, fatty liver

12: Ecological Information
Ecotoxicity : Not available.
BOD5 and COD : Not available.
Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.
Special Remarks on the Products of Biodegradation: Not available.

13: Disposal Considerations
Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

14. Transport Information
DOT Classification : CLASS 3: Flammable liquid.
Identification : : N,N-Dimethylformamide UNNA: 2265 PG: III
Special Provisions for Transport: Not available.

15. Other Regulatory Information
Federal and State Regulations:
Director’s List of Hazardous Substances: N,N-Dimethylformamide TSCA 8(b) inventory: N,N-Dimethylformamide TSCA 8(d) H and S data reporting: N,N-Dimethylformamide: 12/19/95 SARA 313 toxic chemical notification and release reporting: N,N-Dimethylformamide CERCLA: Hazardous substances.: N,N-Dimethylformamide: 100 lbs. (45.36 kg)

Other Regulations:

Other Classifications:
WHMIS (Canada):
CLASS B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R20/21- Harmful by inhalation and in contact with skin. R36- Irritating to eyes. R61- May cause harm to the unborn child. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

| Health Hazard | 2 |
| Fire Hazard | 2 |
| Reactivity | 0 |
| Personal Protection | h |

National Fire Protection Association (U.S.A.):

| Health | 1 |
| Flammability | 2 |
| Reactivity | 0 |

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

16: Other Information

Disclaimer:
The information and recommendations contained herein are, to the best of Pon Pure Chemicals Group knowledge and belief, accurate and reliable as of the date issued.
You can contact Pon Pure Chemicals Group to ensure that this document is the most current available from Pon Pure Chemicals Group. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted.
MATERIAL SAFETY DATA SHEET (MSDS) - ETHYL ACETATE

1. Product Identification
Synonyms: Acetic acid ethyl ester; Acetic ether; Acetoxyethane; Ethyl Acetic Ester; Ethyl ethanoate
CAS No.: 141-78-6
Molecular Weight: 88
Chemical Formula: CH₃COOC₂H₅

COMPANY IDENTIFICATION
Supplier: Pon Pure Chemicals Group
CHENNAI, TAMILNADU, INDIA
24 Hour Health Emergency
(91) 8939878447
(91) 9444038694
Transportation Emergency Phone
(91) 8939768680

2. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS No</th>
<th>Percent</th>
<th>Hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl Acetate</td>
<td>141-78-6</td>
<td>99 - 100%</td>
<td>Yes</td>
</tr>
</tbody>
</table>

3. Hazards Identification
Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Health Rating: 2 - Moderate (Life) Flammability
Rating: 3 - Severe (Flammable) Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation can cause severe irritation of mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. High concentrations may cause lung damage. An irritant to the nose, throat, and upper respiratory tract. Exposure to high concentrations have a narcotic effect and may cause liver and kidney damage.

Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. Repeated or prolonged contact with the skin has a defatting effect and may cause dryness, cracking, and possibly dermatitis.

Eye Contact:
Causes irritation, redness, and pain.

Chronic Exposure:
Chronic overexposure may cause anemia with leukocytosis (transient increase in the white blood cell count) and damage to the liver and kidneys.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: -4C (25F) CC Auto-ignition temperature: 426C (799F) Flammable limits in air % by volume: lel: 2.0; uel: 11.5

Flammable Liquid and Vapor! Contact with strong oxidizers may cause fire.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require
reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

### 7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

### 8. Exposure Controls / Personal Protection

#### Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 400 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 400 ppm (TWA), A4 - Not classifiable as a human carcinogen.

#### Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

#### Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a full face piece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

#### Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
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.

9. Physical/Chemical Properties
Appearance: Clear liquid.
Odor: Fruity odor.
Solubility: 1 ml/10ml water @ 25C
Specific Gravity: 0.902 @ 20C/4C
pH: No information found.
% Volatiles by volume @ 21C (70F): 100
Boiling Point: 77C (171F)
Melting Point: -83C (-117F)
Vapor Density (Air=1): 3.0
Vapor Pressure (mm Hg): 76 @ 20C (68F)
Evaporation Rate (BuAc=1): 6

10. Stability and Reactivity Data
Stability: Stable under ordinary conditions of use and storage. Heat will contribute to instability. Slowly decomposed by moisture.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Avoid heat, flame and other sources of ignition. Contact with nitrates, strong oxidizers, strong alkalis, or strong acids may cause fire and explosions. Will attack some forms of plastic, rubber, and coatings. Can react vigorously with chlorosulfonic acid (LiAlH₂ + 2-chloromethyl furan), oleum, K-tert-butoxide.
Conditions to Avoid:
No information found.

11. Toxicological Information
Inhalation rat LC50: 200 gm/m3; oral rat LD50: 5620 mg/kg; Skin rabbit LD50: > 20 ml/kg.
Investigated as a mutagen.
12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life of less than 1 day. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity:
This material is not expected to be toxic to aquatic life.

13. Disposal Considerations
Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. MSDS Transport Information

Domestic (Land, D.O.T.)
Proper Shipping Name : ETHYL ACETATE
Hazard Class : 3
UN/NA : UN1173
Packing Group : II
Information reported for product/size: 400LB

International (Water, I.M.O.)
Proper Shipping Name: ETHYL ACETATE
Hazard Class : 3
UN/NA : UN1173
Packing Group : II
Information reported for product/size: 400LB
15. Regulatory Information

Australian Hazchem Code: 3[Y]E

Poison Schedule: None allocated.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Label Precautions:
Keep away from heat, sparks and flame.
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Disclaimer:
The information and recommendations contained herein are, to the best of Pon Pure Chemicals Group knowledge and belief, accurate and reliable as of the date issued. You can contact Pon Pure Chemicals Group to ensure that this document is the most current available from Pon Pure Chemicals Group. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to
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1. Product Identification

Synonyms: Acetic acid ethyl ester; Acetic ether; Acetoxyethane; Ethyl Acetic Ester; Ethyl ethanoate

CAS No.: 141-78-6
Molecular Weight: 88
Chemical Formula: \( \text{CH}_3\text{COOC}_2\text{H}_5 \)

COMPANY IDENTIFICATION

Supplier: Pon Pure Chemicals Group
CHENNAI, TAMILNADU, INDIA

24 Hour Health Emergency
(91) 8939878447
(91) 9444038694

Transportation Emergency Phone
(91) 8939768680

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<th>Place</th>
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<td>India</td>
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2. Composition/Information on Ingredients

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3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Health Rating: 2 - Moderate (Life) Flammability
Potential Health Effects

Inhalation:
Inhalation can cause severe irritation of mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. High concentrations may cause lung damage. An irritant to the nose, throat, and upper respiratory tract. Exposure to high concentrations have a narcotic effect and may cause liver and kidney damage.

Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. Repeated or prolonged contact with the skin has a defatting effect and may cause dryness, cracking, and possibly dermatitis.

Eye Contact:
Causes irritation, redness, and pain.

Chronic Exposure:
Chronic overexposure may cause anemia with leukocytosis (transient increase in the white blood cell count) and damage to the liver and kidneys.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: -4°C (25°F) CC Auto-ignition temperature: 426°C (799°F) Flammable limits in air % by volume: lEL: 2.0; uEL: 11.5
Flammable Liquid and Vapor! Contact with strong oxidizers may cause fire.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require
reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

7. Handling and Storage
Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls /Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL): 400 ppm (TWA)
- ACGIH Threshold Limit Value (TLV): 400 ppm (TWA), A4 - Not classifiable as a human carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full face piece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
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.

9. Physical/Chemical Properties

- **Appearance:** Clear liquid.
- **Odor:** Fruity odor.
- **Solubility:** 1 ml/10ml water @ 25C
- **Specific Gravity:** 0.902 @ 20C/4C
- **pH:** No information found.
- **% Volatiles by volume @ 21C (70F):** 100
- **Boiling Point:** 77C (171F)
- **Melting Point:** -83C (-117F)
- **Vapor Density (Air=1):** 3.0
- **Vapor Pressure (mm Hg):** 76 @ 20C (68F)
- **Evaporation Rate (BuAc=1):** 6

10. Stability and Reactivity Data

- **Stability:** Stable under ordinary conditions of use and storage. Heat will contribute to instability. Slowly decomposed by moisture.

- **Hazardous Decomposition Products:** Carbon dioxide and carbon monoxide may form when heated to decomposition.

- **Hazardous Polymerization:** Will not occur.

- **Incompatibilities:** Avoid heat, flame and other sources of ignition. Contact with nitrates, strong oxidizers, strong alkalis, or strong acids may cause fire and explosions. Will attack some forms of plastic, rubber, and coatings. Can react vigorously with chlorosulfonic acid (LiAlH$_2$ + 2-chloromethyl furan), oleum, K-tert-butoxide.

- **Conditions to Avoid:** No information found.

11. Toxicological Information

- Inhalation rat LC50: 200 gm/m3; oral rat LD50: 5620 mg/kg; Skin rabbit LD50: > 20 ml/kg.

Investigated as a mutagen.
12. **Ecological Information**

**Environmental Fate:**
When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life of less than 1 day. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to have a half-life between 1 and 10 days.

**Environmental Toxicity:**
This material is not expected to be toxic to aquatic life.

13. **Disposal Considerations**

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. **MSDS Transport Information**

**Domestic (Land, D.O.T.)**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>ETHYL ACETATE</th>
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<tr>
<td>Hazard Class</td>
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<td>Packing Group</td>
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Information reported for product/size: 400LB

**International (Water, I.M.O.)**

<table>
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<th>Proper Shipping Name: ETHYL ACETATE</th>
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<tr>
<td>Hazard Class: 3</td>
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<td>UN/NA: UN1173</td>
</tr>
<tr>
<td>Packing Group: II</td>
</tr>
</tbody>
</table>

Information reported for product/size: 400LB
15. Regulatory Information
Australian Hazchem Code: 3[Y]E
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information
NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0
Label Hazard Warning:
WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. In all cases, get medical attention.
Product Use:
Laboratory Reagent.

Disclaimer:
The information and recommendations contained herein are, to the best of Pon Pure Chemicals Group knowledge and belief, accurate and reliable as of the date issued. You can contact Pon Pure Chemicals Group to ensure that this document is the most current available from Pon Pure Chemicals Group. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to
insure proper health, safety and other necessary information is included with and/or on the
container. Appropriate warnings and safe-handling procedures should be provided to handlers
and users. Alteration of this document is strictly prohibited. Except to the extent required by
law, re-publication or retransmission of this document, in whole or in part, is not permitted.
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
   Product name : Ferrous Sulphate
   CAS-No. : 7782-63-0

1.2 Relevant identified uses of the substance or mixture and uses advised against
   Identified uses : Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
   Company : Central Drug House (P) Ltd
   7/28 Vardaan House
   New Delhi-10002
   INDIA
   Telephone : +91 11 49404040
   Email : care@cdhfinechemical.com

1.4 Emergency telephone number
   Emergency Phone # : +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
   Classification according to Regulation (EC) No 1272/2008
   Acute toxicity, Oral (Category 4), H302
   Skin irritation (Category 2), H315
   Eye irritation (Category 2), H319
   For the full text of the H-Statements mentioned in this Section, see Section 16.

   Classification according to EU Directives 67/548/EEC or 1999/45/EC
   Xn Harmful R22
   Xi Irritant R36/38
   For the full text of the R-phrases mentioned in this Section, see Section 16.

2.2 Label elements
   Labelling according Regulation (EC) No 1272/2008
   Pictogram

   Signal word Warning
   Hazard statement(s)
   H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statement(s)
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Supplemental Hazard Statements

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances
Synonyms : Ferrous sulfate heptahydrate
Formula : FeO4S · 7H2O
Molecular weight : 278.01 g/mol
CAS-No. : 7782-63-0
EC-No. : 231-753-5
Index-No. : 026-003-01-4

Hazardous ingredients according to Regulation (EC) No 1272/2008

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<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
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</thead>
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<td>Ferrous sulfate heptahydrate</td>
<td>Acute Tox. 4; Skin Irrit. 2; Eye</td>
<td>&lt;= 100 %</td>
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<td>EC-No.</td>
<td>231-753-5</td>
<td>Irrit. 2; H302, H315, H319</td>
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Hazardous ingredients according to Directive 1999/45/EC

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<th>Component</th>
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<td>Ferrous sulfate heptahydrate</td>
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<td>&lt;= 100 %</td>
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</tr>
<tr>
<td>EC-No.</td>
<td>231-753-5</td>
<td></td>
</tr>
<tr>
<td>Index-No.</td>
<td>026-003-01-4</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements and R-Phrases mentioned in this Section, see Section 16

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Sulphur oxides, Iron oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.
Air sensitive. Store under inert gas. hygroscopic
Storage class (TRGS 510): Non Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters
Components with workplace control parameters

8.2 Exposure controls
Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment
Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).
**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Do not let product enter drains.

**SECTION 9: Physical and chemical properties**

9.1 Information on basic physical and chemical properties

- **a)** Appearance  
  Form: solid

- **b)** Odour  
  No data available

- **c)** Odour Threshold  
  No data available

- **d)** pH  
  3.0 - 4.0 at 50 g/l at 25 °C

- **e)** Melting point/freezing point  
  Melting point/range: 64 °C

- **f)** Initial boiling point and boiling range  
  No data available

- **g)** Flash point  
  Not applicable

- **h)** Evaporation rate  
  No data available

- **i)** Flammability (solid, gas)  
  No data available

- **j)** Upper/lower flammability or explosive limits  
  No data available

- **k)** Vapour pressure  
  14.6 hPa at 25 °C

- **l)** Vapour density  
  No data available

- **m)** Relative density  
  1.898 g/cm3 at 25 °C

- **n)** Water solubility  
  No data available

- **o)** Partition coefficient: n-octanol/water  
  No data available

- **p)** Auto-ignition temperature  
  No data available

- **q)** Decomposition temperature  
  No data available

- **r)** Viscosity  
  No data available

- **s)** Explosive properties  
  No data available

- **t)** Oxidizing properties  
  No data available

9.2 Other safety information

- **Bulk density**  
  1.300 kg/m3
SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Mouse - 1.520 mg/kg
LD50 Intraperitoneal - Mouse - 245 mg/kg
LD50 Intravenous - Mouse - 51 mg/kg

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: NO8510000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available
12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: - IMDG: - IATA: -

14.2 UN proper shipping name
ADR/RID: Not dangerous goods
IMDG: Not dangerous goods
IATA: Not dangerous goods

14.3 Transport hazard class(es)
ADR/RID: - IMDG: - IATA: -

14.4 Packaging group
ADR/RID: - IMDG: - IATA: -

14.5 Environmental hazards
ADR/RID: no IMDG Marine pollutant: no IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
No data available

15.2 Chemical Safety Assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox. Acute toxicity
Eye Irrit. Eye irritation
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
Skin Irrit. Skin irritation
Full text of R-phrases referred to under sections 2 and 3

Xn Harmful
R22 Harmful if swallowed.
R36/38 Irritating to eyes and skin.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
1. PRODUCT AND COMPANY IDENTIFICATION

Product: Hydrochloric Acid
Product Number(s): PF021, PF022
CAS#: 7647-01-0
Synonyms: Muriatic acid; Hydrogen chloride, aqueous; Chlorohydric acid
Manufacturer: Pioneer Forensics, LLC
804 E. Eisenhauer Blvd.
Loveland, CO 80537
Ph: (970) 292-8487

Emergency Number: (800) 255-3924 (CHEM-TEL)
Customer Service: (970) 292-8487

2. HAZARDS IDENTIFICATION

Emergency Overview: DANGER! Corrosive. Causes severe skin, eye, and digestive tract burns. Harmful if swallowed. Mist or vapor extremely irritating to eyes and respiratory tract.

Safety Ratings:
- Health: 3, Severe
- Reactivity: 1, Slight
- Flammability: 0, None
- Contact: 4, Extreme

OSHA Regulatory Status: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Acute Health Effects:

Routes of Exposure: Inhalation, ingestion, skin contact, eye contact

Inhalation: Corrosive. May cause damage to mucous membranes in nose, throat, lungs and bronchial system.

Ingestion: Corrosive. Harmful if swallowed. May produce burns to the lips, oral cavity, upper airway, esophagus and digestive tract.

Skin Contact: Corrosive. Causes severe burns.

Eye Contact: Corrosive. Causes severe burns. Vapor or spray may cause eye damage, impaired sight or blindness.

Target Organs: Skin, respiratory system, eyes, lungs

Chronic Health Effects: Corrosive. Prolonged contact causes serious tissue damage.
Aggravation of: Repeated or prolonged exposure to the substance can produce target organs damage.

Medical Conditions: Persons with pre-existing skin disorders or eye problems may be more susceptible to the effects of the substance.

Potential Environmental Effects: May affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

### 3. COMPOSITION AND INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS#</th>
<th>Chemical Formula</th>
<th>% by Weight</th>
<th>Hazardous</th>
<th>% by Weight</th>
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</thead>
<tbody>
<tr>
<td>Hydrochloric Acid</td>
<td>7647-01-0</td>
<td>HCl</td>
<td>36.46</td>
<td>Yes</td>
<td>36.5 - 38.0</td>
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<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>H2O</td>
<td>18.02</td>
<td>No</td>
<td>62.0 - 63.5</td>
</tr>
</tbody>
</table>

### 4. FIRST AID MEASURES

First Aid Procedures:

**Inhalation:** Remove to fresh air. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Get medical attention immediately.

**Ingestion:** Do not induce vomiting. If vomiting occurs, keep head low so that vomit does not enter lungs. Never give anything by mouth to an unconscious person. GET MEDICAL ATTENTION IMMEDIATELY.

**Skin Contact:** Flush affected area with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Get medical attention immediately.

**Eye Contact:** Check for and remove contact lenses. Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

**General Advice:** In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

**Notes to Physician:** Treat symptomatically. Keep victim under observation.

### 5. FIRE FIGHTING MEASURES

**NFPA Ratings:** Health: 3 Inflammability: 0 Reactivity: 1

**Flammable Properties:** The material is not flammable.

**Flash Point:** Not applicable

**Auto-ignition Temp:** Not applicable

**Flammable Limits in Air (% by volume):** Not applicable

**Suitable Extinguishing Media:** Water, dry powder, foam, carbon dioxide

**Unsuitable Extinguishing Media:** No information found
**Hazardous Combustion Products:**
Hydrogen chloride. Chlorine. May decompose upon heating to produce corrosive and/or toxic fumes.

**Specific Hazards:**
Fire may produce irritating, corrosive, and/or toxic gases.

**Special Protective Equipment For Firefighters:**
As in any fire, wear MSHA/NIOSH approved (or equivalent) self-contained positive pressure or pressure-demand breathing apparatus and full protective gear.

**Specific Methods:**
Use water spray to cool unopened containers. Cool containers exposed to flames with flooding quantities of water until well after the fire is out. In the event of fire and/or explosion do not breathe fumes.

6. ACCIDENTAL RELEASE MEASURES

**Personal Precautions:**
Ventilate area of leak or spill. Isolate hazard area and keep unnecessary and unprotected personnel away from the area of the leak or spill. Keep upwind. Keep out of low areas. Wear appropriate personal protective equipment as specified in the Exposure Control and Personal Protection Section 8. Avoid contact with eyes, skin, and clothing.

**Environmental Precautions:**
Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground. In case of large spill, dike if needed.

**Methods for Containment:**
Stop the flow of material, if this is without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible.

**Methods for Cleaning Up:**
Absorb spill with an inert material (e.g. vermiculite, dry sand, earth, cloth, fleece), and place in a suitable non-combustible container for reclamation or disposal. Do not use combustible materials, such as sawdust. Clean contaminated surface thoroughly. Neutralize spill area and washings with soda ash or lime. Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations.

7. HANDLING AND STORAGE

**Handling:**
Wear personal protective equipment (see section 8). Use only in well-ventilated areas. Provide sufficient air exchange and/or exhaust in work rooms. Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Do not ingest. When using, do not eat, smoke, or drink. Keep away from incompatible materials. Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly after handling. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquids). Observe all warnings and precautions listed for the product. Use caution when combining with water. DO NOT add water to acid. ALWAYS add acid to water while stirring to prevent release of heat, steam, and fumes.

**Storage:**
Store in a cool, dry, ventilated area away from incompatible materials. Store in original container. Keep containers tightly closed and upright. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. EXPOSURE CONTROL AND PERSONAL PROTECTION

**Exposure Limits:**
ACGIH: Ceiling: 2 ppm  
OSHA: Ceiling: 5 ppm  
7 mg/m³

**Engineering Controls:**
Ensure adequate ventilation. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls.
to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Explosion proof exhaust ventilation should be used.

Personal Protective Equipment:

Eye/Face Protection: Wear safety glasses with side shields or goggles and a face shield.

Skin Protection: Wear appropriate chemical resistant clothing (with long sleeves) and appropriate chemical resistant gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Respirator type: Chemical respirator with acid gas cartridge. Use a positive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

General Hygiene Considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Provide eyewash station and safety shower.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

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<thead>
<tr>
<th>Physical State:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Appearance:</td>
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<tr>
<td>Color:</td>
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<tr>
<td>Odor:</td>
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<tr>
<td>Molecular Formula:</td>
<td>HCl</td>
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<tr>
<td>Molecular Weight:</td>
<td>36.46</td>
</tr>
<tr>
<td>pH:</td>
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<tr>
<td>Specific Gravity:</td>
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<td>Freezing/Melting Point:</td>
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<tr>
<td>Boiling Point:</td>
<td>50.5 °C (123 °F)</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Auto Ignition Temperature:</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Flammable Limits in Air (% by Volume):
- Upper: Not applicable
- Lower: Not applicable

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<thead>
<tr>
<th>Solubility:</th>
<th>Miscible with water</th>
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<tr>
<td>Vapor Pressure:</td>
<td>25 kPa at 25°C (estimate)</td>
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<td>Vapor Density:</td>
<td>1.3 (estimate)</td>
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<td>Odor threshold (ppm):</td>
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</tr>
<tr>
<td>Evaporation Rate:</td>
<td>No information found</td>
</tr>
<tr>
<td>Partition Coefficient</td>
<td>No information found</td>
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<tr>
<td>(n-octanol/water):</td>
<td>No information found</td>
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</tbody>
</table>

### 10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: Incompatibles

Incompatible Materials: Bases, metals, oxidizing agents, acids, amines, reducing agents, organic materials
Hazardous Decomposition Products: Hydrogen chloride, chlorine. May decompose upon heating to product corrosive and/or toxic fumes.

Possibility of Hazardous Reactions: Can react vigorously, violently or explosively with incompatible materials listed above.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Toxicological Data:
- Oral Rat LD50: 240 mg/kg (estimate)
- Oral Rabbit LD50: 900 mg/kg
- Inhalation Rat LC50: 3124 mg/L 1 H

Acute Effects: Strongly corrosive. May cause deep tissue damage. Harmful if swallowed.

Local Effects: Causes severe burns. Mist or vapor extremely irritating to eyes and respiratory tract.

Sensitization: Not a skin sensitizer.

Chronic Effects: Corrosive. Prolonged or repeated skin contact causes serious tissue damage.

Carcinogenic Effects: This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

- ACGIH: A4 – Not classifiable as a human carcinogen
- IARC: 3 – Not classifiable as to carcinogenicity of humans

Skin Corrosion/Irritation: Corrosive to skin and eyes.

Epidemiology: No epidemiological data is available for this product.

Mutagenicity: No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Neurological Effects: No information found.

Reproductive Effects: Contains no ingredient listed as toxic to reproduction.

Teratogenic Effects: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Target Organs and Symptoms: Corrosive effects. Mucus membranes, skin, eyes, kidneys, liver, respiratory tract

12. ECOLOGICAL INFORMATION

Ecotoxicological Data: LC50 Western mosquitofish (Gambusia affinis): 282 mg/L 96 H

Ecotoxicity: This product may affect the acidity (pH) in water with risk of harmful effects to aquatic organisms.

Environmental Effects: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and Degradability: Expected to be readily biodegradable.
Partition Coefficient
(n-octanol/water): No information found.

13. DISPOSAL INFORMATION

Disposal Instructions: Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. All wastes must be handled in accordance with local, state and federal regulations.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied. Offer rinsed packaging material to local recycling facilities.

Waste Codes: D002: Waste corrosive material (pH ≤ 2 or pH ≥12.5, or corrosive to steel)

14. TRANSPORT INFORMATION

DOT:

UN Number: UN1789
Proper Shipping Name: Hydrochloric Acid
Hazard Class: 8
Packaging Group: II
ERG Number: 157

15. REGULATORY INFORMATION

U.S. Federal Regulations:

OSHA: This product is considered a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Inventory: Hydrochloric Acid; Water

U.S. EPCRA (SARA Title III):

Sections 311/312:

<table>
<thead>
<tr>
<th>Hazard Categories</th>
<th>List (Yes/No)</th>
</tr>
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<tbody>
<tr>
<td>Section 311 – Hazardous Chemical</td>
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</tr>
<tr>
<td>Immediate Hazard</td>
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</tr>
<tr>
<td>Delayed Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Pressure Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Reactivity Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

Section 302: Extremely Hazardous Substance: Hydrochloric Acid
Reportable Quantity: 5000 lbs
Threshold Planning Quantity: 500 lbs

Section 313: Toxic chemical or category: Hydrochloric Acid
De minimis concentration: 1.0%

CERCLA:
Hydrochloric Acid: 5000 lbs

International Inventories:

<table>
<thead>
<tr>
<th>Country(s) or Region</th>
<th>Inventory Name</th>
<th>On Inventory (Yes/No)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of Existing Commercial Chemical Substances (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>Yes</td>
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<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
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</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A “Yes” indicates that the listed component(s) of this product comply with the inventory requirements administered by the governing country(s)

16. OTHER INFORMATION

Product Use: Laboratory and/or field reagent

Disclaimer: Pioneer Forensics LLC provides the information in this Material Safety Data Sheet in the belief that it is reliable but assumes no responsibility for its completeness or accuracy. The physical properties reported in this MSDS are obtained from the literature and do not constitute product specifications. Pioneer Forensics LLC makes and gives no representations or warranties with respect to the information contained herein or the product to which it refers, whether express, implied, or statutory, including without limitation, warranties of accuracy, completeness, merchantability, non-infringement, performance, safety, suitability, stability, and fitness for a particular purpose. No warranty against infringement of any patent, copyright or trademark is made or implied. This MSDS is intended only as a guide to the appropriate handling of the material by a properly trained person. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. Accordingly, Pioneer Forensics LLC assumes no liability whatsoever for the use of or reliance upon this information including results obtained, incidental or consequential damages, or lost profits.

Issue Date: 12/03/2012

Reason for Revision: Not applicable
Hydrocortisone

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 20739

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Toxic To Reproduction, Category 2
Specific Target Organ Toxicity (repeated exposure), Category 2

2.2 Label Elements:

GHS Signal Word: Warning

GHS Hazard Phrases:
H361: Suspected of damaging fertility or the unborn child.
H373: May cause damage to (organs) through prolonged or repeated exposure.

GHS Precaution Phrases:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe (dust/fume/gas/mist/vapors/spray).
P280: Wear (protective gloves/protective clothing/eye protection/face protection).

GHS Response Phrases:
P308+313: IF exposed or concerned: Get medical attention/advice.
P314: Get medical attention/advice if you feel unwell.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.
2.3 Adverse Human Health Effects and Symptoms: Material may be irritating to the mucous membranes and upper respiratory tract. May be harmful by inhalation, ingestion, or skin absorption. May cause damage to (organs) through prolonged or repeated exposure. May cause eye, skin, or respiratory system irritation. Suspected of damaging fertility or the unborn child.

To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

### Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-23-7 GM8925000</td>
<td>Cortisol</td>
<td>100.0 %</td>
<td>200-020-1 NA</td>
<td>Toxic Repro. 2: H361 STOT (RE) 2: H373</td>
</tr>
</tbody>
</table>

### Section 4. First Aid Measures

4.1 Description of First Aid Measures:

- **In Case of Inhalation:** Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

- **In Case of Skin Contact:** Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

- **In Case of Eye Contact:** Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

- **In Case of Ingestion:** Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

### Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media:

Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.

Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media:

A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards:

- **Flash Pt:** No data available.
- **Explosive Limits:** LEL: No data. UEL: No data.
- **Autoignition Pt:** No data.

5.3 Fire Fighting Instructions:

As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.
Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses
Protective Gloves: Compatible chemical-resistant gloves
Other Protective Clothing: Lab coat
Respiratory Equipment: NIOSH approved respirator, as conditions warrant.
(Specify Type): Do not take internally.

Work/Hygienic/Maintenance Practices: Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling. No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States: [ ] Gas [ ] Liquid [ X ] Solid
Appearance and Odor: A crystalline solid
pH: No data.
Melting Point: No data.
Boiling Point: No data.
Flash Pt: No data.
Evaporation Rate: No data.
Flammability (solid, gas): No data available.
Explosive Limits: LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg): No data.
Vapor Density (vs. Air = 1): No data.
Specific Gravity (Water = 1): No data.
Solubility in Water: No data.
Solubility Notes: ~0.2 mg/ml in a 1:4 solution of DMF:PBS (pH 7.2); ~2 mg/ml in EtOH; ~20 mg/ml in DMSO; ~30 mg/ml in DMF;
Octanol/Water Partition Coefficient: No data.
Autoignition Pt: No data.
Decomposition Temperature: No data.
Viscosity: No data.

9.2 Other Information
Percent Volatile: No data.
Molecular Formula & Weight: C21H30O5  362.5

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ]  Stable [ X ]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
10.4 Conditions To Avoid: protect from light
10.5 Incompatibility - Materials strong oxidizing agents
To Avoid:
10.6 Hazardous carbon dioxide
Decomposition or carbon monoxide
Byproducts:

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
Toxicological Effects: Hydrocortisone - Toxicity Data: Intraperitoneal LD50 (rat): 150 mg/kg; Subcutaneous LD50 (rat): 449 mg/kg; Subcutaneous LD50 (mouse): >500 mg/kg; Oral LD50 (rat): 5000 mg/kg; Oral LD50 (mouse): 5000 mg/kg; Hydrocortisone - Investigated as a drug, hormone, mutagen, primary irritant, and reproductive effector. Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information. Hydrocortisone RTECS Number: GM8925000

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-23-7</td>
<td>Cortisol</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.
12.2 Persistence and Degradability: No data available.
12.3 Bioaccumulative Potential: No data available.
12.4 Mobility in Soil: No data available.
12.5 Results of PBT and vPvB assessment: No data available.
12.6 Other adverse effects: No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):
   DOT Proper Shipping Name: Not dangerous goods.
   DOT Hazard Class: 
   UN/NA Number: 

14.1 LAND TRANSPORT (European ADR/RID):
   ADR/RID Shipping Name: Not dangerous goods.
   UN Number: 
   Hazard Class: 

14.3 AIR TRANSPORT (ICAO/IATA):
   ICAO/IATA Shipping Name: Not dangerous goods.
   Additional Transport Information: Transport in accordance with local, state, and federal regulations.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-23-7</td>
<td>Cortisol</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 11/28/2016

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.
SECTION 1: Identification

1.1. Identification

<table>
<thead>
<tr>
<th><strong>Product form</strong></th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Substance name</strong></td>
<td>Isopropyl Alcohol (2-Propanol)</td>
</tr>
<tr>
<td><strong>CAS-No.</strong></td>
<td>67-63-0</td>
</tr>
<tr>
<td><strong>Product code</strong></td>
<td>LC15750</td>
</tr>
<tr>
<td><strong>Formula</strong></td>
<td>C3H8O</td>
</tr>
<tr>
<td><strong>Synonyms</strong></td>
<td>1-methyl ethanol / 1-methylethyl alcohol / 2-hydroxypropane / dimethyl carbinol / ethyl carbinol / hydroxypropane / IPA / 1-propanol / isoethylcarbinol / propan-2-ol / sec-propanol</td>
</tr>
</tbody>
</table>

1.2. Recommended use and restrictions on use

**Use of the substance/mixture:**
- Disinfectant
- Solvent

1.3. Supplier

LabChem Inc
Jackson’s Pointe Commerce Park Building 1000, 1010 Jackson’s Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

**Emergency number:**
CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

<table>
<thead>
<tr>
<th><strong>GHS-US classification</strong></th>
<th><strong>H225</strong></th>
<th><strong>H319</strong></th>
<th><strong>H335</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
<td>Highly flammable liquid and vapour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious eye damage/eye irritation Category 2A</td>
<td>Causes serious eye irritation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure) Category 3</td>
<td>May cause respiratory irritation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

**GHS-US labeling**

- **Hazard pictograms (GHS-US):**
  - GHS02
  - GHS07

- **Signal word (GHS-US):**
  - Danger

- **Hazard statements (GHS-US):**
  - H225 - Highly flammable liquid and vapour
  - H319 - Causes serious eye irritation
  - H335 - May cause respiratory irritation

- **Precautionary statements (GHS-US):**
  - P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
  - P233 - Keep container tightly closed.
  - P240 - Ground/bond container and receiving equipment.
  - P241 - Use explosion-proof electrical, lighting, ventilating equipment
  - P242 - Use only non-sparking tools.
  - P243 - Take precautionary measures against static discharge.
  - P261 - Avoid breathing mist, vapors, spray.
  - P264 - Wash exposed skin thoroughly after handling.
  - P271 - Use only outdoors or in a well-ventilated area.
  - P280 - Wear eye protection, face protection, protective clothing, protective gloves.
  - P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
  - P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact
lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use dry chemical powder, alcohol-resistant foam, carbon dioxide (CO2) to extinguish.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations
If inhaled: Remove person to fresh air and keep comfortable for breathing

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification: None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type: Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl Alcohol (2-Propanol) (Main constituent)</td>
<td>(CAS-No.) 67-63-0</td>
<td>100</td>
<td>Flam. Liq. 2, H225</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eye Irrit. 2A, H319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STOT SE 3, H335</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures


First-aid measures after inhalation: Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact: Rinse with water. Soap may be used. Do not apply (chemical) neutralizing agents. Take victim to a doctor if irritation persists.

First-aid measures after eye contact: Rinse immediately with plenty of water. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.


4.2. Most important symptoms and effects (acute and delayed)


Symptoms/effects after skin contact: Dry skin.

Symptoms/effects after eye contact: Irritation of the eye tissue.


4.3. Immediate medical attention and special treatment, if necessary

No additional information available
SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:
- Water spray
- Polyvalent foam
- Alcohol-resistant foam
- BC powder
- Carbon dioxide

Unsuitable extinguishing media:
- Solid water jet ineffective as extinguishing medium.

5.2. Specific hazards arising from the chemical

Fire hazard:
- DIRECT FIRE HAZARD. Highly flammable. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Gas/vapor spreads at floor level: ignition hazard.

Explosion hazard:
- DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity:
- Upon combustion: CO and CO2 are formed. Violent to explosive reaction with (strong) oxidizers. Prolonged storage/in large quantities: may form peroxides.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions:
- Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat.

Protection during firefighting:
- Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment:

Emergency procedures:

6.1.2. For emergency responders

Protective equipment:
- Equip cleanup crew with proper protection. Do not breathe gas, fumes, vapor or spray.

Emergency procedures:
- Stop leak if safe to do so. Ventilate area. If a major spill occurs, all personnel should be immediately evacuated and the area ventilated.

6.2. Environmental precautions

Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment:
- Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.

Methods for cleaning up:
- Take up liquid spill into absorbent material, e.g.: dry sand/earth/vermiculite or powdered limestone. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling:
- Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Observe normal hygiene standards. Keep container tightly closed. Measure the concentration in the air regularly. Work under local exhaust/ventilation.
Hygiene measures: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

### Conditions for safe storage, including any incompatibilities

**Incompatible products:** Ammonia. Strong acids. Strong oxidizers.

**Incompatible materials:** Direct sunlight. Heat sources. Sources of ignition.

**Heat-ignition:** KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.

**Prohibitions on mixed storage:** KEEP SUBSTANCE AWAY FROM: oxidizing agents. strong acids. (strong) bases. amines. halogens.

**Storage area:** Store in a cool area. Store in a dry area. Ventilation at floor level. Fireproof storeroom. Provide for an automatic sprinkler system. Provide for a tub to collect spills. Provide the tank with earthing. May be stored under nitrogen. Meet the legal requirements.

**Special rules on packaging:** SPECIAL REQUIREMENTS: closing. with pressure relief valve. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

**Packaging materials:** SUITABLE MATERIAL: stainless steel. monel steel. carbon steel. copper. nickel. bronze. glass. Teflon. polyethylene. polypropylene. zinc. MATERIAL TO AVOID: steel with rubber inner lining. aluminium.

### SECTION 8: Exposure controls/personal protection

#### Control parameters

<table>
<thead>
<tr>
<th></th>
<th>ACGIH TWA (ppm)</th>
<th>ACGIH STEL (ppm)</th>
<th>OSHA PEL (TWA) (mg/m³)</th>
<th>OSHA PEL (TWA) (ppm)</th>
<th>IDLH US IDLH (ppm)</th>
<th>NIOSH REL (TWA) (mg/m³)</th>
<th>NIOSH REL (TWA) (ppm)</th>
<th>NIOSH REL (STEL) (mg/m³)</th>
<th>NIOSH REL (STEL) (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl Alcohol (2-Propanol) (67-63-0)</td>
<td>200 ppm (2-propanol; USA; Time-weighted average exposure limit 8 h; TLV - Adopted Value)</td>
<td>400 ppm (2-propanol; USA; Short time value; TLV - Adopted Value)</td>
<td>980 mg/m³</td>
<td>400 ppm</td>
<td>2000 ppm</td>
<td>980 mg/m³</td>
<td>400 ppm</td>
<td>1225 mg/m³</td>
<td>500 ppm</td>
</tr>
</tbody>
</table>

#### Appropriate engineering controls

Appropriate engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

#### Individual protection measures/Personal protective equipment

**Personal protective equipment:**


**Materials for protective clothing:**

GIVE EXCELLENT RESISTANCE: butyl rubber. nitrile rubber. viton. polyethylene/ethylenevinylalcohol. GIVE GOOD RESISTANCE: neoprene. GIVE LESS RESISTANCE: PVC. neoprene/natural rubber. GIVE POOR RESISTANCE: natural rubber. polyethylene. PVA

**Hand protection:**

Gloves

**Eye protection:**

Safety glasses

**Skin and body protection:**
Protective clothing

Respiratory protection:
Wear gas mask with filter type A if conc. in air > exposure limit

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Colourless</td>
</tr>
<tr>
<td>Odor</td>
<td>Alcohol odour. Stuffy odour. Mild odour</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>3 - 610 ppm</td>
</tr>
<tr>
<td></td>
<td>8 - 1499 mg/m³</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point</td>
<td>-88 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>82 °C (1013 hPa)</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>235 °C</td>
</tr>
<tr>
<td>Critical pressure</td>
<td>47600 hPa</td>
</tr>
<tr>
<td>Flash point</td>
<td>12 °C</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>2.3</td>
</tr>
<tr>
<td>Relative evaporation rate (ether=1)</td>
<td>21</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>44 hPa (20 °C)</td>
</tr>
<tr>
<td>Vapor pressure at 50 °C</td>
<td>60.2 hPa (25 °C)</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>2.1</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.79</td>
</tr>
<tr>
<td>Relative density of saturated gas/air mixture</td>
<td>1.05</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>785 kg/m³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>60.1 g/mol</td>
</tr>
<tr>
<td>Log Pow</td>
<td>0.05 (Weight of evidence approach; Other, 25 °C)</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>399 °C</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>2.5316 mm²/s (25 °C)</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>0.002 Pa.s (25 °C)</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>2 - 13 vol %</td>
</tr>
<tr>
<td></td>
<td>50 - 335 g/m³</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2. Other information</td>
<td></td>
</tr>
<tr>
<td>Minimum ignition energy</td>
<td>0.65 mJ</td>
</tr>
<tr>
<td>Specific conductivity</td>
<td>5.8 µS/m</td>
</tr>
<tr>
<td>Saturation concentration</td>
<td>106 g/m³</td>
</tr>
<tr>
<td>VOC content</td>
<td>100 %</td>
</tr>
<tr>
<td>Other properties</td>
<td>Gas/vapour heavier than air at 20°C. Clear. Volatile.</td>
</tr>
</tbody>
</table>
SECTION 10: Stability and reactivity

10.1. Reactivity
Upon combustion: CO and CO2 are formed. Violent to explosive reaction with (strong) oxidizers. Prolonged storage/in large quantities: may form peroxides.

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
May react violently with oxidants.

10.4. Conditions to avoid

10.5. Incompatible materials

10.6. Hazardous decomposition products
Carbon dioxide. Carbon monoxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

<table>
<thead>
<tr>
<th>Likely routes of exposure</th>
<th>Inhalation; Skin and eye contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

**Isopropyl Alcohol (2-Propanol) (67-63-0)**

<table>
<thead>
<tr>
<th>LD50 dermal rabbit</th>
<th>12870 mg/kg (Rabbit; Experimental value; Equivalent or similar to OECD 402; 16.4; Rabbit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>73 mg/l/4h (Rat)</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>5045 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>12870 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>73 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>73 mg/l/4h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin corrosion/irritation</th>
<th>Not classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/irritation</td>
<td>Causes serious eye irritation.</td>
</tr>
<tr>
<td>Respiratory or skin sensitization</td>
<td>Not classified</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

**Isopropyl Alcohol (2-Propanol) (67-63-0)**

<table>
<thead>
<tr>
<th>IARC group</th>
<th>3 - Not classifiable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reproductive toxicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity – single exposure</td>
<td>May cause respiratory irritation.</td>
</tr>
<tr>
<td>Specific target organ toxicity – repeated exposure</td>
<td>Not classified</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms/effects after skin contact</td>
<td>Dry skin.</td>
</tr>
<tr>
<td>Symptoms/effects after eye contact</td>
<td>Irritation of the eye tissue.</td>
</tr>
</tbody>
</table>
SECTION 12: Ecological information

12.1. Toxicity

Ecology - general: Not classified as dangerous for the environment according to the criteria of Directive 67/548/EEC. Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air: Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009). Not included in the list of substances which may contribute to the greenhouse effect (Regulation (EC) No 842/2006). TA-Luft Klasse 5.2.5.

Ecology - water: Ground water pollutant. Not harmful to fishes (LC50(96h) >1000 mg/l). Not harmful to invertebrates (Daphnia). Not harmful to algae (EC50 (72h) >1000 mg/l). Inhibition of activated sludge.

Isopropyl Alcohol (2-Propanol) (67-63-0)

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 2</td>
<td>9640 mg/l (LC50; OECD 203; Fish, Acute Toxicity Test; 96 h; Pimephales promelas; Flow-through system; Fresh water; Experimental value)</td>
</tr>
<tr>
<td>EC50 Daphnia 2</td>
<td>13299 mg/l (EC50; Other; 48 h; Daphnia magna)</td>
</tr>
<tr>
<td>Threshold limit algae 1</td>
<td>&gt; 1000 mg/l (EC50; UBA; 72 h; Scenedesmus subspicatus)</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

Isopropyl Alcohol (2-Propanol) (67-63-0)

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical oxygen demand (BOD)</td>
<td>1.19 g O₂/g substance</td>
</tr>
<tr>
<td>Chemical oxygen demand (COD)</td>
<td>2.23 g O₂/g substance</td>
</tr>
<tr>
<td>ThOD</td>
<td>2.4 g O₂/g substance</td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential

Isopropyl Alcohol (2-Propanol) (67-63-0)

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Pow</td>
<td>0.05 (Weight of evidence approach; Other; 25 °C)</td>
</tr>
<tr>
<td>Bioaccumulative potential</td>
<td>Low potential for bioaccumulation (Log Kow &lt; 4).</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

Isopropyl Alcohol (2-Propanol) (67-63-0)

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface tension</td>
<td>0.021 N/m (25 °C)</td>
</tr>
</tbody>
</table>

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Remove to an authorized waste incinerator for solvents with energy recovery. Do not discharge into surface water. Obtain the consent of pollution control authorities before discharging to wastewater treatment plants.

Additional information: LWCA (the Netherlands): KGA category 03. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description: UN1219 Isopropyl alcohol, 3, II

UN-No. (DOT): UN1219

Proper Shipping Name (DOT): Isopropyl alcohol

Transport hazard class(es) (DOT): 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : II - Medium Danger
Hazard labels (DOT) : 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. T4 - 2.65 178.274(d)(2) Normal............. 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 4b;150
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L
DOT Vessel Stowage Location : B - (i) The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) “On deck only” on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Isopropyl Alcohol (2-Propanol) (67-63-0)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Subject to reporting requirements of United States SARA Section 313

SARA Section 311/312 Hazard Classes

- Physical hazard - Flammable (gases, aerosols, liquids, or solids)
- Health hazard - Serious eye damage or eye irritation
- Health hazard - Specific target organ toxicity (single or repeated exposure)

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Isopropyl Alcohol (2-Propanol) CAS-No. 67-63-0 100%

15.2. International regulations

CANADA
No additional information available

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 01/26/2018
Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H225</th>
<th>Highly flammable liquid and vapour</th>
</tr>
</thead>
<tbody>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
<tr>
<td>H335</td>
<td>May cause respiratory irritation</td>
</tr>
</tbody>
</table>

**NFPA health hazard**: 1 - Materials that, under emergency conditions, can cause significant irritation.

**NFPA fire hazard**: 3 - Liquids and solids (including finely divided suspended solids) that can be ignited under almost all ambient temperature conditions.

**NFPA reactivity**: 0 - Material that in themselves are normally stable, even under fire conditions.

**Hazard Rating**

**Health**: 1 Slight Hazard - Irritation or minor reversible injury possible

**Flammability**: 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)

**Physical**: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

**Personal protection**: H

- H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

*SDS US LabChem*

*Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.*
SAFETY DATA SHEET

1. Identification

Product Name: Lithium chloride, anhydrous
Cat No.: L120500, L121100, L121500; NC1415456; XXL121WA25KG
CAS-No: 7447-41-8
Synonyms: Lithium monochloride.
Recommended Use: Laboratory chemicals.
Uses advised against: Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company: Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) Identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute oral toxicity</td>
<td>Category 4</td>
</tr>
<tr>
<td>Skin Corrosion/irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 2</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word: Warning

Hazard Statements
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation
Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Storage
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>7447-41-8</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. First-aid measures

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately if symptoms occur.

Ingestion
Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms and effects
No information available.

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media

Unsuitable Extinguishing Media
No information available

Flash Point
No information available

Method -
No information available
Lithium chloride, anhydrous

Revision Date 18-Jan-2018

Autoignition Temperature
Explosion Limits
   Upper No data available
   Lower No data available

Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Non-combustible. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Hydrogen chloride gas Chlorine

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA
Health Flammability Instability Physical hazards
2 0 1 N/A

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid dust formation. Keep people away from and upwind of spill/leak.

Environmental Precautions
See Section 12 for additional ecological information.

Methods for Containment and Clean Up
Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling
Wear personal protective equipment. Ensure adequate ventilation. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Protect from moisture.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from direct sunlight. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines
This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection
Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Solid</td>
</tr>
<tr>
<td>Appearance</td>
<td>White</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>7-8 50 g/l aq.sol</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>605 °C / 1121 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>1382 °C / 2519.6 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (solid,gas)</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>No data available</td>
</tr>
<tr>
<td>Lower</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>1.33 hPa @ 547 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>2.060</td>
</tr>
<tr>
<td>Solubility</td>
<td>No information available</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td></td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>Cl Li</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>42.38</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

Reactive Hazard
None known, based on information available

Stability
Hygroscopic. Absorbs moisture from air and becomes liquid.

Conditions to Avoid
Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials
Acids, Strong oxidizing agents, Halogens, Metals

Hazardous Decomposition Products
Hydrogen chloride gas, Chlorine

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. Toxicological information

Acute Toxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>LD50 = 526 mg/kg (Rat)</td>
<td>&gt;2000 mg/kg (Rat)</td>
<td>&gt;5.57 mg/L/4h (Rat)</td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products
No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation
Irritating to eyes and skin

Sensitization
No information available

Carcinogenicity
The table below indicates whether each agency has listed any ingredient as a carcinogen.
Lithium chloride, anhydrous

Revision Date 18-Jan-2018

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>7447-41-8</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Mutagenic Effects
No information available

Reproductive Effects
No information available.

Developmental Effects
No information available.

Teratogenicity
No information available.

STOT - single exposure
None known

STOT - repeated exposure
None known

Aspiration hazard
No information available

Symptoms / effects, both acute and delayed
No information available

Endocrine Disruptor Information
No information available

Other Adverse Effects
The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>Not listed</td>
<td>EC50: 158 mg/L/96h (rainbow trout)</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation
No information available.

Mobility
Will likely be mobile in the environment due to its water solubility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>-2.66</td>
</tr>
</tbody>
</table>

13. Disposal considerations

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
Not regulated

TDG
Not regulated

IATA
Not regulated

IMDG/IMO
Not regulated

15. Regulatory information

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECSC</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium chloride</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-212-3</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
Lithium chloride, anhydrous

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable
SARA 313 Not applicable
SARA 311/312 Hazard Categories See section 2 for more information
CWA (Clean Water Act) Not applicable
Clean Air Act Not applicable
OSHA Occupational Safety and Health Administration Not applicable
CERCLA Not applicable
California Proposition 65 This product does not contain any Proposition 65 chemicals
U.S. State Right-to-Know Regulations Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 15-Dec-2010
Revision Date 18-Jan-2018
Print Date 18-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the
date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of SDS
MATERIAL SAFETY DATA SHEET

METHANOL

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Product Name
Methanol (CH₃OH)

Synonyms
Alcohol, Methyl Hydroxide, Methyl Hydrate, Wood Alcohol, Wood Spirit

Product Use
Solvent, Fuel, Feedstock

Company Identification
Methanol Holdings (Trinidad) Limited
Atlantic Avenue, Point Lisas Industrial Estate
Point Lisas, Trinidad, West Indies.

Emergency Contact (24 hours)
North America CHEMTREC – 1-800-424-9300
Europe Giftinformationszentrum Nord - 011-49-551-19240
Trinidad Industrial Plant Services Limited – 1-868-636-1251

Non-Emergency Contact
North America Southern Chemical Corporation – 1-281-799-4416
Europe Helm AG - 011-19-40-23750
Trinidad Methanol Holdings (Trinidad) Limited – 1-868-636-2906

SECTION 2 – COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Percent</th>
<th>EINECS / ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl Alcohol</td>
<td>67-56-1</td>
<td>99+</td>
<td>200-659-6</td>
</tr>
</tbody>
</table>

Hazard Symbols: T, F
ACGIH STEL: 250 ppm, skin notation
ACGIH TLV: 200 ppm, skin
OSHA PEL: 200 ppm
SECTION 3 – HAZARDS IDENTIFICATION

Emergency Overview

POISON! DANGER! Vapor harmful. May be fatal or cause blindness if swallowed. Harmful if inhaled or absorbed through the skin. Flammable liquid and vapor. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system and liver.

Target Organs: Kidneys, heart, central nervous system, liver, eyes.

Potential Health Effects

Inhalation: An irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of over-exposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse up to 30 hours later.

Ingestion: Toxic. Symptoms similar to those for inhalation, but severity and speed of appearance may be greater. May be fatal or cause blindness. Usual fatal dose: 100 – 125 ml. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.

Skin Contact: Methyl Alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur in harmful amounts; symptoms may parallel inhalation exposure.

Eye Contact: Irritant, characterized by a burning sensation, redness, tearing, inflammation, possible corneal injury, painful sensitization to light. Continued exposure may cause lesions.

Chronic Exposure: Marked impairment of vision has been reported. Repeated or prolonged skin contact may cause dermatitis. Chronic exposure may cause reproductive disorders and teratogenic effects. Laboratory experiments have resulted in mutagenic effects.

Aggravation of Pre-Existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

Other

- Highly flammable.
- May build up Electrostatic charges: risk of ignition.
- Vapor-Air mixture is flammable / explosive within the explosion limits.

National Fire Protection Association (NFPA) 704 Hazard Identification Rating

<table>
<thead>
<tr>
<th>Health:</th>
<th>1</th>
<th>Rating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactivity:</td>
<td>0</td>
<td>0 = No Hazard</td>
</tr>
<tr>
<td>Flammability:</td>
<td>3</td>
<td>1 = Slight Hazard</td>
</tr>
<tr>
<td>Special Hazards:</td>
<td>None</td>
<td>2 = Moderate Hazard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = Serious Hazard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 = Severe Hazard</td>
</tr>
</tbody>
</table>
SECTION 4 – FIRST AID MEASURES

Eyes
Immediately flush eyes with an ample amount of water for at least 15 minutes, occasionally lifting upper and lower eyelids. Get medical help immediately.

Skin
Immediately wash skin with lots of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Inhalation
Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen if available. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Ingestion
The ingestion of methanol is potentially life threatening. Onset of symptoms may be delayed for 18 to 24 hours after digestion. If the victim is conscious and medical help is not immediately available, give 2 to 4 cupfuls of milk or water. Do not induce vomiting! Transport victim to a medical facility immediately.

Note to Physician
Effects may be delayed. Ethanol may inhibit methanol metabolism.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point: 11°C
Lower Explosive Limit: 6% (NFPA 1978)
Upper Explosive Limit: 36% (NFPA 1978)
Auto Ignition Temp.: 385°C (NFPA 1978)

Hazardous Combustion Products: Toxic gases and vapors; Oxides of Carbon and Formaldehyde.

Extinguishing Media
- Small fires: Use dry chemical, carbon dioxide, water spray or alcohol resistant foam. Use water sprays to cool fire-exposed containers.
- Large fires: Use water spray, water fog or alcohol-resistant foam.

Special Protective Equipment for Firefighters
- Firefighters must wear full face, positive pressure self-contained breathing apparatus, MSHA / NIOSH (approved or equivalent), and full protective gear.
- Protective fire fighting structural clothing may not offer complete protection from a methanol fire if there is liquid methanol or vapor levels above the threshold limit value (TLV). Use of HAZMAT suits are recommended.
Important Information
Methanol burns with a clean, clear flame, which is almost invisible in daylight. Containers may build up pressure if exposed to heat and/or fire. Cool tanks / drums with water spray and remove them to safety. Fire fighting water should be contained if possible, as it is toxic and can cause environmental damage. Water runoff can cause environmental damage. Vapors can travel to a source of ignition and flash back. Material is lighter than water, and so a fire can be spread by the use of water. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Responders should stay upwind.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Procedure
- Wear appropriate personal protective equipment as specified in Section 8.
- Stay upwind.
- Ventilate area of leak or spill and isolate hazard area.
- Eliminate all sources of ignition.
- Keep unnecessary and unprotected personnel from entering the hazard zone.
- Contain and recover liquid where possible or dilute with water or use alcohol-resistant foam to reduce fire hazard. Collect liquid in an appropriate container or absorb with an inert material (e.g. vermiculite, dry sand, earth) and place in a chemical waste container. Do not use combustible materials such as saw dust.
- Use non-sparking tools and equipment.
- Do not flush to sewer and prevent from entering confined spaces.
- US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Waste Disposal
- Recycling is the recommended disposal method.
- Incineration should only be performed using a legally approved incinerator fitted with emission controls.
- Methanol wastes are not suitable for underground injection.
- Biological treatment may be used for dilute aqueous waste methanol.

SECTION 7 – HANDLING AND STORAGE

Handling
- Wash hands thoroughly after handling. In the event of exposure, remove contaminated clothing and wash before reuse.
- Containers should be grounded and bonded when transferring material in order to avoid static sparks.
- Do not breathe vapor, mist or gas. Do not get in eyes, skin or clothing.
- Use non-sparking type tools and equipment, including explosion-proof ventilation.
- Empty containers retain product residue (liquid and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition.
- Keep container tightly closed.
Storage

- Keep away from heat, sparks, flames (all sources of ignition). Keep away from oxidizers, acids and bases.
- Store in a cool, dry, well-ventilated area away from incompatible substances.
- Outside or detached storage is recommended.
- Tanks must be grounded and vented and have vapor emission controls including floating roofs, inert gas blanketing to prevent the formation of explosive mixtures and pressure vacuum relief valves to control tank pressures. Tanks should be of welded construction and should also be diked.
- Do not store in aluminum or lead containers. (Anhydrous methanol is non-corrosive to most metals at ambient temperatures except lead and magnesium. Coatings of copper and its alloys, zinc, or aluminum are unsuitable for storage as they are attacked slowly. Mild Steel is the recommended construction material for tanks.)
- Plastics may be used for short-term storage, but not recommended for long-term use due to deterioration effects and the subsequent risk of contamination.

SECTION 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls: Use explosion-proof ventilation equipment. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Personal Protective Equipment

Respiratory Protection: A respiratory protection program that meets OSHA’s 29 CFR 1910.134) and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator’s use.

Eye Protection: Use face shield and chemical flash goggles.

Skin Protection: Rubber (Butyl or Nitrile) or neoprene gloves and additional protection including impervious boots, aprons, or coveralls as needed in areas of unusual exposure.

*PPE must not be considered a long-term solution to exposure control. PPE usage must be accompanied by employer programs to properly select, maintain, clean, fit and use. Consult a competent industrial hygiene resource to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.*
SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Appearance: Clear, Colorless
Odor: Slight Alcohol Odor
pH Value: Not Applicable
Molecular Wt.: 32.04
Boiling Point (760 mm Hg): 64.5°C
Flash Point: 11°C
Auto Ignition Temp.: 385°C (NFPA 1978)
Vapor Pressure: @ 200°C 12.8 kPa
Vapor Density: 1.11 (Air = 1)
Viscosity: 0.55 cP (20°C)
% Volatile / Volume: 100.0
Freezing / Melting Pt.: -98°C (-144°F)
Water Solubility: Complete
Soluble in: Water, Ethanol, Ether, Acetone, and Chloroform
Partition Coefficient n-octanol/water: -0.82 / -0.66
Evaporation Rate: (BuAc=1) 5.9
(Ether = 1) 5.3
Specific Gravity: 0.791 – 0.793
Saturation Concentration: 166 g/m³

SECTION 10 – STABILITY & REACTIVITY

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: High temperatures, incompatible materials, ignition sources, oxidizers.

Incompatible Materials: Avoid contact with strong oxidizers, strong mineral or organic acids and strong bases. Contact with these materials may cause a violent or explosive reaction. May be corrosive to lead, aluminum, magnesium and platinum.

Hazardous Decomposition Products
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.

Hazardous Polymerization
Will not occur.
SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

<table>
<thead>
<tr>
<th>LD₅₀</th>
<th>Oral, Mouse</th>
<th>7300 mg/Kg</th>
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<tbody>
<tr>
<td>LD₅₀</td>
<td>Oral, Rabbit</td>
<td>14200 mg/Kg</td>
</tr>
<tr>
<td>LD₅₀</td>
<td>Oral, Rat</td>
<td>5628 mg/Kg</td>
</tr>
<tr>
<td>LD₅₀</td>
<td>Skin, Rabbit</td>
<td>15800 mg/Kg</td>
</tr>
<tr>
<td>LC₅₀</td>
<td>Inhalation, Rat</td>
<td>64000 ppm</td>
</tr>
</tbody>
</table>

Carcinogenicity: CAS # 67-56-1: Not Listed by ACGIH, IARC, NIOSH, NTP, or OSHA

Teratogenicity: No

Reproductive Effects: Reported to cause birth defects in rats exposed to 20,000 ppm

Mutagenicity: Insufficient data.

SECTION 12 – ECOLOGICAL INFORMATION

Environmental
Methanol in fresh or salt water may have serious effects on aquatic life. A study in methanol’s toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down into carbon dioxide and water.

Mobility:
- Volatile organic compound (VOC): 100 %
- Soluble in water

Persistence and Degradability:
Biodegradation BOD₅: 0.6 – 1.1 g O₂/g substance
COD: 1.42 g O₂/g substance
Water: Readily biodegradable in water (test: 99% OECD 301D. BOD 80% ThOD)

Methanol, when released into the air is expected to exist in the aerosol phase and will be degraded from the ambient atmosphere by the reaction with photochemically produced hydroxyl radicals with an estimated half life of 17.8 days. When released into the soil, methanol is expected to readily biodegrade and leach into groundwater. When released into water, it is expected to have a half life of between 1 and 10 days.

Other Adverse Effects:
- Greenhouse Effect: No data available.
- Wastewater Purification: Sludge digestion is inhibited at 800 mg/l. Nitrification of activated sludge is inhibited at 160 mg/l; 50%
SECTION 13 – DISPOSAL CONSIDERATIONS

Refer to Section 6 – *Waste Disposal*. It is also recommended that users review federal, state and governmental regulations prior to disposal. Store material for disposal as indicated in Section 7, *Handling & Storage*.

SECTION 14 – TRANSPORTATION INFORMATION

Classification of substance in compliance with UN Recommendations
- **UN-number:** 1230
- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing Group:** II
- **Proper Shipping Name:** UN 1230, Methanol

**ADR (Transportation by Road)**
- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1
- **Hazchem:** 2WE

**RID (Transportation by Rail)**
- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1

**ADNR (Transportation by Inland Waterways)**
- **Class:** 3
- **Packing Group:** II
- **Danger Label Tanks:** 3+6.1
- **Danger Label Packages:** 3+6.1

**IMDG (Maritime Transport)**
- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing Group:** II
- **MFAG:** 19 (IMDG suppl. 2002 p.40)
- **EMS:** F – E, S – D
- **Marine Pollutant:** -

**ICAO (Air Transport)**
- **Class:** 3
- **Sub-Risks:** 6.1
- **Packing:** II
- **Packing Instructions Passenger Aircraft:** 305 / Y305
- **Packing Instructions Cargo Aircraft:** 307
Limited Quantities (LQ):
When substance and their packaging meet the conditions established by ADR / RID / ADNR, only the following prescriptions shall be complied with:
Each package shall display a diamond-shaped figure with the following inscription: “UN 1230”.
Or in the case of different goods with different identification numbers within a single package: the letters “LQ”.

SECTION 15 – REGULATORY INFORMATION

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial and local regulations.

CANADIAN REGULATIONS
WHMIS
- Class B-2: Flammable liquid with flash point lower than 37.8°C (100°F).
- Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
- Class D-2A: Material causing other toxic effects (VERY TOXIC).
- Class D-2B: Material causing other toxic effects (TOXIC).

US REGULATIONS
- TSCA (Toxic Substance Control Act) Listed
- CERCLA (Comprehensive Environmental Response Compensation and Liability Act of 1980), 40 CFR 302.4(a) Listed
- SARA (Superfund Amendment & Reauthorization Act), 40 CFR 31 Hazardous
- EPA Accidental Release Prevention, 40 CFR 116-117 Hazardous
- Clean Air Act: Material does not contain any Class 1 or Class 2 Ozone Depleters
- Clean Water Act:
  - None of the chemicals in this product are listed as Hazardous substances under the CWA
  - None of the chemicals in this product are listed as Toxic Pollutants under the CWA

EUROPEAN REGULATIONS
(European Labeling in Accordance with EC Directives)

Hazard Symbols: T F
Risk Phrases:
R 11  -  Highly Flammable
R 23/24/25  - Toxic by inhalation, in contact with skin and if ingested
R 39/23/24/25  - Toxic. Danger of very serious irreversible effects through inhalation, in contact with skin and if ingested
SECTION 16 – ADDITIONAL INFORMATION

DISCLAIMER

The information and recommendations herein are taken from data contained in independent, industry-recognized references and is believed to be accurate and represents the best information currently available to us. Methanol Holdings (Trinidad) Limited makes no representation or warranties, either expressed or implied, including without limitation any warranties of merchantability, fitness for a particular purpose with respect to the information set forth herein or the product to which the information refers. Users should conduct their own investigations to determine the suitability of the information to their particular purpose. Accordingly, Methanol Holdings (Trinidad) Limited will not be responsible for loss or damages resulting from use of or reliance upon this information.

Prepared by: Methanol Holdings (Trinidad) Limited.

Date of Issue: August 2007
MATERIAL SAFETY DATA SHEET- ( MSDS ) METHYL ETHYL KETONE

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name : METHYL ETHYL KETONE
Product Description : Ketone
Intended Use : Solvent

COMPANY IDENTIFICATION

Supplier: Pon Pure Chemicals Group
CHENNAI, TAMILNADU, INDIA

24 Hour Health Emergency
(91) 8939878447
(91) 9444038694

Transportation Emergency Phone
(91) 8939768680

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Place</th>
<th>EMERGENCY TELEPHONE NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pon Pure Chemicals Group</td>
<td>India</td>
<td>Day Emergency – 044-26161803-26161809</td>
</tr>
</tbody>
</table>

2. COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS#</th>
<th>Concentration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHYL ETHYL KETONE</td>
<td>78-93-3</td>
<td>100%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

3. HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see MSDS Section 15).

POTENTIAL PHYSICAL / CHEMICAL EFFECTS

Flammable. Material can release vapors that readily form flammable mixtures.
Vapor accumulation could flash and/or explode if ignited.

**POTENTIAL HEALTH EFFECTS**

Irritating to eyes. If swallowed, may be aspirated and cause lung damage. May cause central nervous system depression.

**Target Organs:** Eye

**NFPA Hazard ID:** Health: 2  Flammability: 3  Reactivity: 0
**HMIS Hazard ID:** Health: 1  Flammability: 3  Reactivity: 0

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

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**4. FIRST AID MEASURES**

**INHALATION**

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

**SKIN CONTACT**

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

**EYE CONTACT**

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

**INGESTION**

Seek immediate medical attention. Do not induce vomiting.

**NOTE TO PHYSICIAN**

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

---

**5. FIRE FIGHTING MEASURES**

**EXTINGUISHING MEDIA**
Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Highly flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material, Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Smoke, Fume, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method] : -4°C (25°F) [ ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.8 UEL: 11.5
Autoignition Temperature : >450°C (842°F)

6. ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and
downwind areas if required due to toxicity or flammability of the material. See Section 5 for firefighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for Personal Protective Equipment.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Use clean non-sparking tools to collect absorbed material.

Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. Seek the advice of a specialist before using dispersants. Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

7. HANDLING AND STORAGE

HANDLING

Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or
confined spaces unless adequately ventilated. Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Prevent small spills and leakage to avoid slip hazard.

Loading/Unloading Temperature: [Ambient]
Transport Temperature: [Ambient]
Transport Pressure: [Ambient]
Static Accumulator: This material is not a static accumulator.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

Storage Temperature : [Ambient]
Storage Pressure : [Ambient]
Suitable Containers/Packing : Tank Trucks; Drums; Barges; Tank Cars
Suitable Materials and Coatings (Chemical Compatibility): Carbon Steel; Stainless Steel; Polyester; Teflon; Butyl Rubber

Unsuitable Materials and Coatings : Ethylene-propylene-diene monomer (EPDM); Polyacrylonitrile; Polypropylene; Polystyrene; Polyvinyl Alcohol; PVC; Polyethylene; Natural Rubber

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

<table>
<thead>
<tr>
<th>Source</th>
<th>Form</th>
<th>Limit / Standard</th>
<th>NOTE</th>
<th>Source</th>
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<tbody>
<tr>
<td>METHYL ETHYL KETONE</td>
<td>TWA</td>
<td>590 mg/m3</td>
<td>200 ppm</td>
<td>N/A</td>
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<tr>
<td>METHYL ETHYL KETONE</td>
<td>STEL</td>
<td>300 ppm</td>
<td>N/A</td>
<td>ACGIH</td>
</tr>
<tr>
<td>METHYL ETHYL KETONE</td>
<td>TWA</td>
<td>200 ppm</td>
<td>N/A</td>
<td>ACGIH</td>
</tr>
</tbody>
</table>
NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider: Adequate ventilation should be provided so that exposure limits are not exceeded. Use explosion-proof ventilation equipment.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator: For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include: If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.
**Eye Protection:** Chemical goggles are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include: If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

**ENVIRONMENTAL CONTROLS:** See Sections 6, 7, 12, 13.

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**9. PHYSICAL AND CHEMICAL PROPERTIES**

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

**GENERAL INFORMATION**

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<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Physical State</td>
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<tr>
<td>Form</td>
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<td>Color</td>
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<tr>
<td>Odor</td>
<td>Characteristic</td>
</tr>
<tr>
<td>Odor Threshold</td>
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</tr>
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</table>

**IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Density (at 20 C)</td>
<td>0.805</td>
</tr>
<tr>
<td>Flash Point [Method]</td>
<td>-4°C (25F) [ ASTM D-56]</td>
</tr>
<tr>
<td>Flammable Limits (Approximate volume % in air)</td>
<td>LEL: 1.8  UEL: 11.5</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>&gt;450°C (842°F)</td>
</tr>
<tr>
<td>Boiling Point / Range</td>
<td>79°C (173°F) - 81°C (178°F)</td>
</tr>
<tr>
<td>Vapor Density (Air = 1)</td>
<td>&gt; 1 at 101 kPa</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>9.3 kPa (69.75 mm Hg) at 20 C</td>
</tr>
<tr>
<td></td>
<td>22.3 kPa (167.25mm Hg) at 38C</td>
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<tr>
<td></td>
<td>43.6 kPa (327 mm Hg) at 55C</td>
</tr>
<tr>
<td>Evaporation Rate (n-butyl acetate = 1)</td>
<td>6</td>
</tr>
<tr>
<td>pH</td>
<td>N/D</td>
</tr>
<tr>
<td>Log Pow (n-Octanol/Water Partition Coefficient)</td>
<td>N/D</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>Appreciable</td>
</tr>
</tbody>
</table>
### Viscosity
- **[N/D at 40 °C]**
- 0.52 cSt (0.52 mm²/sec) at 25°C

### Oxidizing Properties
- See Hazards Identification section.

### OTHER INFORMATION
- **Freezing Point**: -86°C (-123°F)
- **Melting Point**: N/D
- **Molecular Weight**: 72
- **Hygroscopic**: Yes
- **Coefficient of Thermal Expansion**: 0.00129
- **Decomposition Temperature**: N/D

### 10. STABILITY AND REACTIVITY

**STABILITY**: Material is stable under normal conditions.

**CONDITIONS TO AVOID**: Avoid heat, sparks, open flames and other ignition sources.

**MATERIALS TO AVOID**: Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS**: Material does not decompose at ambient temperatures.

**HAZARDOUS POLYMERIZATION**: Will not occur.

### 11. TOXICOLOGICAL INFORMATION

#### ACUTE TOXICITY:

<table>
<thead>
<tr>
<th>Route of Exposure</th>
<th>Conclusion / Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation</td>
<td></td>
</tr>
<tr>
<td><strong>Toxicity</strong>: Data available.</td>
<td>Minimally Toxic. Based on test data for the material.</td>
</tr>
<tr>
<td><strong>Irritation</strong>: Data available.</td>
<td>May be irritating to the respiratory tract. The effects are reversible. Based on test data for the material.</td>
</tr>
<tr>
<td>Ingestion</td>
<td></td>
</tr>
<tr>
<td><strong>Toxicity</strong>: Data available.</td>
<td>Minimally Toxic. Based on test data for the material.</td>
</tr>
<tr>
<td>Skin</td>
<td></td>
</tr>
</tbody>
</table>
Toxicity: Data available. Minimally Toxic. Based on test data for the material.

Irritation: Data available. May dry the skin leading to discomfort and dermatitis. Based on test data for the material.

Eye

Irritation: Data available. Irritating and will injure eye tissue. Based on test data for the material.

**CHRONIC/OTHER EFFECTS**

For the product itself:

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Prolonged and/or repeated skin contact with low viscosity materials may defat the skin resulting in possible irritation and dermatitis.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

METHYL ETHYL KETONE (MEK): Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system.

Additional information is available by request.

**The following ingredients are cited on the lists below:** None.

**--REGULATORY LISTS SEARCHED--**

1 = NTP CARC 2 = NTP SUS 3 = IARC 1 4 = IARC 2A 5 = IARC 2B 6 = OSHA CARC

**12. ECOLOGICAL INFORMATION**

The information given is based on data available for the material, the components of the material, and similar materials.

**ECOTOXICITY:**

Material -- Not expected to be harmful to aquatic organisms.
MOBILITY:

Material -- Expected to remain in water or migrate through soil.

PERSISTENCE AND DEGRADABILITY:

Biodegradation:

Material -- Expected to be readily biodegradable.

Hydrolysis:

Material -- Transformation due to hydrolysis not expected to be significant.

Photolysis:

Material -- Expected to degrade at a moderate rate in water when exposed to sunlight.

Atmospheric Oxidation:

Material -- Transformation due to atmospheric oxidation not expected to be significant.

OTHER ECOLOGICAL INFORMATION

VOC (EPA Method 24):  6.718 lbs/gal

13. DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY. TCLP (METHYL ETHYL KETONE).

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURIZE, CUT, WELD,
BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

14. TRANSPORT INFORMATION

**LAND (DOT)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ETHYL METHYL KETONE</td>
</tr>
<tr>
<td>Hazard Class &amp; Division</td>
<td>3</td>
</tr>
<tr>
<td>ID Number</td>
<td>1193</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
<tr>
<td>Product RQ</td>
<td>5000 LBS - METHYL ETHYL KETONE</td>
</tr>
<tr>
<td>ERG Number</td>
<td>127</td>
</tr>
<tr>
<td>Label(s)</td>
<td>3</td>
</tr>
<tr>
<td>Transport Document Name</td>
<td>UN1193, ETHYL METHYL KETONE, 3, PG II</td>
</tr>
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</table>

**LAND (TDG)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ETHYL METHYL KETONE</td>
</tr>
<tr>
<td>Hazard Class &amp; Division</td>
<td>3</td>
</tr>
<tr>
<td>UN Number</td>
<td>1193</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
</tbody>
</table>

**SEA (IMDG)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ETHYL METHYL KETONE</td>
</tr>
<tr>
<td>Hazard Class &amp; Division</td>
<td>3</td>
</tr>
<tr>
<td>EMS Number</td>
<td>F-E, S-D</td>
</tr>
<tr>
<td>UN Number</td>
<td>1193</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
<tr>
<td>Label(s)</td>
<td>3</td>
</tr>
<tr>
<td>Transport Document Name</td>
<td>UN1193, ETHYL METHYL KETONE (Methyl Ethyl Ketone), 3, PG II, (-4°C c.c.)</td>
</tr>
</tbody>
</table>

**AIR (IATA)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>ETHYL METHYL KETONE</td>
</tr>
<tr>
<td>Hazard Class &amp; Division</td>
<td>3</td>
</tr>
</tbody>
</table>
UN Number : 1193
Packing Group : II
Label(s) / Mark(s) : 3
Transport Document Name : UN1193, ETHYL METHYL KETONE, 3, PG II

15. REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purpose, this material is classified as hazardous in accordance with OSHA 29CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

CERCLA:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>Typical Value</th>
<th>Component RQ</th>
<th>Product RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHYL ETHYL KETONE</td>
<td>78-93-3</td>
<td>100%</td>
<td>5000 LBS</td>
<td>5000 LBS</td>
</tr>
</tbody>
</table>

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS Number</th>
<th>List Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHYL ETHYL KETONE</td>
<td>78-93-3</td>
<td>1, 4, 13, 16, 17, 18, 19</td>
</tr>
</tbody>
</table>

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL
2 = ACGIH A1
3 = ACGIH A2
4 = OSHA Z
5 = TSCA 4
6 = TSCA 5a2
7 = TSCA 5e
8 = TSCA 6
9 = TSCA 12b
10 = CA P65 CARC
11 = CA P65 REPRO
12 = CA RTK
13 = IL RTK
14 = LA RTK
15 = MI 293
16 = MN RTK
17 = NJ RTK
18 = PA RTK
19 = RI RTK

Code key: CARC=Carcinogen; REPRO=Reproductive
16. OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 10 Stability and Reactivity - Header was modified.
Section 13: Disposal Recommendations - Note was modified.
Section 08: Personal Protection was modified.
Section 07: Handling and Storage - Handling was modified.
Section 07: Handling and Storage - Storage Phrases was modified.
Section 07: Loading/Unloading Temperature C(F) was modified.
Section 07: Transport Temperature C(F) was modified.
Section 07: Transport Pressure kPa was modified.
Section 07: Storage Temperature C(F) was modified.
Section 07: Storage Pressure kPa was modified.
Section 07: Suitable Materials and Coatings - Header was modified.
Section 06: Accidental Release - Spill Management - Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Viscosity was modified.
Section 14: Transport Document Name was modified.
Section 14: Label(s) - Header was modified.
Section 14: Transport Document Name was modified.
Section 14: Product RQ was modified.
Section 14: Transport Document Name was modified.
Section 15: CERCLA Table was modified.
Section 15: List Citation Table - Header was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 16: Precautions was modified.
Section 16: Water Spill was modified.
Section 08: Exposure limits/standards was modified.
Section 09: Oxidizing Properties was modified.
Section 08: OEL Table - Notation Column - Header was modified.
PRECAUTIONARY LABEL TEXT:

Contains: METHYL ETHYL KETONE

WARNING!

HEALTH HAZARDS

Irritating to eyes. If swallowed, may be aspirated and cause lung damage.

Target Organs: Eye

PHYSICAL HAZARDS

Flammable.

PRECAUTIONS

Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation.

FIRST AID

Inhalation: Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

Eye: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

FIRE FIGHTING MEDIA

Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SPILL/LEAK

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Prevent entry into waterways,
sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Use clean non-sparking tools to collect absorbed material. Recover by pumping or with suitable absorbent.

**Water Spill:** Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. Seek the advice of a specialist before using dispersants.

**Disclaimer:**
The information and recommendations contained herein are, to the best of Pon Pure Chemicals Group knowledge and belief, accurate and reliable as of the date issued. You can contact Pon Pure Chemicals Group to ensure that this document is the most current available from Pon Pure Chemicals Group. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted.
Section 1 - Chemical Product and Company Identification

MSDS Name: Dichloromethane
Synonyms: Methylene chloride; Methane dichloride; Methylene bichloride; Methylene dichloride; Dichloromethane; DCM.

Company Identification: (INDIA)
Veritas House, 70 Mint Road, Fort, Mumbai - 400 001. INDIA
For information in the INDIA, call:
Tel: +91 - 22 - 2275 5555 / 6184 0000,
Fax: +91 - 22 - 2275 5556 / 6184 0001

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name:</th>
<th>%</th>
<th>EINECS#</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-09-2</td>
<td>Methylene chloride</td>
<td>&gt;99.5</td>
<td>200-838-9</td>
</tr>
</tbody>
</table>

Hazard Symbols: XN

Risk Phrases: 40

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Limited evidence of a carcinogenic effect.

Potential Health Effects

Eye: Contact with eyes may cause severe irritation, and possible eye burns.

Skin: May be absorbed through the skin. Causes irritation with burning pain, itching, and redness. Prolonged exposure may result in skin burns.

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause carboxyhemoglobinemia.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause narcotic effects in high concentration. Vapors may cause dizziness or suffocation. May cause blood changes. Overexposure may cause an increase in carboxyhemoglobin levels in the blood. Can produce delayed pulmonary edema.

Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects. Chronic exposure may cause lung, liver, and pancreatic tumors. May cause conjunctivitis and/or corneal burns.
Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. No flash point in conventional closed tester, but forms flammable vapor-air mixtures in larger volumes and may be an explosion hazard in a confined space.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Keep away from heat, sparks and flame. Use only with adequate ventilation. Avoid breathing vapor or mist.

Storage: Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Store below 40°C. Keep away from active metals.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

CAS# 75-09-2:

United Kingdom, WEL - TWA: 100 ppm TWA; 350 mg/m3 TWA United Kingdom, WEL - STEL: 300 ppm STEL; 1060 mg/m3 STEL

United States OSHA: ; 12.5 ppm Action Level; 25 ppm TWA; 125 ppm STEL (15 min. Cancer, cardiac effects, central nervous system effects, liver effects, and skin and eye irritation - See 29 CFR 1910.1052)
Belgium - TWA: 50 ppm TWA; 177 mg/m³ TWA
France - VME: 50 ppm VME; 180 mg/m³ VME
France - VLE: 100 ppm VLCT; 350 mg/m³ VLCT
Japan: 50 ppm OEL; 170 mg/m³ OEL
Japan: 100 ppm Ceiling; 340 mg/m³ Ceiling
Malaysia: 50 ppm TWA
Netherlands: 500 ppm STEL; 1750 mg/m³ STEL
Netherlands: 100 ppm MAC; 350 mg/m³ MAC
Russia: 50 mg/m³ TWA (vapor)
Russia: 100 mg/m³ STEL (vapor)
Spain: 50 ppm VLA-ED; 177 mg/m³ VLA-ED

Personal Protective Equipment

**Eyes:** Wear chemical splash goggles.

**Skin:** Viton gloves are recommended.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** A respiratory protection program that meets OSHA’s 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

### Section 9 - Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical State:</strong></td>
<td>Liquid</td>
</tr>
<tr>
<td><strong>Color:</strong></td>
<td>colorless</td>
</tr>
<tr>
<td><strong>Odor:</strong></td>
<td>ethereal odor - chloroform-like</td>
</tr>
<tr>
<td><strong>pH:</strong></td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Vapor Pressure:</strong></td>
<td>350 mm Hg @ 20 deg C</td>
</tr>
<tr>
<td><strong>Viscosity:</strong></td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Boiling Point:</strong></td>
<td>40 deg C (104.00°F)</td>
</tr>
<tr>
<td><strong>Freezing/Melting Point:</strong></td>
<td>-97 deg C (-142.60°F)</td>
</tr>
<tr>
<td><strong>Autoignition Temperature:</strong></td>
<td>556 deg C (1,032.80°F)</td>
</tr>
<tr>
<td><strong>Flash Point:</strong></td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Explosion Limits: Lower:</strong></td>
<td>13 vol %</td>
</tr>
<tr>
<td><strong>Explosion Limits: Upper:</strong></td>
<td>23 vol %</td>
</tr>
<tr>
<td><strong>Decomposition Temperature:</strong></td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Solubility in water:</strong></td>
<td>Slightly soluble</td>
</tr>
<tr>
<td><strong>Specific Gravity/Density:</strong></td>
<td>1.33 (Water=1)</td>
</tr>
<tr>
<td><strong>Molecular Formula:</strong></td>
<td>CH₂Cl₂</td>
</tr>
<tr>
<td><strong>Molecular Weight:</strong></td>
<td>84.93</td>
</tr>
</tbody>
</table>

### Section 10 - Stability and Reactivity

**Chemical Stability:** Stable at room temperature in closed containers under normal storage and handling conditions. May form explosive mixtures in atmospheres having high oxygen content.

**Conditions to Avoid:** Excess heat, attacks some plastics, rubber, and coatings, confined spaces. When no water is present, dichloromethane is not corrosive to metals. At high temperatures and in the presence of water (causing slow decomposition forming HCl), corrosion of iron, some stainless steels, copper and aluminum can occur.

**Incompatibilities with Other Materials:** Strong oxidizing agents, strong bases, chemically active metals.
Section 11 - Toxicological Information

RTECS#: CAS# 75-09-2: PA8050000
LD50/LC50:
- Draize test, rabbit, eye: 162 mg Moderate;
- Draize test, rabbit, eye: 10 mg Mild;
- Draize test, rabbit, skin: 810 mg/24H Severe;
- Draize test, rabbit, skin: 100 mg/24H Moderate;
- Inhalation, mouse: LC50 = 14400 ppm/7H;
- Inhalation, mouse: LC50 = 49100 mg/m3/6H;
- Inhalation, mouse: LC50 = 54000 mg/m3/2H;
- Inhalation, mouse: LC50 = 56220 mg/m3/7H;
- Inhalation, rat: LC50 = 52 gm/m3;
- Inhalation, rat: LC50 = 76000 mg/m3/4H;
- Inhalation, rat: LC50 = 52000 mg/m3/6H;
- Oral, mouse: LD50 = 873 mg/kg;
- Oral, rabbit: LD50 = 2000 mg/kg;
- Oral, rat: LD50 = 1600 mg/kg;
- Oral, rat: LD50 = 985 mg/kg;

Carcinogenicity:
- Methylene chloride - ACGIH: A3 - Confirmed animal carcinogen with unknown relevance to humans
- California: carcinogen, initial date 4/1/88
- NTP: Suspect carcinogen
- IARC: Group 2B carcinogen

Other: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 230mg/L; 24H; Static
Fish: Fathead Minnow: 196mg/L; 96H

Section 13 - Disposal Considerations

Products considered hazardous for supply are classified as Special Waste and the disposal of such chemicals is covered by regulations which may vary according to location. Contact a specialist disposal company or the local authority or advice. Empty containers must be decontaminated before returning for recycling.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th>IATA</th>
<th>IMO</th>
<th>RID/ADR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DICHLOROMETHANE</td>
<td>DICHLOROMETHANE</td>
<td>DICHLOROMETHANE</td>
</tr>
<tr>
<td>6.1</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>1593</td>
<td>1593</td>
<td>1593</td>
</tr>
<tr>
<td>III</td>
<td>III</td>
<td>III</td>
</tr>
</tbody>
</table>

USA RQ: CAS# 75-09-2: 1000 lb final RQ; 454 kg final RQ

Section 15 - Regulatory Information

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN

Risk Phrases:
- R 40 Limited evidence of a carcinogenic effect.

Safety Phrases:
- S 23 Do not inhale gas/fumes/vapour/spray
- S 24/25 Avoid contact with skin and eyes.
- S 36/37 Wear suitable protective clothing and gloves.

WGK (Water Danger/Protection)
- CAS# 75-09-2: 2

Canada
- CAS# 75-09-2 is listed on Canada's DSL List

US Federal
- TSCA
- CAS# 75-09-2 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: July 22, 2015
Revision #0 Date

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantibility or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.
Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 15013
Product Name: Methylprednisolone
Synonyms: 11.beta.,17,21-trihydroxy-6.alpha.-methyl-pregna-1,4-diene-3,20-dione; Medesone; Medrol; NSC 19987; Noretona; U 7532;

1.2 Relevant identified uses of the substance or mixture and uses advised against:
Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:
Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108
Web site address: www.caymanchem.com
Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:
Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:
Toxic To Reproduction, Category 1A
Specific Target Organ Toxicity (repeated exposure), Category 2

2.2 Label Elements:

GHS Signal Word: Danger

GHS Hazard Phrases:
H360: May damage fertility or the unborn child.
H373: May cause damage to {adrenals} through prolonged or repeated exposure.

GHS Precaution Phrases:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe {dust/fume/gas/mist/vapours/spray}.
P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:
P308+313: IF exposed or concerned: Get medical attention/advice.
P314: Get medical attention/advice if you feel unwell.

GHS Storage and Disposal Phrases:
Please refer to Section 7 for Storage and Section 13 for Disposal information.
2.3 Adverse Human Health Effects and Symptoms: Material may be irritating to the mucous membranes and upper respiratory tract. May be harmful by inhalation, ingestion, or skin absorption. May cause damage to (adrenals) through prolonged or repeated exposure. May cause eye, skin, or respiratory system irritation. May damage fertility or the unborn child. To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>CAS # / RTECS #</th>
<th>Hazardous Components (Chemical Name)/ REACH Registration No.</th>
<th>Concentration</th>
<th>EC No./ EC Index No.</th>
<th>GHS Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>83-43-2 TU4146000</td>
<td>6-α-Methylprednisolone 01-2120093997-32</td>
<td>100.0 %</td>
<td>201-476-4 NA</td>
<td>Toxic Repro. 1A: H360 STOT (RE) 2: H373 H372</td>
</tr>
</tbody>
</table>

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.

Unsuitable Extinguishing Media: Use water spray to cool fire-exposed containers.

5.2 Flammable Properties and Hazards: No data available.

Flash Pt: No data.
Explosive Limits: LEL: No data. UEL: No data.
Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.
Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures:
   - Avoid raising and breathing dust, and provide adequate ventilation.
   - As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions:
   - Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning:
   - Contain spill and collect, as appropriate.
   - Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling:
   - Avoid breathing dust/fume/gas/mist/vapours/spray.
   - Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing:
   - Keep container tightly closed.
   - Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls:
   - Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:
   - Eye Protection: Safety glasses
   - Protective Gloves: Compatible chemical-resistant gloves
   - Other Protective Clothing: Lab coat
   - Respiratory Equipment: NIOSH approved respirator, as conditions warrant.
   - (Specify Type): 
   - Work/Hygienic/Maintenance Practices:
     - Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower.
     - Wash thoroughly after handling.
     - No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

   - Physical States: [ ] Gas   [ ] Liquid   [ X ] Solid
   - Appearance and Odor: A crystalline solid
   - pH: No data.
   - Melting Point: No data.
   - Boiling Point: No data.
   - Flash Pt: No data.
   - Evaporation Rate: No data.
   - Flammability (solid, gas): No data available.
   - Explosive Limits: LEL: No data.  UEL: No data.
   - Vapor Pressure (vs. Air or mm Hg): No data.
   - Vapor Density (vs. Air = 1): No data.
SAFETY DATA SHEET
Methylprednisolone

Specific Gravity (Water = 1): No data.
Solubility in Water: No data.
Solubility Notes: ~0.5 mg/ml in a 1:1 solution of DMSO:PBS (pH 7.2); ~5 mg/ml in EtOH; ~20 mg/ml in DMSO & DMF;
Octanol/Water Partition Coefficient: No data.
Autoignition Pt: No data.
Decomposition Temperature: No data.
Viscosity: No data.

9.2 Other Information
Percent Volatile: No data.
Molecular Formula & Weight: C22H30O5 374.5

Section 10. Stability and Reactivity

10.1 Reactivity: No data available.
10.2 Stability: Unstable [ ] Stable [X]
10.3 Stability Note(s): Stable if stored in accordance with information listed on the product insert.
Polymerization: Will occur [ ] Will not occur [X]
10.4 Conditions To Avoid: No data available.
10.5 Incompatibility - Materials strong oxidizing agents
To Avoid:
10.6 Hazardous Decomposition or Byproducts: carbon dioxide carbon monoxide

Section 11. Toxicological Information

11.1 Information on Toxicological Effects: The toxicological effects of this product have not been thoroughly studied.
Methylprednisolone - Toxicity Data: Oral LD50 (rat): >4 g/kg; Intraperitoneal LD50 (mouse): 2292 mg/kg; Intraperitoneal TDLO (rat): 100 mg/kg;
Chronic Toxicological Effects: Methylprednisolone - Investigated as a drug and hormone.
Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here.
See actual entry in RTECS for complete information.
Methylprednisolone RTECS Number: TU4146000

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>NTP</th>
<th>IARC</th>
<th>ACGIH</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>83-43-2</td>
<td>6-α-Methylprednisolone</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

Section 12. Ecological Information

12.1 Toxicity: Avoid release into the environment.
Runoff from fire control or dilution water may cause pollution.
12.2 Persistence and Degradability: No data available.
12.3 Bioaccumulative Potential: No data available.
12.4 Mobility in Soil: No data available.
12.5 Results of PBT and vPvB assessment: No data available.
12.6 Other adverse effects: No data available.
Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):
   DOT Proper Shipping Name: Not dangerous goods.
   DOT Hazard Class:
   UN/NA Number:

14.1 LAND TRANSPORT (European ADR/RID):
   ADR/RID Shipping Name: Not dangerous goods.
   UN Number:
   Hazard Class:

14.3 AIR TRANSPORT (ICAO/IATA):
   ICAO/IATA Shipping Name: Not dangerous goods.
   Additional Transport Information: Transport in accordance with local, state, and federal regulations.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>83-43-2</td>
<td>6-alpha-Methylprednisolone</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Other US EPA or State Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>Other US EPA or State Lists</th>
</tr>
</thead>
<tbody>
<tr>
<td>83-43-2</td>
<td>6-alpha-Methylprednisolone</td>
<td>CAA HAP,ODC: No; CWA NPDES: No; TSCA: Yes - Inventory; CA PROP 65: No</td>
</tr>
</tbody>
</table>

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date: 12/20/2018

Additional Information About This Product: No data available.

Company Policy or Disclaimer: DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.
SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Catalogue No. 104374
Product name n-Hexane for analysis EMSURE® ACS, Reag. Ph Eur
REACH Registration Number A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No. 110-54-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses Reagent for analysis, Chemical production
For additional information on uses please refer to the Merck Chemicals portal (www.merckgroup.com).

1.3 Details of the supplier of the safety data sheet

Company Merck Life Science Private Limited * 8th Floor, Godrej One, Pirojshanagar, Eastern Express Highway Vikhroli (E), Mumbai – 400079 India * Tel: 0091 22 6210 9000
Responsible Department Quality Assurance * Merck Life Science Private Limited *
e-mail: quality.chemicals@merckgroup.com *
Tel: +91-2267863131-6

1.4 Emergency telephone number

Please contact the regional company representation in your country.

SECTION 2. Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)
Flammable liquid, Category 2, H225
Skin irritation, Category 2, H315
Reproductive toxicity, Category 2, H361fd
Specific target organ toxicity - single exposure, Category 3, Central nervous system, H336
Specific target organ toxicity - repeated exposure, Category 2, Inhalation, Nervous system, H373
Aspiration hazard, Category 1, H304
Chronic aquatic toxicity, Category 2, H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms

Signal word
Danger

Hazard statements
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.
H373 May cause damage to organs (Nervous system) through prolonged or repeated exposure if inhaled.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements
Prevention
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240 Ground/bond container and receiving equipment.
P273 Avoid release to the environment.
Response
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P314 Get medical advice/ attention if you feel unwell.

Storage
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

Reduced labelling (≤125 ml)
Hazard pictograms

Signal word
Danger

Hazard statements
H304 May be fatal if swallowed and enters airways.
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.

Precautionary statements
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

CAS-No. 110-54-3

2.3 Other hazards
None known.

SECTION 3. Composition/information on ingredients

3.1 Substance

Formula \( \text{CH}_3(\text{CH}_2)_4\text{CH}_3 \) \( \text{C}_9\text{H}_{14} \) (Hill)

EC-No. 203-777-6

Molar mass 86.18 g/mol

Hazardous components (REGULATION (EC) No 1272/2008)

Chemical Name (Concentration)

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Registration number</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Hexane ( (=\ 100\ %) )</td>
<td>110-54-3</td>
<td>*) Flammable liquid, Category 2, H225</td>
</tr>
</tbody>
</table>

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.
SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Catalogue No. 104374
Product name n-Hexane for analysis EMSURE® ACS, Reag. Ph Eur

Skin irritation, Category 2, H315
Reproductive toxicity, Category 2, H361fd
Specific target organ toxicity - single exposure, Category 3, H336
Specific target organ toxicity - repeated exposure, Category 2, H373
Aspiration hazard, Category 1, H304
Chronic aquatic toxicity, Category 2, H411

*) A registration number is not available for this substance as the substance or its use are exempted from registration according to Article 2 REACH Regulation (EC) No 1907/2006, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

For the full text of the H-Statements mentioned in this Section, see Section 16.

3.2 Mixture
Not applicable

SECTION 4. First aid measures

4.1 Description of first aid measures
After inhalation: fresh air. Call in physician.

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/shower. Consult a physician.

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.


4.2 Most important symptoms and effects, both acute and delayed
irritant effects, somnolence, Drowsiness
narcosis, Nausea, Tiredness, CNS disorders, paralysis symptoms
Risk of corneal clouding.
It generally applies for aliphatic hydrocarbons with 6 - 18 carbon atoms that they may cause pneumonia, in some cases also pulmonary oedema, upon direct inhalation, i.e. in conditions that can occur only in very special circumstances (nebulizations, spraying, inhalation of aerosols and similar). After absorption of very large quantities: narcosis.

4.3 Indication of any immediate medical attention and special treatment needed
No information available.
SECTION 5. Firefighting measures

5.1 Extinguishing media
   Suitable extinguishing media
   Foam, Carbon dioxide (CO2), Dry powder

   Unsuitable extinguishing media
   For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
   Combustible.
   Pay attention to flashback.
   Vapours are heavier than air and may spread along floors.
   Development of hazardous combustion gases or vapours possible in the event of fire.
   Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters
   Special protective equipment for firefighters
   Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by
   keeping a safe distance or by wearing suitable protective clothing.

   Further information
   Remove container from danger zone and cool with water. Prevent fire extinguishing water from
   contaminating surface water or the ground water system.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
   Advice for non-emergency personnel: Do not breathe vapours, aerosols. Avoid substance
   contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the
   danger area, observe emergency procedures, consult an expert.

   Advice for emergency responders:
   Protective equipment see section 8.

6.2 Environmental precautions
   Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

The Safety Data Sheets for catalogue items are available at www.merckgroup.com
6.4 Reference to other sections
Indications about waste treatment see section 13.

SECTION 7. Handling and storage

7.1 Precautions for safe handling
Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Observe label precautions.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

7.2 Conditions for safe storage, including any incompatibilities
Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Recommended storage temperature see product label.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Engineering measures
Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

See section 7.1.

**Individual protection measures**
Protective clothing needs to be selected specifically for the workplace, depending on concentrations and quantities of the hazardous substances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.

**Eye/face protection**
Safety glasses

**Hand protection**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Material</th>
<th>Thickness</th>
<th>Breakthrough Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full contact</td>
<td>Nitrile rubber</td>
<td>0.40 mm</td>
<td>&gt; 480 min</td>
</tr>
<tr>
<td>Splash contact</td>
<td>Nitrile rubber</td>
<td>0.11 mm</td>
<td>&gt; 10 min</td>
</tr>
</tbody>
</table>

The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374, for example KCL 730 Camatri® -Velours (full contact), KCL 741 Dermatri® L (splash contact).

The breakthrough times stated above were determined by KCL in laboratory tests acc. to EN374 with samples of the recommended glove types.

This recommendation applies only to the product stated in the safety data sheet supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

**Other protective equipment**
Flame retardant antistatic protective clothing.

**Respiratory protection**

required when vapours/aerosols are generated.

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective
devices are carried out according to the instructions of the producer. These measures have to be properly documented.

Environmental exposure controls
Do not let product enter drains.
Risk of explosion.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Form          liquid

Colour        colourless

Odour         benzine-like

Odour Threshold No information available.

pH            Not applicable

Melting point -94.3 °C

Boiling point/boiling range 69 °C
at 1,013 hPa

Flash point  -22 °C
Method: c.c.

Evaporation rate No information available.

Flammability (solid, gas) No information available.

Lower explosion limit 1.0 %(V)

Upper explosion limit 8.1 %(V)
SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Catalogue No. 104374
Product name n-Hexane for analysis EMSURE® ACS, Reag. Ph Eur

Vapour pressure 160 hPa
at 20 °C

Relative vapour density 2.79

Density 0.66 g/cm³
at 20 °C

Relative density No information available.

Water solubility 0.0095 g/l
at 20 °C

Partition coefficient: n-octanol/water log Pow: 4.11
(calculated)
(Lit.) Potential bioaccumulation

Auto-ignition temperature No information available.

Decomposition temperature Distillable in an undecomposed state at normal pressure.

Viscosity, dynamic 0.326 mPa.s
at 20 °C

Explosive properties Not classified as explosive.

Oxidizing properties none

9.2 Other data

Ignition temperature 240 °C
Method: DIN 51794

Viscosity, kinematic 0.50 mm²/s
at 20 °C

SECTION 10. Stability and reactivity

10.1 Reactivity

The Safety Data Sheets for catalogue items are available at www.merckgroup.com
Vapours may form explosive mixture with air.

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature).

10.3 Possibility of hazardous reactions
Risk of explosion with:
- Strong oxidizing agents, nitrogen oxides
- Violent reactions possible with:
  - Halogens
Risk of ignition or formation of inflammable gases or vapours with:
- SODIUM PEROXIDE

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
- Rubber, various plastics

10.6 Hazardous decomposition products
- No information available

SECTION 11. Toxicological information

11.1 Information on toxicological effects

Acute oral toxicity
LD50 Rat: 16,000 mg/kg
OECD Test Guideline 401

Symptoms: Nausea

Acute inhalation toxicity
LC50 Rat: 172 mg/l; 4 h; vapour
(RTECS)

Symptoms: Irritation symptoms in the respiratory tract.
**Acute dermal toxicity**
LD50 Rabbit: > 2,000 mg/kg  
(ECHA)

**Absorption**

**Skin irritation**
Causes skin irritation.

**Eye irritation**
Risk of corneal clouding.

**Sensitisation**
This information is not available.

**Germ cell mutagenicity**

**Genotoxicity in vivo**
Micronucleus test
Result: negative

(National Toxicology Program)

**Genotoxicity in vitro**
In vitro mammalian cell gene mutation test
Mouse lymphoma test
Result: Positive results were obtained in some in vitro tests.
Method: OECD Test Guideline 476

Ames test
Salmonella typhimurium
Result: negative
Method: OECD Test Guideline 471

**Carcinogenicity**
This information is not available.

**Reproductive toxicity**
This information is not available.

**Teratogenicity**
This information is not available.
**CMR effects**

Teratogenicity:
Suspected of damaging the unborn child.

Reproductive toxicity:
Suspected of damaging fertility.

**Specific target organ toxicity - single exposure**
May cause drowsiness or dizziness.
Target Organs: Central nervous system

**Specific target organ toxicity - repeated exposure**
May cause damage to organs through prolonged or repeated exposure.
Exposure routes: Inhalation
Target Organs: Nervous system

**Aspiration hazard**
Aspiration hazard, Aspiration may cause pulmonary oedema and pneumonitis.

**11.2 Further information**

After absorption:
Tiredness, narcosis

After long-term exposure to the chemical:
CNS disorders, paralysis symptoms

It generally applies for aliphatic hydrocarbons with 6 - 18 carbon atoms that they may cause pneumonia, in some cases also pulmonary oedema, upon direct inhalation, i.e. in conditions that can occur only in very special circumstances (nebulizations, spraying, inhalation of aerosols and similar). After absorption of very large quantities: narcosis.

Other dangerous properties can not be excluded.
This substance should be handled with particular care.

**SECTION 12. Ecological information**

**12.1 Toxicity**

*Toxicity to fish*

LC50 Pimephales promelas (fathead minnow): 2.5 mg/l; 96 h
(ECOTOX Database)
Toxicity to daphnia and other aquatic invertebrates

EC50 Daphnia magna (Water flea): 2.1 mg/l; 48 h
(Lit.)

12.2 Persistence and degradability

No information available.

12.3 Bioaccumulative potential

*Partition coefficient: n-octanol/water*

log Pow: 4.11
(calculated)

(Lit.) Potential bioaccumulation

12.4 Mobility in soil

No information available.

12.5 Results of PBT and vPvB assessment

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

12.6 Other adverse effects

*Henry constant*

183000 Pa*m³/mol
(HSDB) Distribution preferentially in air.

Discharge into the environment must be avoided.
SECTION 13. Disposal considerations

Waste treatment methods
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14. Transport information

Land transport (ADR/RID)
14.1 UN number UN 1208
14.2 Proper shipping name HEXANES
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous yes
14.6 Special precautions for user yes
Tunnel restriction code D/E

Inland waterway transport (ADN)
Not relevant

Air transport (IATA)
14.1 UN number UN 1208
14.2 Proper shipping name HEXANES
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous yes
14.6 Special precautions for user no

Sea transport (IMDG)
SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

Catalogue No. 104374
Product name n-Hexane for analysis EMSURE® ACS, Reag. Ph Eur

14.1 UN number UN 1208
14.2 Proper shipping name HEXANES
14.3 Class 3
14.4 Packing group II
14.5 Environmentally hazardous yes
14.6 Special precautions for user yes
EmS F-E S-D

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not relevant

SECTION 15. Regulatory information
15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

National legislation
Storage class 3

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out.

SECTION 16. Other information

Full text of H-Statements referred to under sections 2 and 3.

H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H361fd Suspected of damaging fertility. Suspected of damaging the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure if inhaled.
H411 Toxic to aquatic life with long lasting effects.

Training advice
Provide adequate information, instruction and training for operators.

**Labelling**

*Hazard pictograms*

![Hazard pictograms]

**Signal word**

Danger

**Hazard statements**

H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs (Nervous system, Central nervous system) through prolonged or repeated exposure if inhaled.
H411 Toxic to aquatic life with long lasting effects.

**Precautionary statements**

*Prevention*
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P240 Ground/bond container and receiving equipment.
P273 Avoid release to the environment.

*Response*
P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P314 Get medical advice/ attention if you feel unwell.

*Storage*
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

**Key or legend to abbreviations and acronyms used in the safety data sheet**

Used abbreviations and acronyms can be looked up at www.wikipedia.org.
The information contained herein is based on the present state of our knowledge. It characterises the product with regard to the appropriate safety precautions. It does not represent a guarantee of any properties of the product.
SAFETY DATA SHEET

1. Identification

Product Name: Hexanoic anhydride
Cat No.: AC186750000; AC186750500; AC186752500
CAS-No: 2051-49-2
Synonyms: Caproic anhydride
Recommended Use: Laboratory chemicals.
Uses advised against: Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet:

Emergency Telephone Number
For information US: call: 001-800-ACROS-01 / Europe: call: +32 14 57 52 11
Emergency Number US: 001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No. US: 001-800-424-9300 / Europe: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Skin Corrosion/Irritation</th>
<th>Category 1 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 1</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word
Danger

Hazard Statements
Causes severe skin burns and eye damage

Precautionary Statements
Prevention
Hexanoic anhydride

Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection

Response
Immediately call a POISON CENTER or doctor/physician

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse

Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting

Storage
Store locked up

Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
None identified

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanoic acid, anhydride</td>
<td>2051-49-2</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. First-aid measures

Eye Contact
Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact
Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.

Inhalation
Remove from exposure, lie down. Move to fresh air. If not breathing, give artificial respiration. Immediate medical attention is required.

Ingestion
Do not induce vomiting. Call a physician immediately.

Most important symptoms and effects
Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media

Unsuitable Extinguishing Media
No information available

Flash Point
> 130 °C / > 266 °F

Method
No information available

Autoignition Temperature
260 °C / 500 °F

Explosion Limits

Page 2 / 7
Hexanoic anhydride

Revision Date 19-Jan-2018

Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

<table>
<thead>
<tr>
<th></th>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions
See Section 12 for additional ecological information.

Methods for Containment and Clean Up
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling
Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use only in area provided with appropriate exhaust ventilation.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Corrosives area. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines
This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection
Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State Liquid
Hexanoic anhydride

Appearance: Light yellow
Odor: Odorless
Odor Threshold: No information available
pH: 4.2  72 g/l aq.sol
Melting Point/Range: -40 °C / -40 °F
Boiling Point/Range: 246 - 248 °C / 474.8 - 478.4 °F @ 760 mmHg
Flash Point: > 130 °C / > 266 °F
Evaporation Rate: No information available
Flammability (solid,gas): Not applicable
Flammability or explosive limits: No data available
Vapor Pressure: No information available
Vapor Density: 7.39
Specific Gravity: 0.926
Solubility: No information available
Partition coefficient; n-octanol/water: No data available
Autoignition Temperature: 260 °C / 500 °F
Decomposition Temperature: No information available
Viscosity: No information available
Molecular Formula: C12 H22 O3
Molecular Weight: 214.3

10. Stability and reactivity

Reactive Hazard: None known, based on information available
Stability: Moisture sensitive.
Conditions to Avoid: Incompatible products. Exposure to moist air or water.
Incompatible Materials: Acids, Bases, Strong oxidizing agents
Hazardous Decomposition Products: Carbon monoxide (CO), Carbon dioxide (CO₂)
Hazardous Polymerization: No information available.
Hazardous Reactions: None under normal processing.

11. Toxicological information

Acute Toxicity
Product Information: No acute toxicity information is available for this product
Component Information: Toxicologically Synergistic Products: No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure
Irritation: No information available
Sensitization: No information available
Carcinogenicity: The table below indicates whether each agency has listed any ingredient as a carcinogen.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexanoic acid, anhydride</td>
<td>2051-49-2</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Mutagenic Effects: No information available
Reproductive Effects: No information available.
Hexanoic anhydride

Developmental Effects: No information available.

Teratogenicity: No information available.

STOT - single exposure: None known
STOT - repeated exposure: None known

Aspiration hazard: No information available

Symptoms / effects, both acute and delayed: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information: No information available

Other Adverse Effects: The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity: Do not empty into drains.

Persistence and Degradability: Soluble in water. Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation: No information available.

Mobility: Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods: Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT
- UN-No: UN3265
- Proper technical name: Hexanoic acid, anhydride
- Hazard Class: 8
- Packing Group: II

TDG
- UN-No: UN3265
- Hazard Class: 8
- Packing Group: II

IATA
- UN-No: UN3265
- Proper Shipping Name: Corrosive liquid, acidic, organic, n.o.s
- Hazard Class: 8
- Packing Group: II

IMDG/IMO
- UN-No: UN3265
- Proper Shipping Name: Corrosive liquid, acidic, organic, n.o.s
- Hazard Class: 8
- Packing Group: II

15. Regulatory information

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECSC</th>
<th>KECL</th>
</tr>
</thead>
</table>

Page 5 / 7
16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date
05-Nov-2010
Revision Date
19-Jan-2018
Print Date
19-Jan-2018
Revision Summary
This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally
Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
Product name : n-Pentane
CAS-No. : 109-66-0

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses : Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
Company : Central Drug House (P) Ltd
7/28 Vardaan House
New Delhi-10002
INDIA
Telephone : +91 11 49404040
Email : care@cdhfinechemical.com

1.4 Emergency telephone number
Emergency Phone # : +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 2), H225
Aspiration hazard (Category 1), H304
Specific target organ toxicity - single exposure (Category 3), H336
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

Classification according to EU Directives 67/548/EEC or 1999/45/EC
F+ Extremely flammable R12
Xn Harmful R65
R66
R67
N Dangerous for the R51/53
environment

For the full text of the R-phrases mentioned in this Section, see Section 16.

2.2 Label elements
Labelling according Regulation (EC) No 1272/2008

Pictogram

Signal word  Danger

Hazard statement(s)
H225  Highly flammable liquid and vapour.
H304  May be fatal if swallowed and enters airways.
H336  May cause drowsiness or dizziness.
H411  Toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P210  Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261  Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273  Avoid release to the environment.
P301 + P310  IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331  Do NOT induce vomiting.

Supplemental Hazard information (EU)
EUH066  Repeated exposure may cause skin dryness or cracking.

2.3 Other hazards - none

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Formula</th>
<th>C5H12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight</td>
<td>72.15 g/mol</td>
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<tr>
<td>CAS-No.</td>
<td>109-66-0</td>
</tr>
<tr>
<td>EC-No.</td>
<td>203-692-4</td>
</tr>
<tr>
<td>Index-No.</td>
<td>601-006-00-1</td>
</tr>
<tr>
<td>Registration number</td>
<td>01-2119459286-30-XXXX</td>
</tr>
</tbody>
</table>

Hazardous ingredients according to Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Pentane</td>
<td>Flam. Liq. 2; STOT SE 3; Asp.</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td></td>
<td>Tox. 1; Aquatic Chronic 2; H225, H304, H336, H411, EUH066</td>
<td></td>
</tr>
</tbody>
</table>

Hazardous ingredients according to Directive 1999/45/EC

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Pentane</td>
<td>F+, Xn, N, R12 - R51/53 - R65</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td></td>
<td>- R66 - R67</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements and R-Phrases mentioned in this Section, see Section 16

SECTION 4: First aid measures

4.1 Description of first aid measures
**General advice**
Consult a physician. Show this safety data sheet to the doctor in attendance.

**If inhaled**
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 **Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 **Indication of any immediate medical attention and special treatment needed**
no data available

**SECTION 5: Firefighting measures**

5.1 **Extinguishing media**
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 **Special hazards arising from the substance or mixture**
Carbon oxides

5.3 **Advice for firefighters**
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 **Further information**
Use water spray to cool unopened containers.

**SECTION 6: Accidental release measures**

6.1 **Personal precautions, protective equipment and emergency procedures**
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. For personal protection see section 8.

6.2 **Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 **Methods and materials for containment and cleaning up**
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 **Reference to other sections**
For disposal see section 13.

**SECTION 7: Handling and storage**

7.1 **Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.
7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Refrigerate before opening.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance Form: liquid, clear
   Colour: colourless
b) Odour no data available
c) Odour Threshold no data available
d) pH no data available
e) Melting point/freezing point Melting point/range: -130 °C - lit.
f) Initial boiling point and boiling range 35 - 36 °C - lit.
g) Flash point -49,0 °C - closed cup
h) Evaporation rate  no data available
i) Flammability (solid, gas)  no data available
j) Upper/lower flammability or explosive limits  Upper explosion limit: 8.3 % (V)
          Lower explosion limit: 1.4 % (V)
k) Vapour pressure  579.0 hPa at 20.0 °C
          1.859.7 hPa at 55.0 °C
l) Vapour density  no data available
m) Relative density  0.626 g/cm3 at 25 °C
n) Water solubility  no data available
o) Partition coefficient: n-octanol/water  log Pow: 3.39
p) Auto-ignition temperature  260.0 °C
q) Decomposition temperature  no data available
r) Viscosity  no data available
s) Explosive properties  Not explosive
t) Oxidizing properties  no data available

9.2 Other safety information
   no data available

SECTION 10: Stability and reactivity

10.1 Reactivity
   no data available
10.2 Chemical stability
   Stable under recommended storage conditions.
10.3 Possibility of hazardous reactions
   no data available
10.4 Conditions to avoid
   Heat, flames and sparks. Extremes of temperature and direct sunlight.
10.5 Incompatible materials
   Strong oxidizing agents
10.6 Hazardous decomposition products
   Other decomposition products - no data available
   In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects
   Acute toxicity
   LD50 Oral - mouse - 5.000 mg/kg
   LC50 Inhalation - rat - 4 h - 364.000 mg/m3
   LD50 Dermal - rabbit - 3.000 mg/kg
   Skin corrosion/irritation
   Skin - rabbit
   Result: No skin irritation
   (OECD Test Guideline 404)
Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
Ames test
S. typhimurium
Result: negative

Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: RZ9450000
Contact with eyes can cause: Redness, Blurred vision, Provokes tears., Prolonged or repeated contact with skin may cause: defatting, Dermatitis, Central nervous system depression, Damage to the lungs.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity
Toxicity to daphnia and EC50 - Daphnia magna (Water flea) - 9.74 mg/l - 48 h
other aquatic invertebrates

12.2 Persistence and degradability
Biodegradability Biotic/Aerobic - Exposure time 192 h
Result: 70 % - Readily biodegradable.

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
Toxic to aquatic life.

Avoid release to the environment. Do not empty into drains.

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.
Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 1265
IMDG: 1265
IATA: 1265

14.2 UN proper shipping name
ADR/RID: PENTANES
IMDG: PENTANES
IATA: Pentanes

14.3 Transport hazard class(es)
ADR/RID: 3
IMDG: 3
IATA: 3

14.4 Packaging group
ADR/RID: II
IMDG: II
IATA: II

14.5 Environmental hazards
ADR/RID: yes
IMDG Marine pollutant: yes
IATA: no

14.6 Special precautions for user
no data available

SECTION 15: Regulatory information

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
no data available

15.2 Chemical Safety Assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-statements referred to under sections 2 and 3.
Aquatic Chronic Chronic aquatic toxicity
Asp. Tox. Aspiration hazard
EUH066 Repeated exposure may cause skin dryness or cracking.
Flam. Liq. Flammable liquids
H225 Highly flammable liquid and vapour.

H304 May be fatal if swallowed and enters airways.
H336 May cause drowsiness or dizziness.
H411 Toxic to aquatic life with long lasting effects.
STOT SE Specific target organ toxicity - single exposure

Full text of R-phrases referred to under sections 2 and 3
F+ Extremely flammable
N Dangerous for the environment
Xn Harmful
R12 Extremely flammable.
R51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R65 Harmful: may cause lung damage if swallowed.
R66 Repeated exposure may cause skin dryness or cracking.
R67 Vapours may cause drowsiness and dizziness.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
## SECTION 1: Identification of the substance/mixture and of the company/undertaking

### 1.1 Product identifiers

- **Product name**: Phenol
- **CAS-No.**: 108-95-2

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

- **Identified uses**: Laboratory chemicals, Industrial & for professional use only.

### 1.3 Details of the supplier of the safety data sheet

- **Company**: Central Drug House (P) Ltd
  7/28 Vardaan House
  New Delhi-10002
  INDIA
- **Telephone**: +91 11 49404040
- **Email**: care@cdhfinechemical.com

### 1.4 Emergency telephone number

- **Emergency Phone #**: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

## SECTION 2: Hazards identification

### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No 1272/2008**

- Acute toxicity, Oral (Category 3), H301
- Acute toxicity, Inhalation (Category 3), H331
- Acute toxicity, Dermal (Category 3), H311
- Skin corrosion (Category 1B), H314
- Germ cell mutagenicity (Category 2), H341
- Specific target organ toxicity - repeated exposure (Category 2), H373
- Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 Label elements

**Labelling according Regulation (EC) No 1272/2008**

- **Pictogram**

  ![Pictogram](image)

- **Signal word**: Danger
- **Hazard statement(s)**
  - H301 + H311 + H331: Toxic if swallowed, in contact with skin or if inhaled
  - H314: Causes severe skin burns and eye damage.
Precautionary statement(s)
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331 + P310 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor/ physician.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Supplemental Hazard Statements

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher. Vesicant., Rapidly absorbed through skin.

SECTION 3: Composition/information on ingredients

3.1 Substances
Synonyms : Hydroxybenzene

<table>
<thead>
<tr>
<th>Formula</th>
<th>C6H6O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>94.11 g/mol</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>108-95-2</td>
</tr>
<tr>
<td>EC-No.</td>
<td>203-632-7</td>
</tr>
<tr>
<td>Index-No.</td>
<td>604-001-00-2</td>
</tr>
<tr>
<td>Registration number</td>
<td>01-2119471329-32-XXXX</td>
</tr>
</tbody>
</table>

Hazardous ingredients according to Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenol</td>
<td>Acute Tox. 3; Skin Corr. 1B;</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td></td>
<td>Muta. 2; STOT RE 2; Aquatic</td>
<td>Chronic 2; H301, H331, H311, H314, H341, H373, H411</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concentration limits:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;= 3 %: Skin Corr. 1B, H314;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 - &lt; 3 %: Skin Irrit. 2, H315; 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- &lt; 3 %: Eye Irrit. 2, H319;</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures
5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

SECTION 6: Accidental release measures
6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage
7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place.
Recommended storage temperature 2 - 8 °C
Light sensitive. Handle and store under inert gas.
7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters
Components with workplace control parameters

8.2 Exposure controls
Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance Form: solid
b) Odour No data available
c) Odour Threshold No data available
d) pH 6,0
e) Melting point/freezing point Melting point/range: 38 - 43 °C
f) Initial boiling point and boiling range 182,0 °C
g) Flash point 79,0 °C - closed cup
h) Evaporation rate No data available
i) Flammability (solid, gas) No data available
j) Upper/lower flammability or explosive limits Upper explosion limit: 8,6 % (V) Lower explosion limit: 1,7 % (V)
k) Vapour pressure 6,3 hPa at 55,0 °C 0,5 hPa at 20,0 °C
l) Vapour density No data available
m) Relative density 1,07 g/cm³
n) Water solubility 84 g/l at 20 °C
o) Partition coefficient: n-octanol/water log Pow: 1,46
p) Auto-ignition temperature 715,0 °C
q) Decomposition temperature No data available
r) Viscosity No data available
s) Explosive properties No data available
t) Oxidizing properties No data available

9.2 Other safety information
Surface tension 38,2 mN/m at 50,0 °C

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases, Strong acids

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 317,0 mg/kg
Remarks: Behavioral: Convulsions or effect on seizure threshold.

LC50 Inhalation - Rat - 8 h - 900 mg/m³
LD50 Dermal - Rabbit - 630,0 mg/kg

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Corrosive
(OECD Test Guideline 405)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
In vitro tests showed mutagenic effects
Carcinogenicity
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Phenol)

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: SJ3325000
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Circulatory collapse, tachypnea, paralysis, Convulsions, Coma., necrosis of mouth and G.I. Tract, Jaundice, respiratory failure, cardiac arrest
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish
LC50 - Leuciscus idus (Golden orfe) - 14,00 - 25,00 mg/l - 48 h
LC50 - Carassius auratus (goldfish) - 36,10 - 68,80 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 56 mg/l - 48 h

Toxicity to algae
EC50 - Chlorella vulgaris (Fresh water algae) - 370,00 mg/l - 96 h

12.2 Persistence and degradability

Biodegradability Result: - Readily biodegradable

12.3 Bioaccumulative potential

Bioaccumulation Danio rerio (zebra fish) - 5 h
- 2 mg/l

Bioconcentration factor (BCF): 17,5
Remarks: Does not bioaccumulate.

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
Toxic to aquatic life with long lasting effects.
SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 1671
IMDG: 1671
IATA: 1671

14.2 UN proper shipping name
ADR/RID: PHENOL, SOLID
IMDG: PHENOL, SOLID
IATA: Phenol, solid

14.3 Transport hazard class(es)
ADR/RID: 6.1
IMDG: 6.1
IATA: 6.1

14.4 Packaging group
ADR/RID: II
IMDG: II
IATA: II

14.5 Environmental hazards
ADR/RID: yes
IMDG Marine pollutant: yes
IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical Safety Assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

H301 Toxic if swallowed.
H301 + H311 + Toxic if swallowed, in contact with skin or if inhaled
H331
H311 Toxic in contact with skin.
H314 Causes severe skin burns and eye damage.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H331 Toxic if inhaled.
H341 Suspected of causing genetic defects.
H373 May cause damage to organs through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
1. PRODUCT AND COMPANY IDENTIFICATION

Product Code: 8KAC60
Product Name: Potassium Acetate, 60%
Trade Name: Potassium Acetate, 60%
Company Name: Compass Chemical International LLC
5544 Oakdale Road SE
Smyrna, GA 30082
Web site address: www.compasschemical.com
Emergency Contact: Chemtrec
24 Hour (404)696-6711
(678)904-4017
Phone Number: (800)424-9300
Intended Use: Intended for Industrial Use

2. HAZARDS IDENTIFICATION

GHS Signal Word: None
GHS Hazard Phrases: No phrases apply.
GHS Precaution Phrases: No phrases apply.
GHS Response Phrases: No phrases apply.
GHS Storage and Disposal Phrases: No phrases apply.
OSHA Regulatory Status: This material is classified as not hazardous under OSHA regulations.
Potential Health Effects (Acute and Chronic):
Inhalation: No hazard expected in normal industrial use.
Skin Contact: May cause skin irritation.
Eye Contact: May cause eye irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. No hazard expected in normal industrial use.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>Concentration</th>
<th>RTECS #</th>
</tr>
</thead>
<tbody>
<tr>
<td>127-08-2</td>
<td>Potassium acetate (Acetic acid, potassium salt)</td>
<td>60 %</td>
<td>AJ3325000</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Emergency and First Aid Procedures:
In Case of Inhalation: Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.
In Case of Skin Contact: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.
In Case of Eye Contact: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If irritation develops get medical aid.
In Case of Ingestion: Get medical aid. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Note to Physician: Treat symptomatically and supportively.
5. FIRE FIGHTING MEASURES

Flammability Classification: non-flammable
Flash Pt: NP
Explosive Limits: LEL: N.A. UEL: N.A.
Autoignition Pt: NP
Suitable Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Fire Fighting Instructions: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Material will not burn.
Flammable Properties and Hazards: No data available.

6. ACCIDENTAL RELEASE MEASURES

Protective Precautions, Protective Equipment and Emergency Procedures: Wear appropriate protective gloves to prevent skin exposure.
Steps To Be Taken In Case Material Is Released Or Spilled: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid generating dusty conditions. Provide ventilation. Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container.

7. HANDLING AND STORAGE

Precautions To Be Taken in Handling: Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Use with adequate ventilation.
Precautions To Be Taken in Storing: Store in a cool, dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Partial Chemical Name</th>
<th>OSHA TWA</th>
<th>ACGIH TWA</th>
<th>Other Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>127-08-2</td>
<td>Potassium acetate (Acetic acid, potassium salt)</td>
<td>No data.</td>
<td>No data.</td>
<td>No data.</td>
</tr>
</tbody>
</table>

Respiratory Equipment (Specify Type): A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use. Respirator protection is not normally required.
Eye Protection: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Wear chemical splash goggles.
Protective Gloves: Wear appropriate protective gloves to prevent skin exposure.
Other Protective Clothing: Wear appropriate protective clothing to minimize contact with skin.
Engineering Controls (Ventilation etc.): Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low. There are no special ventilation requirements.
### 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical States:</td>
<td>[ ] Gas [ X ] Liquid [ ] Solid</td>
</tr>
<tr>
<td>Appearance and Odor:</td>
<td>Clear, near colorless.</td>
</tr>
<tr>
<td></td>
<td>Mild odor.</td>
</tr>
<tr>
<td></td>
<td>Odor threshold: Unavailable</td>
</tr>
<tr>
<td>Melting Point:</td>
<td>No data.</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>No data.</td>
</tr>
<tr>
<td>Autoignition Pt:</td>
<td>NP</td>
</tr>
<tr>
<td>Flash Pt:</td>
<td>NP</td>
</tr>
<tr>
<td>Explosive Limits:</td>
<td>LEL: N.A. UEL: N.A.</td>
</tr>
<tr>
<td>Specific Gravity (Water = 1):</td>
<td>&gt;=1.320 at 25.0 C (77.0 F)</td>
</tr>
<tr>
<td>Density:</td>
<td>~ 11 LB/GA at 25.0 C (77.0 F)</td>
</tr>
<tr>
<td>Bulk density:</td>
<td>NP</td>
</tr>
<tr>
<td>Vapor Pressure (vs. Air or mm Hg):</td>
<td>NP</td>
</tr>
<tr>
<td>Vapor Density (vs. Air = 1):</td>
<td>NP</td>
</tr>
<tr>
<td>Evaporation Rate:</td>
<td>NA</td>
</tr>
<tr>
<td>Solubility in Water:</td>
<td>soluble at 25.0 C (77.0 F)</td>
</tr>
<tr>
<td>Saturated Vapor Concentration:</td>
<td>NA</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>NA</td>
</tr>
<tr>
<td>Octanol/Water Partition Coefficient:</td>
<td>unknown</td>
</tr>
<tr>
<td>pH:</td>
<td>8.5 - 10.0</td>
</tr>
<tr>
<td>Percent Volatile:</td>
<td>~ 40.00 % by weight.</td>
</tr>
<tr>
<td>VOC / Volume:</td>
<td>NP</td>
</tr>
<tr>
<td>Particle Size:</td>
<td>NP</td>
</tr>
<tr>
<td>Heat Value:</td>
<td>NP</td>
</tr>
<tr>
<td>Corrosion Rate:</td>
<td>NA</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability:</td>
<td>Unstable [ ] Stable [ X ]</td>
</tr>
<tr>
<td>Conditions To Avoid - Instability:</td>
<td>Incompatible materials.</td>
</tr>
<tr>
<td>Incompatibility - Materials To Avoid:</td>
<td>Strong oxidizing agents.</td>
</tr>
<tr>
<td>Hazardous Decomposition or Byproducts:</td>
<td>Carbon monoxide.</td>
</tr>
<tr>
<td>Possibility of Hazardous Reactions:</td>
<td>Will occur [ ] Will not occur [ X ]</td>
</tr>
<tr>
<td>Conditions To Avoid - Hazardous Reactions:</td>
<td>No data available.</td>
</tr>
</tbody>
</table>
11. TOXICOLOGICAL INFORMATION

Toxicological Information:
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: Mutagenicity: Neurotoxicity: Other Studies: No data available.

Carcinogenicity/Other Information:
Acute toxicity, LD50, Oral, Rat, 3250. MG/KG.

Result:
Behavioral: Convulsions or effect on seizure threshold.
Gastrointestinal: Hypermotility, diarrhea.

Nutritional and Gross Metabolic: Changes in: Body temperature increase.

Toxicological Information:
CAS# 127-08-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65. CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Carcinogenicity/Other Information:
CAS# 127-08-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

12. ECOLOGICAL INFORMATION

General Ecological Information:
Environmental: No information available.
Physical: No information available.
Other: Do not empty into drains.

Results of PBT and vPvB assessment:
CAS# 127-08-2:
LC50, Fathead Minnow (Pimephales promelas), 421.0 MG/L, 96 H, Mortality, Water temperature: 20.00 C (68.0 F) C, Hardness: 180.00 MG/L.
Result:
No loss of equilibrium observed.


Effective concentration to 50% of test organisms., Water Flea (Daphnia similis), neonate, 1.150 G/L, 48 H, Mortality, Water temperature: 20.00 C (68.0 F) C, Hardness: 44.00 MG/L.
Result:
Morphological changes.

- Acute and Chronic Toxicity of Potassium Chloride (KCl) and Potassium Acetate (KC2H3O2) to Daphnia similis and Ceriodaphnia dubia (Crustacea; Cladocera), Utz, L.R.P., and M.B.C. Bohrer, 2001

Effective concentration to 50% of test organisms., Water Flea (Daphnia similis), neonate, 1.050 G/L, 48 H, Mortality, Water temperature: 20.00 C (68.0 F) C, Hardness: 44.00 MG/L.
Result:
Morphological changes.

- Acute and Chronic Toxicity of Potassium Chloride (KCl) and Potassium Acetate (KC2H3O2) to Daphnia similis and Ceriodaphnia dubia (Crustacea; Cladocera), Utz, L.R.P., and M.B.C. Bohrer, 2001

Effective concentration to 0% of test organisms, Water Flea (Ceriodaphnia dubia), neonate, 0.300 G/L, 12 D, Reproduction, Water temperature: 25.00 C (77.0 F) C, Hardness: 44.00 MG/L.
Result:
Morphological changes.
- Acute and Chronic Toxicity of Potassium Chloride (KCl) and Potassium Acetate (KC2H3O2) to Daphnia similis and Ceriodaphnia dubia (Crustacea; Cladocera), Utz, L.R.P., and M.B.C. Bohrer, 2001

Effective concentration to (0) % of test organisms, Water Flea (Ceriodaphnia dubia), neonate, 0.600 G/L, 12 D, Growth, Water temperature: 25.00 C (77.0 F) C, Hardness: 44.00 MG/L.
Result:
Morphological changes.
- Acute and Chronic Toxicity of Potassium Chloride (KCl) and Potassium Acetate (KC2H3O2) to Daphnia similis and Ceriodaphnia dubia (Crustacea; Cladocera), Utz, L.R.P., and M.B.C. Bohrer, 2001

Inhibition concentration to 25% of test organisms, Water Flea (Ceriodaphnia dubia), 54.50 MG/L, 6 - 7 D, Reproduction, Water temperature: 25.00 C (77.0 F) C; Aquatic Toxicity of Airfield-Pavement Deicer Materials and Implications for Airport Runoff, Corsi, S.R., S.W. Geis, G. Bowman, G.G. Failey, and T.D. Rutter, 2009

### 13. DISPOSAL CONSIDERATIONS

**Waste Disposal Method:** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.
**RCRA U-Series:** None listed.

### 14. TRANSPORT INFORMATION

**GHS Classification:** No GHS classifications apply.

**LAND TRANSPORT (US DOT):**
- **DOT Proper Shipping Name:** Not Regulated.
- **DOT Hazard Class:**
- **UN/NA Number:**

**LAND TRANSPORT (Canadian TDG):**
- **TDG Shipping Name:** Not Regulated.
- **UN Number:**
- **Hazard Class:**
- **TDG Classification:**

**LAND TRANSPORT (European ADR/RID):**
- **ADR/RID Shipping Name:**
- **UN Number:**
- **Hazard Class:**

**MARINE TRANSPORT (IMDG/IMO):**
- **IMDG/IMO Shipping Name:**
- **UN Number:** |N|
- **Hazard Class:**
- **Packing Group:**
- **IMDG MFAG Number:**
### 15. REGULATORY INFORMATION

#### EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Hazardous Components (Chemical Name)</th>
<th>S. 302 (EHS)</th>
<th>S. 304 RQ</th>
<th>S. 313 (TRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>127-08-2</td>
<td>Potassium acetate (Acetic acid, potassium salt)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

This material meets the EPA 'Hazard Categories' defined for SARA Title III Sections:
- [ ] Yes [X] No Acute (immediate) Health Hazard
- [ ] Yes [X] No Chronic (delayed) Health Hazard
- [ ] Yes [X] No Fire Hazard
- [ ] Yes [X] No Sudden Release of Pressure Hazard
- [ ] Yes [X] No Reactive Hazard

#### Other US EPA or State Lists

- CAA HAP, ODC: No
- CWA NPDES: No
- TSCA: Yes - Inventory
- CA PROP.65: No

#### International Regulatory Lists

- Canadian DSL: Yes
- Canadian NDSL: No
- Mexico INSQ: Yes
- Australia ICS: Yes
- China IECSC: Yes
- Japan ENCS: Yes - (2)-692
- Korea ECL: Yes - KE-29069
- Philippines ICCS: Yes
- Taiwan TCSCA: Yes
- REACH: Yes - (R), (P)

**Regulatory Information Statement:** Regulatory information provided in this SDS was prepared for this product and is to be used only for the product in its present form. If this material is used as a component in another material or altered in any way, the information in this SDS may no longer be applicable. This document was generated for the purpose of distributing health, safety and environmental data.

### 16. OTHER INFORMATION

**Revision Date:** 06/17/2015  
**Preparer Name:** Compass EHS Department  
**Company Policy or Disclaimer:**

**NFPA:**  
- Flammability: 1  
- Health: 1  
- Special Hazard: 0  
- Instability: D  
- Physical: 0  
- PPE:  

**Additional Information About This Product:**  
SDS Data Field Acronym Legend:  
- NA: Not Available  
- NE: Not Established  
- NP: Not Applicable  
- NR: Not Required  
- PR: Proprietary  
- TS: Trade Secret.

**MANUFACTURER DISCLAIMER:** NOTICE: We believe that the information contained on this Safety Data Sheet is accurate. The suggested procedures are based on experience as of the date of publication. They are not necessarily either all-inclusive or fully adequate in every circumstance. Also, these suggestions should not be confused with or followed in violation of applicable laws, regulation, rules or insurance requirements. NO WARRANTY IS MADE, EXPRESSED OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE.
SECTION 1: Identification

1.1. Identification

Product form: Substance
Substance name: Potassium Hydroxide
CAS-No.: 1310-58-3
Product code: LC19190
Formula: KOH
Synonyms: caustic potash / caustic potash dry / caustic potash, dry solid, flake, bead or granular / caustic potash, solid / caustic potash, solid / hydrate of potash / hydrate of potassium / hydroxide of potash / hydroxide of potassium / lye (=potassium hydroxide) / potash / potash hydrate / potash lye / potassium hydrate / potassium hydroxide (K(OH)) / potassium hydroxide dry / potassium hydroxide pellets / potassium hydroxide, dry solid, flake, bead or granular / potassium hydroxide, electrolytically solid / potassium hydroxide, solid / Potassium hydroxide, solid / potassium lye

1.2. Recommended use and restrictions on use

Use of the substance/mixture: For laboratory and manufacturing use only.
Recommended use: Laboratory chemicals
Restrictions on use: Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification
Acute toxicity (oral) H302 Harmful if swallowed
Category 4
Skin corrosion/irritation H314 Causes severe skin burns and eye damage
Category 1A
Hazardous to the aquatic environment - Acute Hazard Category 3 H402 Harmful to aquatic life

Full text of H statements: see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling
Hazard pictograms (GHS-US):

Signal word (GHS-US): Danger
Hazard statements (GHS-US):
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H402 - Harmful to aquatic life

Precautionary statements (GHS-US):
P260 - Do not breathe dust.
P264 - Wash exposed skin thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
Potassium Hydroxide
Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center or doctor/physician.
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations

If inhaled: Remove person to fresh air and keep comfortable for breathing

2.3. Other hazards which do not result in classification
Other hazards not contributing to the classification: None under normal conditions.

2.4. Unknown acute toxicity (GHS US)
Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances
Substance type: Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium Hydroxide (Main constituent)</td>
<td>(CAS-No.) 1310-58-3</td>
<td>100</td>
<td>Acute Tox. 4 (Oral), H302 Skin Corr. 1A, H314 Aquatic Acute 3, H402</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixtures
Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation: Remove the victim into fresh air. Doctor: administration of corticoid spray. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact: Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact: Rinse immediately with plenty of water for 15 minutes. Cover eyes aseptically. Do not apply neutralizing agents. Take victim to an ophthalmologist.


4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after skin contact: Caustic burns/corrosion of the skin. Slow-healing wounds.

Symptoms/effects after eye contact: Corrosion of the eye tissue. Permanent eye damage. Blindness.


Chronic symptoms: No effects known.

4.3. Immediate medical attention and special treatment, if necessary
No additional information available
SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: EXTINGUISHING MEDIA FOR SURROUNDING FIRES: Adapt extinguishing media to the environment.

Unsuitable extinguishing media: No unsuitable extinguishing media known.

5.2. Specific hazards arising from the chemical

Fire hazard: DIRECT FIRE HAZARD. Non combustible. INDIRECT FIRE HAZARD. Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard: INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity: Violent exothermic reaction with water (moisture). Reacts on exposure to water (moisture) with combustible materials: risk of spontaneous ignition. Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). Absorbs the atmospheric CO2. Violent to explosive reaction with many compounds e.g.: with organic material, with (some) halogens and with (some) acids: heat release resulting in increased fire or explosion risk.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions: Cool tanks/drums with water spray/remove them into safety. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.


SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel


Measures in case of dust release: In case of dust production: keep upwind. Dust production: have neighbourhood close doors and windows.

6.1.2. For emergency responders

Protective equipment: Equip cleanup crew with proper protection.

Emergency procedures: Ventilate area. Stop release.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment: Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the solid spill. Knock down/dilute dust cloud with water spray. Take account of toxic/corrosive precipitation water. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain.

Methods for cleaning up: Collect the spill only if it is in a dry state. Wetted substance: cover with dry sand/earth. Scoop solid spill into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/lefovers. Take collected spill to manufacturer/competent authority. Small quantities of liquid spill: neutralize with dilute acid solution. Wash away neutralized product with plentiful water. Clean contaminated surfaces with an excess of water. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling: Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Use corrosionproof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Avoid raising dust. Avoid contact of substance with water. Observe very strict hygiene - avoid contact. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.
Hygiene measures: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Storage temperature: 20 °C
Heat-ignition: KEEP SUBSTANCE AWAY FROM: heat sources.
Storage area: Store in a dry area. Keep container in a well-ventilated place. Keep locked up. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
Special rules on packaging: SPECIAL REQUIREMENTS: hermetical. watertight. corrosion-proof. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Potassium Hydroxide (1310-58-3)</th>
<th>ACGIH Ceiling (mg/m³)</th>
<th>2 mg/m³ (Potassium hydroxide; USA; Momentary value; TLV - Adopted Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td></td>
<td>2 mg/m³ (Potassium hydroxide; USA; Momentary value; TLV - Adopted Value)</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (ceiling) (ppm)</td>
<td>2 ppm</td>
</tr>
</tbody>
</table>

8.2. Appropriate engineering controls

Appropriate engineering controls: Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Materials for protective clothing:
GIVE EXCELLENT RESISTANCE: butyl rubber. natural rubber. neoprene. nitrile rubber. PVC. viton. GIVE LESS RESISTANCE: No data available. GIVE POOR RESISTANCE: leather. natural fibres. PVA

Hand protection:
Gloves

Eye protection:
Face shield

Skin and body protection:
Corrosion-proof clothing. In case of dust production: head/neck protection

Respiratory protection:
Dust production: dust mask with filter type P3. Self-contained breathing apparatus if conc. in air > 1 vol %

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state: Solid
Appearance: Solid in various shapes. Powder.
### Potassium Hydroxide Safety Data Sheet

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>White to light yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>13.5 (0.60 %)</td>
</tr>
<tr>
<td>pH solution</td>
<td>0.6 %</td>
</tr>
<tr>
<td>Melting point</td>
<td>360 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>No data available</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>&lt; 0.1 hPa (20 °C)</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>2 (20 °C)</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>2044 kg/m³ (20 °C)</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>56.11 g/mol</td>
</tr>
<tr>
<td>Solubility</td>
<td>Exothermically soluble in water. Soluble in ethanol. Soluble in glycerol. Water: 112 g/100ml</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>None</td>
</tr>
</tbody>
</table>

#### 9.2. Other information

- Minimum ignition energy: Not applicable
- SADT: Not applicable
- VOC content: 0 %
- Other properties: Translucent. Hygroscopic. Substance has basic reaction.

#### SECTION 10: Stability and reactivity

**10.1. Reactivity**

- Violent exothermic reaction with water (moisture). Reacts on exposure to water (moisture) with combustible materials: risk of spontaneous ignition.
- Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen). Absorbs the atmospheric CO2.
- Violent to explosive reaction with many compounds e.g.: with organic material, with (some) halogens and with (some) acids: heat release resulting in increased fire or explosion risk.

**10.2. Chemical stability**

- Hygroscopic. Absorbs atmospheric CO2.

**10.3. Possibility of hazardous reactions**

- Reacts violently with water. Reacts violently with acids.

**10.4. Conditions to avoid**


**10.5. Incompatible materials**


**10.6. Hazardous decomposition products**

- Potassium oxide.

#### SECTION 11: Toxicological information

**11.1. Information on toxicological effects**

- Likely routes of exposure: Skin and eye contact
Potassium Hydroxide
Safety Data Sheet

Acute toxicity
- Oral: Harmful if swallowed.

Potassium Hydroxide (1310-58-3)

<table>
<thead>
<tr>
<th>Toxicity Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>333 mg/kg (Rat; Equivalent or similar to OECD 425; Experimental value)</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>333 mg/kg body weight</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation: Causes severe skin burns and eye damage.
- pH: 13.5 (0.60 %)

Serious eye damage/irritation: Not classified
- pH: 13.5 (0.60 %)

Respiratory or skin sensitization: Not classified

Germ cell mutagenicity: Not classified

Carcinogenicity: Not classified

Reproductive toxicity: Not classified

Specific target organ toxicity – single exposure: Not classified

Specific target organ toxicity – repeated exposure: Not classified

Aspiration hazard: Not classified

Symptoms/effects after inhalation:

Symptoms/effects after skin contact: Caustic burns/corrosion of the skin. Slow-healing wounds.

Symptoms/effects after eye contact: Corrosion of the eye tissue. Permanent eye damage. Blindness.

Symptoms/effects after ingestion:

Chronic symptoms: No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - air: Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).


Potassium Hydroxide (1310-58-3)

<table>
<thead>
<tr>
<th>Ecotoxicity</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 2</td>
<td>80 mg/l (LC50; 96 h; Gambusia affinis; Static system; Fresh water)</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

Potassium Hydroxide (1310-58-3)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistence and degradability</td>
<td>Biodegradability: not applicable.</td>
</tr>
<tr>
<td>Biochemical oxygen demand (BOD)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Chemical oxygen demand (COD)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>ThOD</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential

Potassium Hydroxide (1310-58-3)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioaccumulative potential</td>
<td>Bioaccumulation: not applicable.</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available
SECTION 13: Disposal considerations

13.1 Disposal methods

Waste disposal recommendations: Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Should not be landfilled with household waste. Recycle/reuse. Immobilize the toxic or harmful components. Precipitate/make insoluble. Remove to an authorized dump (Class I). Treat using the best available techniques before discharge into drains or the aquatic environment.

Additional information: LWCA (the Netherlands): KGA category 05. Hazardous waste according to Directive 2008/98/EC.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description: UN1813 Potassium hydroxide, solid, 8, II

UN-No.(DOT): UN1813

Proper Shipping Name (DOT): Potassium hydroxide, solid

Transport hazard class(es) (DOT): 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT): II - Medium Danger

Hazard labels (DOT): 8 - Corrosive

DOT Packaging Non Bulk (49 CFR 173.xxx): 212

DOT Packaging Bulk (49 CFR 173.xxx): 240

DOT Special Provisions (49 CFR 172.102):

IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).

IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.

IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.

T3 - 2.65 178.274(d)(2) Normal............. 178.275(d)(2)

TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx): 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27): 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75): 50 kg

DOT Vessel Stowage Location: A - The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel.

DOT Vessel Stowage Other: 52 - Stow “separated from” acids

Other information: No supplementary information available.
SECTION 15: Regulatory information

15.1. US Federal regulations

**Potassium Hydroxide (1310-58-3)**

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Not subject to reporting requirements of the United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA’s List of Lists) 1000 lb

SARA Section 311/312 Hazard Classes Immediate (acute) health hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 02/06/2018

Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H302</th>
<th>Harmful if swallowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>H314</td>
<td>Causes severe skin burns and eye damage</td>
</tr>
<tr>
<td>H402</td>
<td>Harmful to aquatic life</td>
</tr>
</tbody>
</table>

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.

NFPA specific hazard : W - Materials that react violently or explosively with water.

Hazard Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given.

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection : F - Safety glasses, Gloves, Synthetic apron, Dust respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
PROPIONYL CHLORIDE  
CAS NO 79-03-8  

MATERIAL SAFETY DATA SHEET  
SDS/MSDS

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
   Product name : Propionyl Chloride
   CAS-No. : 79-03-8

1.2 Relevant identified uses of the substance or mixture and uses advised against
   Identified uses : Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
   Company : Central Drug House (P) Ltd  
   7/28 Vardaan House  
   New Delhi -110002  
   INDIA
   Telephone : +91 11 49404040
   Email : care@cdhfinechemical.com

1.4 Emergency telephone number
   Emergency Phone # : +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
   Classification according to Regulation (EC) No 1272/2008
   Flammable liquids (Category 2), H225
   Acute toxicity, Oral (Category 4), H302
   Acute toxicity, Inhalation (Category 3), H331
   Skin corrosion (Category 1B), H314

   For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements
   Labelling according Regulation (EC) No 1272/2008
   Pictogram
   Signal word
   Danger
   Hazard statement(s)
   H225 Highly flammable liquid and vapour.
   H302 Harmful if swallowed.
   H314 Causes severe skin burns and eye damage.
H331
Toxic if inhaled.

Precautionary statement(s)
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

Supplemental Hazard information (EU)
EUH014 Reacts violently with water.

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Lachrymator.
Reacts violently with water.
Lachrymator., Reacts violently with water.

SECTION 3: Composition/information on ingredients

3.1 Substances
Formula: CH₃CH₂COCI
Molecular weight: 92.52 g/mol
CAS-No.: 79-03-8
EC-No.: 201-170-0
Index-No.: 607-093-00-2

Hazardous ingredients according to Regulation (EC) No 1272/2008
Component Classification Concentration
Propionyl chloride
CAS-No. 79-03-8 Flam. Liq. 2; Acute Tox. 4; <= 100 %
EC-No. 201-170-0 Acute Tox. 3; Skin Corr. 1B;
Index-No. 607-093-00-2 H225, H302, H331, H314

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
4.2  **Most important symptoms and effects, both acute and delayed**
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3  **Indication of any immediate medical attention and special treatment needed**
No data available

SECTION 5: Firefighting measures

5.1  **Extinguishing media**
Suitable extinguishing media
Dry powder

5.2  **Special hazards arising from the substance or mixture**
Carbon oxides, Hydrogen chloride gas

5.3  **Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

5.4  **Further information**
No data available

SECTION 6: Accidental release measures

6.1  **Personal precautions, protective equipment and emergency procedures**
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2  **Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3  **Methods and materials for containment and cleaning up**
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water.

6.4  **Reference to other sections**
For disposal see section 13.

SECTION 7: Handling and storage

7.1  **Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2  **Conditions for safe storage, including any incompatibilities**
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Never allow product to get in contact with water during storage.
Reacts violently with water.
Storage class (TRGS 510): Flammable liquids

7.3  **Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1  **Control parameters**

8.2  **Exposure controls**

**Appropriate engineering controls**
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.
Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineer protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Appearance</td>
<td>Form: clear, liquid</td>
<td>Colour: colourless</td>
</tr>
<tr>
<td>b) Odour</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>c) Odour Threshold</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>d) pH</td>
<td>&lt; 7</td>
<td></td>
</tr>
<tr>
<td>e) Melting point/freezing point</td>
<td>Melting point/range: -94 °C</td>
<td></td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>77 - 79 °C - lit.</td>
<td></td>
</tr>
<tr>
<td>g) Flash point</td>
<td>6 °C - closed cup</td>
<td></td>
</tr>
<tr>
<td>h) Evaporation rate</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>i) Flammability (solid, gas)</td>
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<td></td>
</tr>
<tr>
<td>j) Upper/lower flammability or explosive limits</td>
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<td></td>
</tr>
<tr>
<td>k) Vapour pressure</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>3.19 - (Air = 1.0)</td>
<td></td>
</tr>
<tr>
<td>m) Relative density</td>
<td>1.059 g/cm3</td>
<td></td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>insoluble</td>
<td></td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>p) Auto-ignition temperature</td>
<td>No data available</td>
<td></td>
</tr>
<tr>
<td>q) Decomposition temperature</td>
<td>No data available</td>
<td></td>
</tr>
</tbody>
</table>
r) Viscosity No data available
s) Explosive properties No data available
t) Oxidizing properties No data available

9.2 Other safety information
Relative vapour density 3.19 - (Air = 1.0)

SECTION 10: Stability and reactivity
10.1 Reactivity
No data available
10.2 Chemical stability
Stable under recommended storage conditions.
10.3 Possibility of hazardous reactions
Reacts violently with water.
10.4 Conditions to avoid
Heat, flames and sparks. Exposure to moisture
10.5 Incompatible materials
Alcohols, Oxidizing agents, Strong bases, Water
10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

SECTION 11: Toxicological information
11.1 Information on toxicological effects
Acute toxicity
LD50 Oral - Rat - 823 mg/kg(Propionyl chloride) Inhalation: No data available(Propionyl chloride)
Skin corrosion/irritation
Skin - Rabbit(Propionyl chloride) Result: Causes burns.
Serious eye damage/eye irritation Eyes - Rabbit(Propionyl chloride) Result: Corrosive
Respiratory or skin sensitisation
No data available(Propionyl chloride)
Germ cell mutagenicity
No data available(Propionyl chloride)
Carcinogenicity
IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
Reproductive toxicity
No data available(Propionyl chloride)
Specific target organ toxicity - single exposure
No data available(Propionyl chloride)
Specific target organ toxicity - repeated exposure
No data available
Aspiration hazard
No data available(Propionyl chloride)
Additional Information
RTECS: Not available

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Cough, Shortness of breath, Headache, Nausea, burning sensation, wheezing, laryngitis, Vomiting, Dermatitis, Gastrointestinal disturbance, Inhalation may provoke the following symptoms: spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema (Propionyl chloride)

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available (Propionyl chloride)

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 1815
IMDG: 1815
IATA: 1815

14.2 UN proper shipping name
ADR/RID: PROPIONYL CHLORIDE
IMDG: PROPIONYL CHLORIDE
IATA: Propionyl chloride

14.3 Transport hazard class(es)
ADR/RID: 3 (8)
IMDG: 3 (8)
IATA: 3 (8)

14.4 Packaging group
ADR/RID: II
IMDG: II
IATA: II

14.5 Environmental hazards
ADR/RID: no
IMDG Marine pollutant: no
IATA: no

14.6 Special precautions for user
No data available
SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.2 Chemical safety assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

EUH014 Reacts violently with water.
H225 Highly flammable liquid and vapour.
H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H331 Toxic if inhaled.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
Material Safety Data Sheet
Pyridine

ACC# 19990

Section 1 - Chemical Product and Company Identification

**MSDS Name:** Pyridine

**Catalog Numbers:**

**Synonyms:** Azabenzene; Azine.

**Company Identification:**
- Fisher Scientific
- 1 Reagent Lane
- Fair Lawn, NJ 07410

For information, call: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>110-86-1</td>
<td>Pyridine</td>
<td>100</td>
<td>203-809-9</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

**EMERGENCY OVERVIEW**

Appearance: colorless to light yellow liquid. Flash Point: 17 deg C.

**Danger!** Causes severe eye and skin irritation with possible burns. **Flammable liquid and vapor.**

Causes respiratory tract irritation. Stench. May be harmful if swallowed, inhaled, or absorbed through the skin. May cause central nervous system depression.

**Target Organs:** Blood, kidneys, central nervous system, liver, eyes, skin, mucous membranes.

**Potential Health Effects**

**Eye:** Contact with eyes may cause severe irritation, and possible eye burns.

**Skin:** May cause skin irritation. May be harmful if absorbed through the skin. Effects may be delayed. May cause smarting of the skin and first-degree burns on short exposure. Substance is readily absorbed through the skin. Pyridine was determined not to be a skin sensitizer in guinea pigs.

**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver and kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Effects may be delayed.

**Inhalation:** Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. Prolonged exposure may result in dizziness and general weakness. Other symptoms reported with acute exposure to pyridine include nervousness, insomnia, and loss of appetite.

**Chronic:** Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation and ingestion may...
cause effects similar to those of acute inhalation and ingestion. May cause liver and kidney damage. Exposures to doses of pyridine that are too low to produce overt clinical symptoms can cause liver damage and repeated low-level exposures can cause cirrhosis. Feeding studies in rats produced blood effects like changes in clotting factors.

Section 4 - First Aid Measures

**Eyes:** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

**Skin:** In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid. Wash clothing before reuse.

**Ingestion:** If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

**Inhalation:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Notes to Physician:** Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Flammable liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

**Extinguishing Media:** Solid streams of water may be ineffective and spread material. Use water spray, dry chemical, "alcohol resistant" foam, or carbon dioxide.

**Flash Point:** 17 deg C (62.60 deg F)

**Autoignition Temperature:** 482 deg C (899.60 deg F)

**Explosion Limits, Lower:** 1.8%

**Upper:** 12.4%

**NFPA Rating:** (estimated) Health: 3; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Prevent spreading of vapors through sewers, ventilation systems and confined areas. Evacuate unnecessary personnel. Approach spill from upwind. Use water spray to cool and disperse vapors, protect personnel, and dilute spills to form nonflammable mixtures. Control runoff and isolate discharged material for proper disposal.

Section 7 - Handling and Storage

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Do not breathe vapor. Use only with adequate ventilation.

**Storage:** Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Isolate from oxidizing materials and acids.
Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Ventilation fans and other electrical service must be non-sparking and have an explosion-proof design.

**Exposure Limits**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyridine</td>
<td>1 ppm TWA</td>
<td>5 ppm TWA; 15 mg/m3 TWA 1000 ppm IDLH</td>
<td>5 ppm TWA; 15 mg/m3 TWA</td>
</tr>
</tbody>
</table>

**OSHA Vacated PELs:** Pyridine: 5 ppm TWA; 15 mg/m3 TWA

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles and face shield.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Appearance:** colorless to light yellow

**Odor:** strong odor - fish-like - penetrating odor - nauseating - stench

**pH:** 8.5 (0.2 M aq soln)

**Vapor Pressure:** 18 mm Hg @ 20 deg C

**Vapor Density:** 2.73 (Air=1)

**Evaporation Rate:** Not available.

**Viscosity:** 0.95 mPa s 20 deg C

**Boiling Point:** 115 deg C

**Freezing/Melting Point:** -42 deg C

**Decomposition Temperature:** Not available.

**Solubility:** Soluble.

**Specific Gravity/Density:** 0.9780

**Molecular Formula:** C5H5N

**Molecular Weight:** 79.1

Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Ignition sources, excess heat, confined spaces.

**Incompatibilities with Other Materials:** Strong oxidizing agents, acids.

**Hazardous Decomposition Products:** Nitrogen oxides, carbon monoxide, carbon dioxide.

**Hazardous Polymerization:** Will not occur.

Section 11 - Toxicological Information

**RTECS#:**

**CAS# 110-86-1:** UR8400000

**LD50/LC50:**

- **LD50/LC50:**
  - Dermal, guinea pig: LD50 = 1 gm/kg;
  - Draize test, rabbit, skin: 500 mg/24H Mild;
  - Inhalation, rat: LC50 = 28500 mg/m3/1H;
  - Oral, mouse: LD50 = 1500 mg/kg;
Oral, rat: LD50 = 891 mg/kg;
Skin, rabbit: LD50 = 1121 mg/kg;
Inhalation, rat: LC50 = 28500 mg/m3/1H; Skin, guinea pig: LD50 = 1 gm/kg.

**Carcinogenicity:**
CAS# 110-86-1:
- ACGIH: A3 - Confirmed animal carcinogen with unknown relevance to humans
- California: carcinogen, initial date 5/17/02
- NTP: Not listed.
- IARC: Not listed.

**Epidemiology:** No information found

**Teratogenicity:** Pyridine caused muscle/skeletal effects when injected into developing chickens but was not teratogenic in frogs at sublethal doses. The relevance of these studies to human reproduction is unclear.

**Reproductive Effects:** No information found

**Mutagenicity:** Pyridine's mutagenicity potential is equivocal. It was reported to be both positive and negative in Salmonella typhimurium strains. It was not mutagenic in tests for chromosome aberrations, but did give weak positive results in tests that detect sister chromatid exchanges.

**Neurotoxicity:** No information found

**Other Studies:**

---

**Section 12 - Ecological Information**

**Ecotoxicity:** Fish: Fathead Minnow: 106mg/L; 96H; Flow-through No data available.

**Environmental:** Terrestrial: Should have very high mobility. It is adsorbed to acid clay to a moderate extent. Complete degradation in one soil occurred in less than 8 days. Aquatic: Should biodegrade after an acclimation period and can also be lost through volatilization. Atmospheric: Exists in the vapor phase based on a vapor pressure of 20.80 mm Hg and react slowly with photochemically produced hydroxy radicals with experimental half-lives of 32 and 16 days in clean and moderately polluted atmospheres, respectively. Bioconcentration in aquatic organisms should not be significant.

**Physical:** No information available.

**Other:** No information available.

---

**Section 13 - Disposal Considerations**

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.

**RCRA U-Series:**
CAS# 110-86-1: waste number U196.

---

**Section 14 - Transport Information**

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<thead>
<tr>
<th></th>
<th>US DOT</th>
<th>Canada TDG</th>
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<tbody>
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<td>Shipping Name</td>
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<td>PYRIDINE</td>
</tr>
<tr>
<td>Hazard Class</td>
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<td>3</td>
</tr>
<tr>
<td>UN Number</td>
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<td>UN1282</td>
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<td>Packing Group</td>
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</tr>
<tr>
<td>Additional Info</td>
<td>FLASHPOINT 17C</td>
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</tbody>
</table>

---

**Section 15 - Regulatory Information**
US FEDERAL

TSCA
CAS# 110-86-1 is listed on the TSCA inventory.

Health & Safety Reporting List
CAS# 110-86-1: Effective 10/4/82, Sunset 10/4/92

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 110-86-1: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.

SARA Codes
CAS # 110-86-1: immediate, delayed, fire.

Section 313
This material contains Pyridine (CAS# 110-86-1, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
CAS# 110-86-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Pyridine, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
  XN F
Risk Phrases:
  R 11 Highly flammable.
  R 20/21/22 Harmful by inhalation, in contact with skin and if swallowed.

Safety Phrases:
  S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
  S 28A After contact with skin, wash immediately with plenty of water

WGK (Water Danger/Protection)
CAS# 110-86-1: 2

Canada - DSL/NDSL
CAS# 110-86-1 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of B2.
This product has been classified in accordance with the hazard criteria of the Controlled Products
Regulations and the MSDS contains all of the information required by those regulations. **Canadian Ingredient Disclosure List**

CAS# 110-86-1 is listed on the Canadian Ingredient Disclosure List.

### Section 16 - Additional Information

**MSDS Creation Date:** 4/28/1998  
**Revision #12 Date:** 2/11/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
SODIUM DIHYDROGEN PHOSPHATE

Prepared at the 7th JECFA (1963), published in NMRS 35 (1964) and in FNP 52 (1992). Metals and arsenic specifications revised at the 59th JECFA (2002). A group MTDI of 70 mg/kg bw, as phosphorus from all food sources, was established at the 26th JECFA (1982)

SYNONYMS
Monobasic sodium phosphate, monosodium monophosphate sodium acid phosphate, sodium biphosphate; INS No. 339(i)

DEFINITION
Chemical names
Sodium dihydrogenphosphate, monosodium dihydrogenorth- phosphate, monosodium dihydrogen monophosphate

C.A.S. number 7558-80-7

Chemical formula
Anhydrous: NaH₂PO₄
Monohydrate: NaH₂PO₄ · H₂O
Dihydrate: NaH₂PO₄ · 2H₂O

Formula weight
Anhydrous: 119.98
Monohydrate: 138.00
Dihydrate: 156.01

Assay Not less than 97% after drying

DESCRIPTION
White odourless, slightly deliquescent powder, crystals, or granules

FUNCTIONAL USES
Acidity regulator, sequestrant

CHARACTERISTICS

IDENTIFICATION

Solubility (Vol. 4) Freely soluble in water; insoluble in ethanol, ether or chloroform

pH (Vol. 4) 4.2 - 4.6 (1 in 100 soln)

Test for sodium (Vol. 4) Passes test

Test for phosphate (Vol. 4) Passes test

Test for orthophosphate To a 1% solution of the sample add silver nitrate TS; the yellow precipitate formed is soluble in dilute nitric acid TS.

PURITY

Loss on drying (Vol. 4) Anhydrous: Not more than 2% (60⁰, 1 h, then 105⁰, 4 h)
Monohydrate: Not more than 15% (60⁰, 1 h, then 105⁰, 4 h)
Dihydrate: Not more than 25% (60⁰, 1 h, then 105⁰, 4 h)

Free acid and disodium 2.00 g of the sample dissolved in 40 ml of water require for neutralization
phosphate
not more than 0.3 ml of either N sodium hydroxide or N sulfuric acid, using methyl orange TS as indicator.

Fluoride (Vol. 4)
Not more than 10 mg/kg

Arsenic (Vol. 4)
Not more than 3 mg/kg
(Method II)

Lead (Vol. 4)
Not more than 4 mg/kg
Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, “Instrumental Methods.”

METHOD OF ASSAY
Transfer 0.7000 g of the dried sample to a 250-ml beaker, add 50 ml of 0.1 N hydrochloric acid, and stir until the sample is completely dissolved. Place the electrodes of a suitable pH meter in the solution and add slowly from a burette, with constant stirring, 0.1 N sodium hydroxide until a pH of 3.3 is attained. Continue to add sodium hydroxide solution until the next ml or 0.5-ml graduation mark on the burette is reached. Record the burette reading under column 1 of a suitable data sheet and record the pH under column 2. Continue the addition of 0.1 N sodium hydroxide in 0.5-ml increments until a pH of 6.0 is attained, recording the burette reading and the pH after the addition of each increment. Then proceed with the titration in the usual manner until a pH of 8.5 is attained, and again continue to add the solution until the next ml or 0.5-ml graduation mark is reached before recording the burette reading and the pH. Then continue adding 0.1 N sodium hydroxide in 0.5-ml increments until the pH is 10.0, again recording the burette reading and the pH after the addition of each increment. In column 3 of the data sheet, note the values for "delta"pH obtained by subtracting each pH value recorded from the net higher value. In column 4, note the values for "delta"\(^2\)pH, i.e., the differences between successive "delta"pH values, recording them as plus or minus depending upon whether the value of "delta"pH is higher or lower than the preceding one. The end-point lies in the 0.5-ml increment of sodium hydroxide that gives the highest value for "delta"pH, its exact position being calculated by adding 0.5 b/B to the next lower burette reading, where b is the last "delta"\(^2\)pH value having a plus sign and B is the sum, without regard to sign, of the last "delta"pH value having a plus sign and the first "delta"\(^2\)pH value having a minus sign. Two end-points are calculated, that occurring between pH 3.3 and pH 6.0 being designated F and that between pH 8.5 and pH 10.0 being designated T. The volume of sodium hydroxide used in the titration is obtained by subtracting F from T. Each ml of 0.1 N sodium hydroxide is equivalent to 0.0120 g of NaH\(_2\)PO\(_4\).
SECTION 1: Identification

1.1. Identification
Product form: Substance
Substance name: Sodium Bicarbonate
Chemical name: Sodium Hydrogen Carbonate
CAS-No.: 144-55-8
Product code: LC22943
Formula: NaHCO3

1.2. Recommended use and restrictions on use
Use of the substance/mixture: For laboratory and manufacturing use only.
Recommended use: Laboratory chemicals
Restrictions on use: Not for food, drug or household use

1.3. Supplier
LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number
Emergency number: CHEMTREC: 1-800-424-9300 or 011-70-3-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture
GHS-US classification
Serious eye damage/eye irritation Category 2B: H320 - Causes eye irritation

2.2. GHS Label elements, including precautionary statements
GHS-US labeling
Signal word (GHS-US): Warning
Hazard statements (GHS-US): H320 - Causes eye irritation

2.3. Other hazards which do not result in classification
Other hazards not contributing to the classification: None.

2.4. Unknown acute toxicity (GHS US)
Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances
Substance type: Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Bicarbonate (Main constituent)</td>
<td>(CAS-No.) 144-55-8</td>
<td>100</td>
<td>Eye Irrit. 2B, H320</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixtures
Not applicable
SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation: Allow victim to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact: Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.

First-aid measures after eye contact: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

First-aid measures after ingestion: Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after eye contact: Causes eye irritation.

4.3. Immediate medical attention and special treatment, if necessary

No additional information available

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media


Unsuitable extinguishing media: Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

No additional information available

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions: Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment: Safety glasses. Gloves.

Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Equip cleanup crew with proper protection.

Emergency procedures: Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up: On land, sweep or shovel into suitable containers. Minimize generation of dust. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Keep cool. Keep container closed when not in use.


SECTION 8: Exposure controls/personal protection

8.1. Control parameters
No additional information available

8.2. Appropriate engineering controls
Appropriate engineering controls: Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Gloves. Safety glasses.

Hand protection:
Wear protective gloves.

Eye protection:
Chemical goggles or safety glasses

Respiratory protection:
Respiratory protection not required in normal conditions

Other information:
Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Solid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Powder</td>
</tr>
<tr>
<td>Color</td>
<td>white</td>
</tr>
<tr>
<td>Odor</td>
<td>None</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>8.3 0.1M solution</td>
</tr>
<tr>
<td>Melting point</td>
<td>270 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>No data available</td>
</tr>
<tr>
<td>Flash point</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Non flammable.</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>No data available</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>2.159 g/cm³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>84.01 g/mol</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in water.</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>&gt; 50 °C</td>
</tr>
</tbody>
</table>

Water: 6.9 g/100ml
Viscosity, kinematic: No data available
Viscosity, dynamic: No data available
Explosion limits: No data available
Explosive properties: Not applicable.
Oxidizing properties: None.

9.2. Other information
No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity
No additional information available

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
Reacts vigorously with strong oxidizers and acids.

10.4. Conditions to avoid

10.5. Incompatible materials
Strong acids. Strong oxidizers.

10.6. Hazardous decomposition products
Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Likely routes of exposure: Ingestion; Inhalation; Skin and eye contact
Acute toxicity: Not classified

Sodium Bicarbonate (144-55-8)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>4220 mg/kg</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>4220 mg/kg body weight</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation: Not classified
pH: 8.3 0.1M solution

Serious eye damage/irritation: Causes eye irritation.
pH: 8.3 0.1M solution

Respiratory or skin sensitization: Not classified

Germ cell mutagenicity: Not classified

Carcinogenicity: Not classified

Reproductive toxicity: Not classified

Specific target organ toxicity – single exposure: Not classified

Specific target organ toxicity – repeated exposure: Not classified

Aspiration hazard: Not classified

Potential Adverse human health effects and symptoms: Based on available data, the classification criteria are not met.

Symptoms/effects after eye contact: Causes eye irritation.

SECTION 12: Ecological information

12.1. Toxicity

Sodium Bicarbonate (144-55-8)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 1</td>
<td>8250 - 9000 mg/l</td>
</tr>
<tr>
<td>EC50 Daphnia 1</td>
<td>2350 mg/l</td>
</tr>
</tbody>
</table>
### 12.2. Persistence and degradability

| Sodium Bicarbonate (144-55-8) | Persistence and degradability | Not established. |

### 12.3. Bioaccumulative potential

| Sodium Bicarbonate (144-55-8) | Bioaccumulative potential | Not established. |

### 12.4. Mobility in soil

No additional information available.

### 12.5. Other adverse effects

Other information: Avoid release to the environment.

### SECTION 13: Disposal considerations

#### 13.1. Disposal methods

| Waste disposal recommendations | Dispose in a safe manner in accordance with local/national regulations. |
| Ecology - waste materials | Avoid release to the environment. |

### SECTION 14: Transport information

#### Department of Transportation (DOT)

In accordance with DOT

Not regulated

### SECTION 15: Regulatory information

#### 15.1. US Federal regulations

| Sodium Bicarbonate (144-55-8) | Listed on the United States TSCA (Toxic Substances Control Act) inventory |
| SARA Section 311/312 Hazard Classes | Immediate (acute) health hazard |

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

#### 15.2. International regulations

**CANADA**

| Sodium Bicarbonate (144-55-8) | Listed on the Canadian DSL (Domestic Substances List) |

**EU-Regulations**

No additional information available.

**National regulations**

| Sodium Bicarbonate (144-55-8) | Not listed on the Canadian IDL (Ingredient Disclosure List) |

**15.3. US State regulations**

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm.

### SECTION 16: Other information

Revision date: 03/13/2018

Other information: None.

Full text of H-phrases: see section 16:

| H320 | Causes eye irritation |
Sodium Bicarbonate
Safety Data Sheet

NFPA health hazard: 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA fire hazard: 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity: 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.

Hazard Rating
Health: 2 Moderate Hazard - Temporary or minor injury may occur
Flammability: 0 Minimal Hazard - Materials that will not burn
Physical: 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection: E - Safety glasses, Gloves, Dust respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
Material Safety Data Sheet
Sodium carbonate

ACC# 21080

Section 1 - Chemical Product and Company Identification

MSDS Name: Sodium carbonate
Synonyms: Crystal carbonate; Disodium carbonate; Sal soda; Soda ash; Washing soda; Soda, calcined.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>497-19-8</td>
<td>Sodium carbonate anhydrous</td>
<td>100</td>
<td>207-838-8</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white powder.
Warning! Harmful if inhaled. Causes eye and skin irritation. May cause respiratory tract irritation. Hygroscopic (absorbs moisture from the air).
Target Organs: Eyes, skin.

Potential Health Effects
Eye: Causes eye irritation. Lachrymator (substance which increases the flow of tears).
Skin: Causes skin irritation. May be harmful if absorbed through the skin.
Ingestion: May cause irritation of the digestive tract. May be harmful if swallowed.
Inhalation: Harmful if inhaled. May cause respiratory tract irritation.
Chronic: Adverse reproductive effects have been reported in animals.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Ingestion: Do not induce vomiting. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.
Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible.

**Extinguishing Media:** Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.

**Flash Point:** Not applicable.

**Autoignition Temperature:** Not available.

**Explosion Limits, Lower:** Not available.

**Upper:** Not available.

**NFPA Rating:** (estimated) Health: 2; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

**General Information:** Use proper personal protective equipment as indicated in Section 8.

**Spills/Leaks:** Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Avoid generating dusty conditions. Provide ventilation. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

**Handling:** Minimize dust generation and accumulation. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood.

**Storage:** Store in a cool, dry place. Store in a tightly closed container. Keep away from acids. Do not get water inside containers.

Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

**Exposure Limits**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium carbonate anhydrous</td>
<td>none listed</td>
<td>none listed</td>
<td>none listed</td>
</tr>
</tbody>
</table>

**OSHA Vacated PELs:** Sodium carbonate anhydrous: No OSHA Vacated PELs are listed for this chemical.

**Personal Protective Equipment**

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

**Physical State:** Powder

**Appearance:** white

**Odor:** odorless

**pH:** Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 1600 deg C @ 760 mmHg
Freezing/Melting Point: 851 deg C
Decomposition Temperature: Not available.
Solubility: 22 g/100mL (20°C)
Specific Gravity/Density: 2.53
Molecular Formula: CNa2O3
Molecular Weight: 105.99

Section 10 - Stability and Reactivity

Chemical Stability: Hygroscopic: absorbs moisture or water from the air.
Conditions to Avoid: Incompatible materials, dust generation, excess heat, moist air.
Incompatibilities with Other Materials: Acids, strong oxidizing agents, metals, fluorine, hydrogen peroxide, phosphorus pentoxide, 2,4,6-trinitrotoluene, 2,4-dinitrotoluene.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, toxic fumes of sodium oxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#: 
CAS # 497-19-8: VZ4050000
LD50/LC50:
CAS # 497-19-8:
  Draize test, rabbit, eye: 100 mg/24H Moderate;
  Draize test, rabbit, eye: 50 mg Severe;
  Draize test, rabbit, skin: 500 mg/24H Mild;
  Inhalation, mouse: LC50 = 1200 mg/m3/2H;
  Inhalation, rat: LC50 = 2300 mg/m3/2H;
  Oral, mouse: LD50 = 6600 mg/kg;
  Oral, mouse: LD50 = 6600 mg/kg;
  Oral, rat: LD50 = 4090 mg/kg;

Carcinogenicity:
CAS # 497-19-8: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: Teratogenic effects have occurred in experimental animals.
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: LC50 = 320 mg/L; 96 Hr.; Static Conditions No data available.
Environmental: No information available.
Physical: No information available.
Other: Do not empty into drains.

Section 13 - Disposal Considerations
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

**RCRA P-Series:** None listed.
**RCRA U-Series:** None listed.

### Section 14 - Transport Information

<table>
<thead>
<tr>
<th></th>
<th>US DOT</th>
<th>Canada TDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping Name:</td>
<td>Not regulated</td>
<td>Not Regulated</td>
</tr>
<tr>
<td>Hazard Class:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN Number:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packing Group:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Section 15 - Regulatory Information

**US FEDERAL**

**TSCA**
- CAS# 497-19-8 is listed on the TSCA inventory.

**Health & Safety Reporting List**
- None of the chemicals are on the Health & Safety Reporting List.

**Chemical Test Rules**
- None of the chemicals in this product are under a Chemical Test Rule.

**Section 12b**
- None of the chemicals are listed under TSCA Section 12b.

**TSCA Significant New Use Rule**
- None of the chemicals in this material have a SNUR under TSCA.

**CERCLA Hazardous Substances and corresponding RQs**
- None of the chemicals in this material have an RQ.

**SARA Section 302 Extremely Hazardous Substances**
- None of the chemicals in this product have a TPQ.

**SARA Codes**
- CAS # 497-19-8: immediate.

**Section 313**
- No chemicals are reportable under Section 313.

**Clean Air Act:**
- This material does not contain any hazardous air pollutants.
- This material does not contain any Class 1 Ozone depletors.
- This material does not contain any Class 2 Ozone depletors.

**Clean Water Act:**
- None of the chemicals in this product are listed as Hazardous Substances under the CWA.
- None of the chemicals in this product are listed as Priority Pollutants under the CWA.
- None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

**OSHA:**
- None of the chemicals in this product are considered highly hazardous by OSHA.

**STATE**
- CAS# 497-19-8 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

**California Prop 65**
- California No Significant Risk Level: None of the chemicals in this product are listed.

**European/International Regulations**

**European Labeling in Accordance with EC Directives**

**Hazard Symbols:**
- XI

**Risk Phrases:**
R 36 Irritating to eyes.

Safety Phrases:
S 22 Do not breathe dust.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

WGK (Water Danger/Protection)
CAS# 497-19-8: 1

Canada - DSL/NDSL
CAS# 497-19-8 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D2B. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 497-19-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/12/1999
Revision #7 Date: 2/15/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
Sodium Iodide, ACS
Safety Data Sheet

Date of issue: 05/05/2015
Revision date: 04/04/2018
Supersedes: 05/05/2015
Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form : Substance
Substance name : Sodium Iodide, ACS
CAS-No. : 7681-82-5
Product code : LC24645
Formula : NaI

1.2. Recommended use and restrictions on use

Use of the substance/mixture : For laboratory and manufacturing use only.
Recommended use : Laboratory chemicals
Restrictions on use : Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification
Hazardous to the aquatic environment - Acute 1, H400 - Very toxic to aquatic life
Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling
Hazard pictograms (GHS-US) : GHS09

Signal word (GHS-US) : Warning
Hazard statements (GHS-US) : H400 - Very toxic to aquatic life
Precautionary statements (GHS-US) : P273 - Avoid release to the environment.
P391 - Collect spillage.
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None under normal conditions.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Mono-constituent

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Iodide, ACS</td>
<td>(CAS-No.) 7681-82-5</td>
<td>100</td>
<td>Aquatic Acute 1, H400</td>
</tr>
</tbody>
</table>
Sodium Iodide, ACS
Safety Data Sheet

Full text of hazard classes and H-statements: see section 16

3.2. Mixtures
Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures
First-aid measures general: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
First-aid measures after inhalation: Allow victim to breathe fresh air. Allow the victim to rest.
First-aid measures after skin contact: Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.
First-aid measures after eye contact: Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.
First-aid measures after ingestion: Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)
Symptoms/effects: Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Immediate medical attention and special treatment, if necessary
Treat symptomatically.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media
Unsuitable extinguishing media: Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical
No additional information available

5.3. Special protective equipment and precautions for fire-fighters
Firefighting instructions: Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.
Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel
Protective equipment: Safety glasses.
Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders
Protective equipment: Equip cleanup crew with proper protection.
Emergency procedures: Ventilate area.

6.2. Environmental precautions
Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up
Methods for cleaning up: On land, sweep or shovel into suitable containers. Minimize generation of dust. Store away from other materials.

6.4. Reference to other sections
See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Precautions for safe handling: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor.

7.2. Conditions for safe storage, including any incompatibilities
Storage conditions: Protect from sunlight. Keep container closed when not in use.
SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Sodium Iodide, ACS (7681-82-5)</th>
<th>ACGIH</th>
<th>ACGIH TWA (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.01 ppm Inhalable fraction and vapor</td>
</tr>
</tbody>
</table>

8.2. Appropriate engineering controls

Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Gloves. Safety glasses.

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or safety glasses

Respiratory protection:

Respiratory protection not required in normal conditions

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>White to off-white</td>
</tr>
<tr>
<td>Odor</td>
<td>None.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>6 - 9.5% solution</td>
</tr>
<tr>
<td>Melting point</td>
<td>651 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>1304 °C</td>
</tr>
<tr>
<td>Flash point</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Non flammable.</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>&lt; 0.0000001 kPa 25°C</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>No data available</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>3.667 g/cm³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>149.89 g/mol</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in water. Soluble in alcohols. Soluble in acetone. Soluble in glycerol. Water: 184 g/100ml. Ethanol: 42.57 g/100ml. Acetone: 39.9 g/100ml</td>
</tr>
</tbody>
</table>
**Sodium Iodide, ACS**

**Safety Data Sheet**

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

---

**Log Pow** : No data available

**Auto-ignition temperature** : No data available

**Decomposition temperature** : No data available

**Viscosity, kinematic** : No data available

**Viscosity, dynamic** : No data available

**Explosion limits** : No data available

**Explosive properties** : No data available

**Oxidizing properties** : No data available

**9.2. Other information**

No additional information available

---

**SECTION 10: Stability and reactivity**

**10.1. Reactivity**

No additional information available

**10.2. Chemical stability**

Light sensitive.

**10.3. Possibility of hazardous reactions**

Not established.

**10.4. Conditions to avoid**

Direct sunlight. Extremely high or low temperatures.

**10.5. Incompatible materials**

Strong acids. Strong oxidizers.

**10.6. Hazardous decomposition products**

Iodine vapor.

---

**SECTION 11: Toxicological information**

**11.1. Information on toxicological effects**

Likely routes of exposure : Inhalation; Skin and eye contact

Acute toxicity : Not classified

<table>
<thead>
<tr>
<th>Sodium Iodide, ACS (7681-82-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
</tr>
<tr>
<td>ATE US (oral)</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation : Not classified

Serious eye damage/irritation : Not classified

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified

Carcinogenicity : Not classified

Reproductive toxicity : Not classified

Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

---

**SECTION 12: Ecological information**

**12.1. Toxicity**

Ecology - water : Very toxic to aquatic life.
Sodium Iodide, ACS
Safety Data Sheet

Sodium Iodide, ACS (7681-82-5)

<table>
<thead>
<tr>
<th>LC50 fish 1</th>
<th>860 mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC50 Daphnia 1</td>
<td>0.17 mg/l</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

Sodium Iodide, ACS (7681-82-5)

Persistence and degradability
Not established.

12.3. Bioaccumulative potential

Sodium Iodide, ACS (7681-82-5)

Bioconcentration factor (BCF REACH) 344
Bioaccumulative potential
Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects

Other information
Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations
Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.

Ecology - waste materials
Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)
In accordance with DOT
Not regulated

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Iodide, ACS (7681-82-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA
Sodium Iodide, ACS (7681-82-5)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 04/04/2018
Other information : None.
Full text of H-phrases: see section 16:

<table>
<thead>
<tr>
<th>H400</th>
<th>Very toxic to aquatic life</th>
</tr>
</thead>
</table>

NFPA health hazard  : 0 - Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.

NFPA fire hazard    : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity     : 0 - Material that in themselves are normally stable, even under fire conditions.

Hazard Rating

Health               : 0 Minimal Hazard - No significant risk to health
Flammability         : 0 Minimal Hazard - Materials that will not burn
Physical             : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal protection  : A
                      : A - Safety glasses

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.
Material Safety Data Sheet
Sulfuric acid 90-98%

ACC# 22350

Section 1 - Chemical Product and Company Identification

MSDS Name: Sulfuric acid 90-98%
Synonyms: Hydrogen sulfate; Oil of vitriol; Mattling acid; Battery acid; Sulphuric acid; Electrolyte acid; Dihydrogen sulfate; Spirit of sulfur; Chamber acid.

Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7664-93-9</td>
<td>Sulfuric acid</td>
<td>90-98</td>
<td>231-639-5</td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear colorless to yellow liquid.

Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. May be fatal if mist inhaled. Strong inorganic acid mists containing sulfuric acid may cause cancer. Concentrated sulfuric acid reacts violently with water and many other substances under certain conditions. May cause lung damage. Hygroscopic (absorbs moisture from the air). Corrosive to metal.

Target Organs: Lungs, teeth, eyes, skin.

Potential Health Effects

Eye: Causes severe eye burns. May cause irreversible eye injury. May cause blindness. May cause permanent corneal opacification. The severity of injury depends on the concentration of the solution and the duration of exposure.
Skin: Causes skin burns. The severity of injury depends on the concentration of the solution and the duration of exposure.
Ingestion: May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns.
Inhalation: May cause irritation of the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath and pulmonary edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi,
chemical pneumonitis and pulmonary edema. Because its vapor pressure is negligible, it exists in the air only as a mist or spray. Exposure may impair lung function and cause mucostasis (reduced mucous clearance).

**Chronic:** Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated inhalation may cause nosebleeds, nasal congestion, erosion of the teeth, perforation of the nasal septum, chest pain and bronchitis. Prolonged or repeated eye contact may cause conjunctivitis. Effects may be delayed. Workers chronically exposed to sulfuric acid mists may show various lesions of the skin, tracheobronchitis, stomatitis, conjunctivitis, or gastritis. Occupational exposure to strong inorganic acid mists containing sulfuric acid is carcinogenic to humans.

### Section 4 - First Aid Measures

**Eyes:** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

**Skin:** In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

**Ingestion:** If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

**Inhalation:** POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

**Notes to Physician:** Monitor arterial blood gases, chest x-ray, and pulmonary function tests if respiratory tract irritation or respiratory depression is evident. Treat dermal irritation or burns with standard topical therapy. Effects may be delayed. Do NOT use sodium bicarbonate in an attempt to neutralize the acid.

### Section 5 - Fire Fighting Measures

**General Information:** As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Substance is noncombustible. Contact with water can cause violent liberation of heat and splattering of the material. Contact with metals may evolve flammable hydrogen gas. Runoff from fire control or dilution water may cause pollution. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Strong dehydrating agent, which may cause ignition of finely divided materials on contact. Oxides of sulfur may be produced in fire.

**Extinguishing Media:** Use extinguishing media most appropriate for the surrounding fire. Do NOT get water inside containers. If water is used, care should be taken, since it can generate heat and cause spattering if applied directly to sulfuric acid.

**Flash Point:** Not applicable.

**Autoignition Temperature:** Not available.

**Explosion Limits, Lower:** Not available.

**Upper:** Not available.

**NFPA Rating:** (estimated) Health: 3; Flammability: 0; Instability: 2; Special Hazard: -W-
clothing. Keep container tightly closed. Discard contaminated shoes. Use only with adequate ventilation. Do not breathe spray or mist. Do not use with metal spatula or other metal items. Inform laundry personnel of contaminant's hazards.

**Storage:** Do not store near combustible materials. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near alkaline substances. Store protected from moisture. Ideally, sulfuric acid should be stored in isolation from all other chemicals in an approved acid or corrosives safety cabinet.

### Section 8 - Exposure Controls, Personal Protection

**Engineering Controls:** Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use a corrosion-resistant ventilation system.

**Exposure Limits**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric acid</td>
<td>0.2 mg/m3 TWA (thoracic fraction)</td>
<td>1 mg/m3 TWA 15 mg/m3 IDLH</td>
<td>1 mg/m3 TWA</td>
</tr>
</tbody>
</table>

**OSHA Vacated PELs:** Sulfuric acid: 1 mg/m3 TWA

**Personal Protective Equipment**

**Eyes:** Wear chemical splash goggles and face shield.

**Skin:** Wear neoprene gloves, apron, and/or clothing. Viton gloves are recommended.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

### Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Appearance:** oily - clear colorless to yellow

**Odor:** odorless

**pH:** 0.3 (1N solution)

**Vapor Pressure:** < 0.001 mm Hg @ 20 deg C

**Vapor Density:** 3.38 (air=1)

**Evaporation Rate:** Slower than ether.

**Viscosity:** 21 mPas @ 25 C

**Boiling Point:** 290 - 338 deg C

**Freezing/Melting Point:** 10 deg C

**Decomposition Temperature:** 340 deg C

**Solubility:** Soluble with much heat

**Specific Gravity/Density:** 1.84

**Molecular Formula:** H2SO4

**Molecular Weight:** 98.07

### Section 10 - Stability and Reactivity

**Chemical Stability:** Sulfuric acid reacts vigorously, violently or explosively with many organic and inorganic chemicals and with water.

**Conditions to Avoid:** Excess heat, exposure to moist air or water, Note: Use great caution in mixing with water due to heat evolution that causes explosive spattering. Always add the acid to water, never the reverse..

**Incompatibilities with Other Materials:** Metals, oxidizing agents, reducing agents, bases, acrylonitrile, chlorates, finely powdered metals, nitrates, perchlorates, permanganates, epichlorohydrin, aniline, carbides, fulminates, picrates, organic materials, flammable liquids.

**Hazardous Decomposition Products:** Oxides of sulfur.

**Hazardous Polymerization:** Has not been reported.
Section 11 - Toxicological Information

RTECS#: 
CAS# 7664-93-9: WS5600000
LD50/LC50:
CAS# 7664-93-9: 
Draize test, rabbit, eye: 250 ug Severe;
Inhalation, mouse: LC50 = 320 mg/m3/2H;
Inhalation, mouse: LC50 = 320 mg/m3;
Inhalation, rat: LC50 = 510 mg/m3/2H;
Inhalation, rat: LC50 = 510 mg/m3;
Oral, rat: LD50 = 2140 mg/kg;

Carcinogenicity: 
CAS# 7664-93-9:
- ACGIH: A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)
- California: carcinogen, initial date 3/14/03 (listed as Strong inorganic acid mists containing sulfuric acid).
- NTP: Known carcinogen (listed as Strong inorganic acid mists containing s).
- IARC: Group 1 carcinogen

Epidemiology: Workers exposed to industrial sulfuric acid mist showed a statistical increase in laryngeal cancer. This suggests a possible relationship between carcinogenesis and inhalation of sulfuric acid mist.
Teratogenicity: Sulfuric acid was not teratogenic in mice and rabbits, but was slightly embryotoxic in rabbits (a minor, rare skeletal variation). The animals were exposed to 5 and 20 mg/m3 for 7 hr/day throughout pregnancy. Slight maternal toxicity was present at the highest dose in both species.
Reproductive Effects: No information found
Mutagenicity: There are no mutagenicity studies specifically of sulfuric acid. However, there are established effects of reduced pH in mutagenicity testing, as would be caused by sulfuric acid. These effects are an artifact of low pH and are not necessarily due to biological effects of sulfuric acid itself.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 49 mg/L; 48Hr; TLm (tap water @ 20C)
Fish: Bluegill/Sunfish: 24.5 ppm; 48Hr; TLm (fresh water)

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th></th>
<th>US DOT</th>
<th>Canada TDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping Name:</td>
<td>SULFURIC ACID</td>
<td>SULFURIC ACID</td>
</tr>
<tr>
<td>Hazard Class:</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>UN Number:</td>
<td>UN1830</td>
<td>UN1830</td>
</tr>
</tbody>
</table>
Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7664-93-9 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 7664-93-9: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances
CAS# 7664-93-9: 1000 lb TPQ

SARA Codes
CAS# 7664-93-9: immediate, delayed, reactive.

Section 313
This material contains Sulfuric acid (CAS# 7664-93-9, 90-98%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
CAS# 7664-93-9 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
CAS# 7664-93-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Sulfuric acid, listed as `Strong inorganic acid mists contain’, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives

Hazard Symbols:
C

Risk Phrases:
R 35 Causes severe burns.

Safety Phrases:
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 30 Never add water to this product.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 7664-93-9: 2
Canada - DSL/NDSL
   CAS# 7664-93-9 is listed on Canada’s DSL List.

Canada - WHMIS
   This product has a WHMIS classification of D2A, D1A, E.
   This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
   CAS# 7664-93-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

**MSDS Creation Date:** 4/22/1999  
**Revision #15 Date:** 2/13/2008

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.
SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers
Product name: Tetrahydrofuran

CAS-No.: 109-99-9

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Industrial & for professional use only.

1.3 Details of the supplier of the safety data sheet
Company: Central Drug House (P) Ltd
7/28 Vardaan House
New Delhi-10002
INDIA

Telephone: +91 11 49404040
Email: care@cdhfinechemical.com

1.4 Emergency telephone number
Emergency Phone #: +91 11 49404040 (9:00am - 6:00 pm) [Office hours]

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Eye irritation (Category 2), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008
Pictogram

Signal word: Danger

Hazard statement(s)
H225: Highly flammable liquid and vapour.
H302: Harmful if swallowed.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.
Precautionary statement(s)
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P370 + P378 In case of fire: Use dry powder or dry sand to extinguish.
P403 + P235 Store in a well-ventilated place. Keep cool.

Supplemental Hazard information (EU)
EUH019 May form explosive peroxides.

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances
Synonyms: THF
Formula: C₄H₈O
Molecular weight: 72.11 g/mol
CAS-No.: 109-99-9
EC-No.: 203-726-8
Index-No.: 603-025-00-0
Registration number: 01-2119444314-46-XXXX

Hazardous ingredients according to Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>Flam. Liq. 2; Acute Tox. 4; Eye</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>109-99-9</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>203-726-8</td>
<td>Irrit. 2; Carc. 2; STOT SE 3;</td>
</tr>
<tr>
<td>Index-No.</td>
<td>603-025-00-0</td>
<td>H225, H302, H319, H351,</td>
</tr>
<tr>
<td>Registration number</td>
<td>01-2119444314-46-XXXX</td>
<td>H335</td>
</tr>
<tr>
<td></td>
<td>Concentration limits:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;= 25 %: Eye Irrit. 2, H319;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt;= 25 %: STOT SE 3, H335;</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Dry residue is explosive. Store under inert gas. Test for peroxide formation periodically and before distillation.
Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

**Derived No Effect Level (DNEL)**

<table>
<thead>
<tr>
<th>Application Area</th>
<th>Exposure routes</th>
<th>Health effect</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers</td>
<td>Skin contact</td>
<td>Long-term systemic effects</td>
<td>25mg/kg BW/d</td>
</tr>
<tr>
<td>Consumers</td>
<td>Skin contact</td>
<td>Long-term systemic effects</td>
<td>15mg/kg BW/d</td>
</tr>
<tr>
<td>Workers</td>
<td>Inhalation</td>
<td>Long-term local effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Workers</td>
<td>Inhalation</td>
<td>Long-term systemic effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inhalation</td>
<td>Acute local effects</td>
<td>150 mg/m3</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inhalation</td>
<td>Acute systemic effects</td>
<td>150 mg/m3</td>
</tr>
</tbody>
</table>

**Predicted No Effect Concentration (PNEC)**

<table>
<thead>
<tr>
<th>Compartment</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>2,13 mg/kg</td>
</tr>
<tr>
<td>Marine water</td>
<td>0,432 mg/l</td>
</tr>
<tr>
<td>Fresh water</td>
<td>4,32 mg/l</td>
</tr>
<tr>
<td>Marine sediment</td>
<td>2,33 mg/kg</td>
</tr>
<tr>
<td>Fresh water sediment</td>
<td>23,3 mg/kg</td>
</tr>
<tr>
<td>Onsite sewage treatment plant</td>
<td>4,6 mg/l</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

**Appropriate engineering controls**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Body Protection**
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.
SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance  
   Form: liquid, clear  
   Colour: colourless

b) Odour  
   ether-like

c) Odour Threshold  
   No data available

d) pH  
   ca. 7

e) Melting point/freezing point  
   Melting point/range: -108,44 °C at 1.013,25 hPa

f) Initial boiling point and boiling range  
   65,0 - 67,0 °C at 1.013,25 hPa

g) Flash point  
   -17,0 °C - closed cup

h) Evaporation rate  
   No data available

i) Flammability (solid, gas)  
   No data available

j) Upper/lower flammability or explosive limits  
   Upper explosion limit: 11,8 % (V)  
   Lower explosion limit: 1,8 % (V)

k) Vapour pressure  
   170 hPa at 20,0 °C

l) Vapour density  
   ca.2,5 at 25 °C - (Air = 1.0)

m) Relative density  
   0,89 g/cm^3

n) Water solubility  
   soluble

o) Partition coefficient: n-octanol/water  
   log Pow: 0,46

p) Auto-ignition temperature  
   215 °C at 1.013 hPa

q) Decomposition temperature  
   No data available

r) Viscosity  
   0,518 mm2/s at 25 °C - 0,403 mm2/s at 50 °C -

s) Explosive properties  
   Not explosive, In use may form flammable/explosive vapour-air mixture.

t) Oxidizing properties  
   The substance or mixture is not classified as oxidizing.

9.2 Other safety information

Relative vapour density  
   ca.2,5 at 25 °C - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity  
   No data available

10.2 Chemical stability  
   Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions  
   No data available

10.4 Conditions to avoid  
   Heat, flames and sparks.

10.5 Incompatible materials  
   Strong oxidizing agents, Acids

10.6 Hazardous decomposition products  
   Other decomposition products - No data available  
   In the event of fire: see section 5
SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 1.650 mg/kg
LC50 Inhalation - Rat - 6 h - 14.7 mg/l
Remarks: Material may be irritating to mucous membranes and upper respiratory tract.
LD50 Dermal - Rat - > 2.000 mg/kg

Skin corrosion/irritation
Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Risk of serious damage to eyes.
(Draize Test)

Respiratory or skin sensitisation
Based on available data, the classification criteria are not met.

Germ cell mutagenicity
In vivo tests did not show mutagenic effects

Carcinogenicity
Suspected human carcinogens

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No toxicity to reproduction

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness. - Nervous system
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
No aspiration toxicity classification

Additional Information
RTECS: LU5950000
Central nervous system depression, Cough, chest pain, Difficulty in breathing, Exposure to high airborne concentrations can cause anesthetic effects.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish
LC50 - Pimephales promelas (fathead minnow) - 2.160 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 382 mg/l - 24 h

Toxicity to algae
Growth inhibition IC50 - Algae - 3.700 mg/l - 192 h
12.2 Persistence and degradability
Biodegradability
(OECD Test Guideline 301)
Remarks: According to the results of tests of biodegradability this product is not readily biodegradable.

12.3 Bioaccumulative potential
No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number
ADR/RID: 2056
IMDG: 2056
IATA: 2056

14.2 UN proper shipping name
ADR/RID: TETRAHYDROFURAN
IMDG: TETRAHYDROFURAN
IATA: Tetrahydrofuran

14.3 Transport hazard class(es)
ADR/RID: 3
IMDG: 3
IATA: 3

14.4 Packaging group
ADR/RID: II
IMDG: II
IATA: II

14.5 Environmental hazards
ADR/RID: no
IMDG Marine pollutant: no
IATA: no

14.6 Special precautions for user
No data available

SECTION 15: Regulatory information
This safety datasheet complies with the requirements of Regulation (EC) No. 453/2010.

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

15.2 Chemical Safety Assessment
A Chemical Safety Assessment has been carried out for this substance.
SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

EUH019  May form explosive peroxides.
H225    Highly flammable liquid and vapour.
H302    Harmful if swallowed.
H319    Causes serious eye irritation.
H335    May cause respiratory irritation.
H351    Suspected of causing cancer.

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Central Drug House (P) Ltd and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.cdhfinechemical.com for additional terms and conditions of sale.
1. Identification

Product Name: Trimethyl orthopropionate

Cat No.: AC384620000; AC384620250; AC384621000

Synonyms: 1,1,1-Trimethoxypropane

Recommended Use: Laboratory chemicals.

Uses advised against: Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information US call: 001-800-ACROS-01 / Europe call: +32 14 57 52 11
Emergency Number US:001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No.US:001-800-424-9300 / Europe:001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Flammable liquids</th>
<th>Category 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Corrosion/irritation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
<td>Category 2</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word: Danger

Hazard Statements
Highly flammable liquid and vapor
Causes skin irritation
Causes serious eye irritation
Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Skin
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Fire
In case of fire: Use CO₂, dry chemical, or foam for extinction
Storage
Store in a well-ventilated place. Keep cool
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

### 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethyl orthopropionate</td>
<td>24823-81-2</td>
<td>97</td>
</tr>
</tbody>
</table>

### 4. First-aid measures

| Eye Contact | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention. |
| Skin Contact | Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention. |
| Inhalation | Remove from exposure, lie down. Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Obtain medical attention. |
| Ingestion | Clean mouth with water. Get medical attention. |
| Most important symptoms and effects | Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting |
| Notes to Physician | Treat symptomatically |

### 5. Fire-fighting measures

| Unsuitable Extinguishing Media | No information available |
| Flash Point | 19 °C / 66.2 °F |
| Method - | No information available |
Trimethyl orthopropionate

Revision Date 23-Jan-2018

Autoignition Temperature
No information available

Explosion Limits
Upper No data available
Lower No data available

Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Flammable. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

<table>
<thead>
<tr>
<th></th>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions
See Section 12 for additional ecological information.

Methods for Containment and Clean Up
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Do not let this chemical enter the environment.

7. Handling and storage

Handling
Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Do not ingest. Use explosion-proof equipment. Use only non-sparking tools.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines
This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures
Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection
Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>No information available</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>No information available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>121 - 122 °C / 249.8 - 251.6 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>19 °C / 66.2 °F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>No data available</td>
</tr>
<tr>
<td>Lower</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.944</td>
</tr>
<tr>
<td>Solubility</td>
<td>No information available</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No information available</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C6 H14 O3</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>134.18</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

- **Reactive Hazard**: None known, based on information available.
- **Stability**: Stable under normal conditions. Moisture sensitive.
- **Conditions to Avoid**: Keep away from open flames, hot surfaces and sources of ignition. Incompatible products. Exposure to moist air or water.
- **Incompatible Materials**: Strong oxidizing agents.
- **Hazardous Decomposition Products**: Carbon monoxide (CO), Carbon dioxide (CO₂).
- **Hazardous Polymerization**: Hazardous polymerization does not occur.
- **Hazardous Reactions**: None under normal processing.

11. Toxicological information

- **Acute Toxicity**
  - **Product Information**: No acute toxicity information is available for this product.
  - **Component Information**: No information available.
  - **Toxicologically Synergistic Products**: No information available.

- **Delayed and immediate effects as well as chronic effects from short and long-term exposure**
  - **Irritation**: No information available.
  - **Sensitization**: No information available.
  - **Carcinogenicity**: The table below indicates whether each agency has listed any ingredient as a carcinogen.
Trimethyl orthopropionate

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethyl orthopropionate</td>
<td>24823-81-2</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

**Mutagenic Effects**
No information available.

**Reproductive Effects**
No information available.

**Developmental Effects**
No information available.

**Teratogenicity**
No information available.

**STOT - single exposure**
None known.

**STOT - repeated exposure**
None known.

**Aspiration hazard**
No information available.

**Symptoms / effects, both acute and delayed**
Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

**Endocrine Disruptor Information**
No information available.

**Other Adverse Effects**
The toxicological properties have not been fully investigated.

### 12. Ecological information

**Ecotoxicity**
Do not empty into drains.

**Persistence and Degradability**
No information available.

**Bioaccumulation / Accumulation**
No information available.

**Mobility**
No information available.

### 13. Disposal considerations

**Waste Disposal Methods**
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

### 14. Transport information

**DOT**
- UN-No: UN3271
- Hazard Class: 3
- Packing Group: II

**TDG**
- UN-No: UN3271
- Hazard Class: 3
- Packing Group: II

**IATA**
- UN-No: 3271
- Proper Shipping Name: Ethers, N.O.S.*
- Hazard Class: 3
- Packing Group: II

**IMDG/IMO**
- UN-No: 3271
- Proper Shipping Name: Ethers, N.O.S.
- Hazard Class: 3
- Packing Group: II

### 15. Regulatory information
International Inventories

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable
SARA 313 Not applicable
SARA 311/312 Hazard Categories See section 2 for more information
CWA (Clean Water Act) Not applicable
Clean Air Act Not applicable
OSHA Occupational Safety and Health Administration Not applicable
CERCLA Not applicable
California Proposition 65 This product does not contain any Proposition 65 chemicals
U.S. State Right-to-Know Regulations Not applicable

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard
disclaimer
the information provided in this safety data sheet is correct to the best of our knowledge, information and belief at the date of its publication. the information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. the information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

end of sds
1. Identification

Product Name Valeryl chloride
Cat No. : AC169120000; AC169120010; AC169121000
CAS-No 638-29-9
Synonyms No information available
Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company Fisher Scientific Acros Organics
One Reagent Lane One Reagent Lane
Fair Lawn, NJ 07410 Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
For information US call: 001-800-ACROS-01 / Europe call: +32 14 57 52 11
Emergency Number US:001-201-796-7100 / Europe: +32 14 57 52 99
CHEMTREC Tel. No.US:001-800-424-9300 / Europe:001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

<table>
<thead>
<tr>
<th>Hazard Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids</td>
</tr>
<tr>
<td>Acute Inhalation Toxicity - Vapors</td>
</tr>
<tr>
<td>Skin Corrosion/irritation</td>
</tr>
<tr>
<td>Serious Eye Damage/Eye Irritation</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
</tr>
<tr>
<td>Target Organs - Respiratory system.</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
Causes severe skin burns and eye damage
May cause respiratory irritation
Toxic if inhaled
Precautionary Statements
Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Immediately call a POISON CENTER or doctor/physician
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
Storage
Store locked up
Store in a closed container
Store in a well-ventilated place. Keep cool
Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Contact with water liberates toxic gas

### 3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>638-29-9</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

### 4. First-aid measures

**Eye Contact**
Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

**Skin Contact**
Immediate medical attention is required. Wash off immediately with plenty of water for at
**Valeryl chloride**

**Inhalation**
Move to fresh air. Immediate medical attention is required. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If not breathing, give artificial respiration.

**Ingestion**
Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Most important symptoms and effects**
Breathing difficulties. Causes burns by all exposure routes. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated: Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

**Notes to Physician**
Treat symptomatically

---

**5. Fire-fighting measures**

**Suitable Extinguishing Media**
Carbon dioxide (CO₂). Dry chemical. Chemical foam. CO₂, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media**
DO NOT USE WATER

**Flash Point**
32 °C / 89.6 °F

**Method -**
No information available

**Autoignition Temperature**
265 °C / 509 °F

**Explosion Limits**
Upper No data available
Lower No data available

**Sensitivity to Mechanical Impact**
No information available

**Sensitivity to Static Discharge**
No information available

**Specific Hazards Arising from the Chemical**

**Hazardous Combustion Products**
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO₂) Phosgene

**Protective Equipment and Precautions for Firefighters**
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

**NFPA**

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>0</td>
<td>W</td>
</tr>
</tbody>
</table>

---

**6. Accidental release measures**

**Personal Precautions**
Remove all sources of ignition. Take precautionary measures against static discharges. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing. Use personal protective equipment.

**Environmental Precautions**
See Section 12 for additional ecological information.

**Methods for Containment and Clean Up**
Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Wear self-contained breathing apparatus and protective suit. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Do not expose spill to water. Do not let this chemical enter the environment. Take precautionary measures against static discharges. Soak up with inert
7. Handling and storage

Handling
Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use only in area provided with appropriate exhaust ventilation. Handle under inert gas, protect from moisture. Use explosion-proof equipment. Use only non-sparking tools. Do not allow contact with water. Do not allow contact with water because of violent reaction. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only under a chemical fume hood. Do not breathe vapors/dust. Do not ingest. Wear personal protective equipment.

Storage

8. Exposure controls / personal protection

Exposure Guidelines
This product does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Engineering Measures
Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location. Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection
Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection
Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Light yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>No information available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>-110 °C / -166 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>125 - 127 °C / 257 - 260.6 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>32 °C / 89.6 °F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>No data available</td>
</tr>
<tr>
<td>Lower</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>11.4 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>4.16</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.990</td>
</tr>
</tbody>
</table>
Valeryl chloride

10. Stability and reactivity

Reactive Hazard
Yes

Stability
Moisture sensitive. Contact with water liberates toxic gas.

Conditions to Avoid
Keep away from open flames, hot surfaces and sources of ignition. Incompatible products. Exposure to moist air or water. Heat, flames and sparks.

Incompatible Materials
Water, Strong oxidizing agents, Strong bases, Alcohols, Amines

Hazardous Decomposition Products
Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO₂), Phosgene

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
Contact with water liberates toxic gas.

11. Toxicological information

Acute Toxicity

Product Information
Vapor LC50

Component Information

<table>
<thead>
<tr>
<th>Component</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>Not listed</td>
<td>Not listed</td>
<td>2.07 mg/L/54h (Rat)</td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products
No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation
Causes burns by all exposure routes

Sensitization
No information available

Carcinogenicity
The table below indicates whether each agency has listed any ingredient as a carcinogen.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>IARC</th>
<th>NTP</th>
<th>ACGIH</th>
<th>OSHA</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>638-29-9</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Mutagenic Effects
Not mutagenic in AMES Test

Reproductive Effects
No information available.

Developmental Effects
No information available.

Teratogenicity
No information available.

STOT - single exposure
Respiratory system

STOT - repeated exposure
None known

Aspiration hazard
No information available

Symptoms / effects, both acute and delayed
Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting; Product is a corrosive material. Use of gastric lavage or emesis is contraindicated.
Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation.

**Endocrine Disruptor Information**
No information available

**Other Adverse Effects**
The toxicological properties have not been fully investigated.

### 12. Ecological information

#### Ecotoxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Algae</th>
<th>Freshwater Fish</th>
<th>Microtox</th>
<th>Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>Not listed</td>
<td>Leuciscus idus: 46-100 mg/L 96h</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

**Persistence and Degradability**
Soluble in water. Persistence is unlikely based on information available.

**Bioaccumulation/ Accumulation**
No information available.

**Mobility**
Will likely be mobile in the environment due to its water solubility.

### 13. Disposal considerations

**Waste Disposal Methods**
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

### 14. Transport information

**DOT**
- UN-No: UN2502
- Proper Shipping Name: VALERYL CHLORIDE
- Hazard Class: 8
- Subsidiary Hazard Class: 3
- Packing Group: II

**TDG**
- UN-No: UN2502
- Proper Shipping Name: VALERYL CHLORIDE
- Hazard Class: 8
- Subsidiary Hazard Class: 3
- Packing Group: II

**IATA**
- UN-No: UN2502
- Proper Shipping Name: VALERYL CHLORIDE
- Hazard Class: 8
- Subsidiary Hazard Class: 3
- Packing Group: II

**IMDG/IMO**
- UN-No: UN2502
- Proper Shipping Name: VALERYL CHLORIDE
- Hazard Class: 8
- Subsidiary Hazard Class: 3
- Packing Group: II

### 15. Regulatory information

**International Inventories**

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NDSL</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>PICCS</th>
<th>ENCS</th>
<th>AICS</th>
<th>IECSC</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>211-330-1</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
</tbody>
</table>

Legend:
- **X** - Listed
Valeryl chloride

Revision Date 19-Jan-2018

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable
SARA 313 Not applicable
SARA 311/312 Hazard Categories See section 2 for more information
CWA (Clean Water Act) Not applicable
Clean Air Act Not applicable
OSHA Occupational Safety and Health Administration Not applicable
CERCLA Not applicable
California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Component</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valeryl chloride</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
              Thermo Fisher Scientific
              Email: EMSDS.RA@thermofisher.com

Creation Date 10-Nov-2010
Revision Date 19-Jan-2018
Print Date 19-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally
Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS