SAFETY DATA SHEET

n-Heptane Primary Reference Fuel (PRF)
Version 1.5 Revision Date 2017-07-27

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product information
Product Name : n-Heptane Primary Reference Fuel (PRF)
Material : 1084146, 1021846, 1021847, 1021848, 1021849, 1021850, 1031134

Company : Chevron Phillips Chemical Company LP
Specialty Chemicals
10001 Six Pines Drive
The Woodlands, TX 77380

Local : CHEVRON PHILLIPS CHEMICALS ASIA PTE. LTD.
C/O DONG WOO CORPORATION
#B-2601,JEONGJAIL-RO.
BUNDANG-GU,SEONGNAMI-SI,
GYEONGGI-DO,13557
SOUTH KOREA
Telephone no.: +612-9186-1132

Emergency telephone:
Health:
866.442.9628 (North America)
1.832.813.4984 (International)

Transport:
CHEMTREC 800.424.9300 or 703.527.3887(int'l)
Asia: CHEMWATCH (+612 9186 1132) China: 0532 8388 9090
EUROPE: BIG +32.14.584545 (phone) or +32.14583516 (telefax)
Mexico CHEMTREC 01-800-681-9531 (24 hours)
South America SOS-Cotec Inside Brazil: 0800.111.767 Outside Brazil: +55.19.3467.1600
Argentina: +(54)-(11)59839431

Responsible Department : Product Safety and Toxicology Group
E-mail address : SDS@CPChem.com
Website : www.CPChem.com

SECTION 2: Hazards identification

Classification of the substance or mixture
Standards for classification and labeling of chemical substances and material safety data sheet
(ministry of employment and labor public notice No. 2016-19) (GHS 2011)

SDS Number:100000067063 1/12
n-Heptane Primary Reference Fuel (PRF)

Classification:
- Flammable liquids, Category 2
- Skin irritation, Category 2
- Specific target organ systemic toxicity - single exposure, Category 3, Respiratory system, Central nervous system
- Aspiration hazard, Category 1
- Acute aquatic toxicity, Category 1
- Chronic aquatic toxicity, Category 1

Labeling:
- Symbol(s):
- Signal Word: Danger

Hazard Statements:
- H225: Highly flammable liquid and vapor.
- H304: May be fatal if swallowed and enters airways.
- H315: Causes skin irritation.
- H336: May cause drowsiness or dizziness.
- H410: Very toxic to aquatic life with long lasting effects.

Precautionary Statements:
- Prevention:
  - 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 dust/fume/gas/mist/vapor.
  - P261: Avoid breathing dust/fume/gas/mist/vapors/spray.
  - P264: Wash the contact area thoroughly after handling.
  - P271: Use only outdoors or in a well-ventilated area.
  - P273: Avoid release to the environment.
  - P280: Wear protective gloves/eye protection/face protection.
- Response:
  - P301 + P310: IF SWALLOWED: 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: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
  - P312: Call a POISON CENTER or doctor/physician if you feel unwell.
  - P321: Specific treatment (see supplemental first aid instructions on this label).
  - P331: Do NOT induce vomiting.
  - P332 + P313: If skin irritation occurs: Get medical advice/attention.
  - P362: Take off contaminated clothing and wash before reuse.
  - P370 + P378: In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
  - P391: Collect spillage.

Storage:

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n-Heptane Primary Reference Fuel (PRF)

SECTION 3: Composition/Information on ingredients

| Synonyms            | Normal Heptane  
| Dipropilmetano     |                  |
| Molecular formula   | C7H16            |
| Chemical name       | n-Heptane        |
| CAS-No.             | 142-82-5         |
| Concentration       | 100%             |
| KECI Number         | KE-18271         |

SECTION 4: First aid measures

General advice: Move out of dangerous area. Show this material safety data sheet to the doctor in attendance. Symptoms of poisoning may appear several hours later. Do not leave the victim unattended.

If inhaled: Move to fresh air. If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.

In case of skin contact: If skin irritation persists, call a physician. If on skin, rinse well with water. If on clothes, remove clothes.

In case of eye contact: Immediately flush eye(s) with plenty of water. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing. If eye irritation persists, consult a specialist.

If swallowed: Keep respiratory tract clear. Do NOT induce vomiting. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. Take victim immediately to hospital.

SECTION 5: Firefighting measures

Flash point: -4 °C (25 °F)  
Method: Tag closed cup

Autoignition temperature: 203.85 °C (398.93 °F)

Suitable extinguishing media: Dry chemical. Carbon dioxide (CO2). Alcohol-resistant foam.

Unsuitable extinguishing: High volume water jet.

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media

Specific hazards during fire fighting : Do not allow run-off from fire fighting to enter drains or water courses.

Special protective equipment for fire-fighters : Wear self-contained breathing apparatus for firefighting if necessary.

Further information : Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. For safety reasons in case of fire, cans should be stored separately in closed containments. Use a water spray to cool fully closed containers.

Fire and explosion protection : Do not spray on an open flame or any other incandescent material. Use only explosion-proof equipment. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Keep away from open flames, hot surfaces and sources of ignition.

Hazardous decomposition products : Carbon oxides.

SECTION 6: Accidental release measures

Personal precautions : Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

Environmental precautions : Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.

Methods for cleaning up : Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

SECTION 7: Handling and storage

Handling

Advice on safe handling : Avoid formation of aerosol. Do not breathe vapors/dust. Avoid exposure - obtain special instructions before use. Avoid contact with skin and eyes. For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. Open drum carefully as content may be under pressure. Dispose of rinse water in accordance with local and national regulations. Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary, but may not by themselves be sufficient. Review all operations, which have the
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Potential to generating and accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106 “Flammable and Combustible Liquids”; National Fire Protection Association (NFPA 77), "Recommended Practice on Static Electricity"; and/or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising Out of Static, Lightning, and stray Currents”.

Advice on protection against fire and explosion: Do not spray on an open flame or any other incandescent material. Use only explosion-proof equipment. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapors). Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage areas and containers: No smoking. 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. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8: Exposure controls/personal protection

Ingredients with workplace control parameters

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Basis</th>
<th>Value</th>
<th>Control parameters</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-Heptane</td>
<td>KR OEL</td>
<td>TWA</td>
<td>400 ppm, 1,600 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>KR OEL</td>
<td>STEL</td>
<td>500 ppm, 2,000 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Engineering measures

Adequate ventilation to control airborne concentrations below the exposure guidelines/limits. Consider the potential hazards of this material (see Section 2), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Personal protective equipment

Respiratory protection: Wear a supplied-air NIOSH approved respirator unless ventilation or other engineering controls are adequate to maintain minimal oxygen content of 19.5% by volume under normal atmospheric pressure. Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as: Air-Purifying Respirator for Organic Vapors. Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.
### Hand protection
The suitability for a specific workplace should be discussed with the producers of the protective gloves. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

### Eye protection
Eye wash bottle with pure water. Tightly fitting safety goggles.

### Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place. Wear as appropriate: Flame retardant antistatic protective clothing. Workers should wear antistatic footwear.

### Hygiene measures
When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

### SECTION 9: Physical and chemical properties

#### Information on basic physical and chemical properties

**Appearance**
- Form: Liquid
- Physical state: Liquid
- Color: Clear
- Odor: Sweet

**Safety data**
- Flash point: -4 °C (25 °F)
  - Method: Tag closed cup
- Lower explosion limit: 1 % (V)
- Upper explosion limit: 7 % (V)
- Oxidizing properties: no
- Autoignition temperature: 203.85 °C (398.93 °F)
- Molecular formula: C7H16
- Molecular weight: 100.23 g/mol
- pH: Not applicable
- Pour point: No data available
- Boiling point/boiling range: 98 °C (208 °F)
- Vapor pressure: 1.60 PSI at 38 °C (100 °F)
- Relative density: 0.69 at 16 °C (61 °F)
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Density: 5.75 L/G at 20 °C (68 °F)
Water solubility: Negligible
Partition coefficient: n-octanol/water: No data available
Relative vapor density: 3.4 (Air = 1.0)
Evaporation rate: 3.46
Percent volatile: > 99%

Conductivity: < 1 pSm at 20 °C

SECTION 10: Stability and reactivity

Chemical stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions
Conditions to avoid: Not applicable.
Materials to avoid: May react with oxygen and strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous decomposition products: Carbon oxides
Other data: No decomposition if stored and applied as directed.

SECTION 11: Toxicological information

Acute oral toxicity
n-Heptane: LD50: > 5,000 mg/kg
Species: Rat
Method: OECD Test Guideline 401
Information given is based on data obtained from similar substances.

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Skin irritation: Irritating to skin.
May cause skin irritation in susceptible persons.
Eye irritation: Vapors may cause irritation to the eyes, respiratory system and the skin.

Sensitization:
n-Heptane: Did not cause sensitization on laboratory animals. Information given is based on data obtained from similar substances.

Repeated dose toxicity:
n-Heptane: Species: Rat, male
   Sex: male
   Application Route: Inhalation
   Dose: 12.47 mg/l
   Exposure time: 16 wk
   Number of exposures: 12 h/d, 7 d/wk
   NOEL: 12.47 mg/l
   No adverse effect has been observed in chronic toxicity tests.

Reproductive toxicity:
n-Heptane: Species: Rat
   Application Route: Inhalation
   Dose: 0, 900, 3000, 9000 ppm
   Number of exposures: 6 hr/d, 5 d/wk
   Test period: 13 wk
   Method: OECD Test Guideline 416
   NOAEL Parent: 9000 ppm
   NOAEL F1: 3000 ppm
   NOAEL F2: 3000 ppm

Developmental Toxicity:
n-Heptane: Species: Rat
   Application Route: Inhalation
   Dose: 0, 900, 3000, 9000 ppm
   Exposure time: GD6-15
   Number of exposures: 6 hrs/d
   NOAEL Teratogenicity: 9000 ppm
   NOAEL Maternal: 3000 ppm

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Aspiration toxicity: May be fatal if swallowed and enters airways. Substances known to cause human aspiration toxicity hazards or to be regarded as if they cause human aspiration toxicity hazard.

CMR effects:
n-Heptane: Mutagenicity: Tests on bacterial or mammalian cell cultures did not show mutagenic effects. Teratogenicity: Animal testing did not show any effects on fetal development. Reproductive toxicity: No toxicity to reproduction

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Further information: Concentrations substantially above the TLV value may cause
n-Heptane Primary Reference Fuel (PRF)

SECTION 12: Ecological information

Toxicity to fish
n-Heptane : LL50: 1.284 mg/l
Exposure time: 96 h
Species: Oncorhynchus mykiss (rainbow trout)
Method: QSAR

LC50: 375 mg/l
Exposure time: 96 h
Species: Tilapia mosambica (Fish)

Toxicity to daphnia and other aquatic invertebrates
n-Heptane : EC50: 1.5 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
static test Toxic to aquatic organisms.

LC50: 0.1 mg/l
Exposure time: 96 h
Species: Mysidopsis bahia (mysid shrimp)
semi-static test Very toxic to aquatic organisms.

Toxicity to algae
n-Heptane : EL50: 4.338 mg/l
Exposure time: 72 h
Species: Pseudokirchneriella subcapitata (microalgae)
Method: QSAR

Biodegradability
n-Heptane : Result: Readily biodegradable.
70 %
Testing period: 10 d

Ecotoxicology Assessment

Acute aquatic toxicity
n-Heptane : Very toxic to aquatic life.

Chronic aquatic toxicity
n-Heptane : Very toxic to aquatic life with long lasting effects.

Results of PBT assessment
n-Heptane : Non-classified PBT substance, Non-classified vPvB substance
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**Additional ecological information**: An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

**SECTION 13: Disposal considerations**

The information in this SDS pertains only to the product as shipped.

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

**Product**: The product should not be allowed to enter drains, water courses or the soil. Do not contaminate ponds, waterways or ditches with chemical or used container. Send to a licensed waste management company.

**Contaminated packaging**: Empty remaining contents. Dispose of as unused product. Do not re-use empty containers. Do not burn, or use a cutting torch on, the empty drum.

**SECTION 14: Transport information**

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition).

Consult the appropriate domestic or international mode-specific and quantity-specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the SDS and the bill of lading.

**US DOT (UNITED STATES DEPARTMENT OF TRANSPORTATION)**

UN1206, HEPTANES, 3, II, MARINE POLLUTANT, (N-HEPTANE)

**IMO / IMDG (INTERNATIONAL MARITIME DANGEROUS GOODS)**

UN1206, HEPTANES, 3, II, (-4 °C), MARINE POLLUTANT, (N-HEPTANE)

**IATA (INTERNATIONAL AIR TRANSPORT ASSOCIATION)**

UN1206, HEPTANES, 3, II

**ADR (AGREEMENT ON DANGEROUS GOODS BY ROAD (EUROPE))**

UN1206, HEPTANES, 3, II, (D/E), ENVIRONMENTALLY HAZARDOUS, (N-HEPTANE)

**RID (REGULATIONS CONCERNING THE INTERNATIONAL TRANSPORT OF DANGEROUS GOODS (EUROPE))**

UN1206, HEPTANES, 3, II, ENVIRONMENTALLY HAZARDOUS, (N-HEPTANE)
n-Heptane Primary Reference Fuel (PRF)

Version 1.5

Revision Date 2017-07-27

ADN (EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY INLAND WATERWAYS)
UN1206, HEPTANES, 3, II, ENVIRONMENTALLY HAZARDOUS, (N-HEPTANE)

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

National legislation

Regulation under the Occupational Safety and Health Act
A Material Safety Datasheet (MSDS) for this product is not required according to article 41 of the iSHA.

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Chemical name</th>
<th>Threshold limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harmful Substances Prohibited from Manufacturing</td>
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<td></td>
</tr>
<tr>
<td>Harmful Substances Required Permission for Manufacture</td>
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</table>

Act on the Registration and Evaluation, etc. of Chemical Substances, Chemicals Control Act

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Chemical name</th>
<th>Threshold limits</th>
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</thead>
<tbody>
<tr>
<td>Toxic Chemicals</td>
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<tr>
<td>Prohibited Chemicals</td>
<td>Not relevant</td>
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<tr>
<td>Observational chemicals</td>
<td>Not relevant</td>
<td></td>
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<tr>
<td>Restricted Chemicals</td>
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<tr>
<td>Toxic Release Inventory</td>
<td>Not relevant</td>
<td></td>
</tr>
</tbody>
</table>

Dangerous Substances Safety Management Act

Dangerous Substances: Flammable liquids, Type 1 petroleums, Water insoluble liquid

Safety Management Act

Notification status

Europe REACH: On the inventory, or in compliance with the inventory
United States of America (USA) TSCA: On the inventory, or in compliance with the inventory
Canada DSL: On the inventory, or in compliance with the inventory
Australia AICS: On the inventory, or in compliance with the inventory
New Zealand NZIoC: On the inventory, or in compliance with the inventory
Japan ENCS: On the inventory, or in compliance with the inventory
Korea KECI: On the inventory, or in compliance with the inventory
Philippines PICCS: On the inventory, or in compliance with the inventory
China IECSC: On the inventory, or in compliance with the inventory
SECTION 16: Other information

Further information

Legacy SDS Number : 26960

Significant changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information in this SDS pertains only to the product as shipped.

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.

Key or legend to abbreviations and acronyms used in the safety data sheet

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td>American Conference of Government Industrial Hygienists</td>
</tr>
<tr>
<td>LD50</td>
<td>Lethal Dose 50%</td>
</tr>
<tr>
<td>AIICS</td>
<td>Australia, Inventory of Chemical Substances</td>
</tr>
<tr>
<td>LOAEL</td>
<td>Lowest Observed Adverse Effect Level</td>
</tr>
<tr>
<td>DSL</td>
<td>Canada, Domestic Substances List</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Agency</td>
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<tr>
<td>NDSL</td>
<td>Canada, Non-Domestic Substances List</td>
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<tr>
<td>NIOSH</td>
<td>National Institute for Occupational Safety &amp; Health</td>
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<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>NTP</td>
<td>National Toxicology Program</td>
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<td>CAS</td>
<td>Chemical Abstract Service</td>
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<td>NZIoC</td>
<td>New Zealand Inventory of Chemicals</td>
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<tr>
<td>EC50</td>
<td>Effective Concentration</td>
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<td>NOAEL</td>
<td>No Observable Adverse Effect Level</td>
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<tr>
<td>EC50</td>
<td>Effective Concentration 50%</td>
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<td>NOEC</td>
<td>No Observed Effect Concentration</td>
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<td>EGEST</td>
<td>EOSCA Generic Exposure Scenario Tool</td>
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<td>OSHA</td>
<td>Occupational Safety &amp; Health Administration</td>
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<td>EOSCA</td>
<td>European Oilfield Specialty Chemicals Association</td>
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<tr>
<td>PEL</td>
<td>Permissible Exposure Limit</td>
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<td>EINECS</td>
<td>European Inventory of Existing Chemical Substances</td>
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<td>PICCS</td>
<td>Philippines Inventory of Commercial Chemical Substances</td>
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<td>MAK</td>
<td>Germany Maximum Concentration Values</td>
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<td>PRNT</td>
<td>Presumed Not Toxic</td>
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<td>GHS</td>
<td>Globally Harmonized System</td>
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<td>RCRA</td>
<td>Resource Conservation Recovery Act</td>
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<td>&gt;=</td>
<td>Greater Than or Equal To</td>
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<td>STEL</td>
<td>Short-term Exposure Limit</td>
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<tr>
<td>IC50</td>
<td>Inhibition Concentration 50%</td>
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<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act.</td>
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<tr>
<td>IARC</td>
<td>International Agency for Research on Cancer</td>
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<tr>
<td>TLV</td>
<td>Threshold Limit Value</td>
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<td>IECSC</td>
<td>Inventory of Existing Chemical Substances in China</td>
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<td>TWA</td>
<td>Time Weighted Average</td>
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<td>ENCS</td>
<td>Japan, Inventory of Existing and New Chemical Substances</td>
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<td>TSCA</td>
<td>Toxic Substance Control Act</td>
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<tr>
<td>KECI</td>
<td>Korea, Existing Chemical Inventory</td>
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<td>UVCB</td>
<td>Unknown or Variable Composition, Complex Reaction Products, and Biological Materials</td>
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<tr>
<td>&lt;=</td>
<td>Less Than or Equal To</td>
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<tr>
<td>WHMIS</td>
<td>Workplace Hazardous Materials Information System</td>
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<tr>
<td>LC50</td>
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