INTERIM REMEDIAL MEASURES WORK PLAN

for

280 WEST 155th STREET DEVELOPMENT
280 West 155th Street
New York, New York
NYSDEC BCP No. C231138

Prepared For:

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Langan Project No. 100765102
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CERTIFICATION

I, Satyajit Vaidya, P.E., certify that I am currently a NYS registered professional engineer as defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 and that this Interim Remedial Measures Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

Satyajit Vaidya, P.E.
NYS P.E. # 089797

5.10.2021

I, Christopher McMahon, certify that I am currently a Qualified Environmental Professional as defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375 and that this Interim Remedial Measures Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER-10.

Christopher McMahon, CHMM
1.0 INTRODUCTION

1.1 General

This Interim Remedial Measures (IRM) Work Plan was prepared on behalf of 280 W 155TH STREET OWNER L.L.C. (the Volunteer) for the property at 280 West 155th Street (Tax Block 2040, Lot 48) in the Harlem neighborhood of New York, New York (the Site). A Site Location Map is included as Figure 1.

The Site is identified as Brownfield Cleanup Program (BCP) Site No. C231138 and the 37,500-square-foot site is currently occupied by an at-grade asphalt paved parking lot and has been used as a parking lot since 1996. The Volunteer submitted a Brownfield Cleanup Agreement (BCA) Amendment dated 3 November 2020 to the New York State Department of Environmental Conservation (NYSDEC). The BCA Amendment modified the 2 January 2020 BCA to transfer the Applicant from 280 W 155 ST LLC to 280 W 155TH STREET OWNER L.L.C.

The work that will be completed as part of this IRM will allow for the Site to complete initial foundation construction activities, which are necessary to prepare the Site for the completion of the anticipated remedial action. Components of the final remedy for the Site are anticipated to consist of the removal of petroleum impacted source material, installation of a vapor membrane and construction of a Sub-Membrane Soil Vapor Mitigation system (SMDS), the construction of a Site-wide composite cover system and the implementation of Institutional and Engineering Controls (IC/ECs). The final remedy will be detailed in the forthcoming Remedial Action Work Plan (RAWP), which will be submitted to the NYSDEC prior to implementation.

The scope of work to be completed as part of this IRM Work Plan (IRMWP) includes the following initial foundation construction activities:

- Monitoring well decommissioning;
- Site-wide excavation and disposal of contaminated historic fill;
- Installation of a support-of-excavation (SOE) system; and,
- Drilling piles for foundation construction.
As will be discussed below, Site-wide excavation and disposal of contaminated historic fill is not anticipated to extend to the depth of petroleum impacts as observed during the 2018 Waste Characterization Investigation, the 2019 Phase II Environmental Site Investigation or the 2020 Remedial Investigation (RI). However, contingencies are provided to address unforeseen contamination that may be discovered during the soil disturbance activities, including removal of grossly and/or petroleum-impacted soil hotspots and closure of any underground storage tanks (USTs) encountered during soil disturbance activities, in advance of implementation of a RAWP for the redevelopment of the Site. As this Site has already been entered into the NYSDEC BCP as Site No. C231138 to investigate and remediate the Site, this IRMWP is being submitted to ensure that the scope of work will be completed in accordance with the requirements of the amended Brownfield Cleanup Agreement currently in place. The Work Plan was prepared in accordance with the process and requirements of the BCP and the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10). Work described herein will be coordinated with the NYSDEC and the New York State Department of Health (NYSDOH).

1.2 Site Description

The approximately 37,500-square-foot Site is located at 280 West 155th Street in the Harlem neighborhood of Manhattan, New York, and is identified as Block 2040 and Lot 48 (former Lots 48, 61, and 62) on the New York City (NYC) Tax Map. The Site is currently an at-grade asphalt paved parking lot and has been used as a parking lot since 1996. The Site is bound to the north by West 155th Street and the elevated 155th Street Viaduct associated with the Macomb’s Dam Bridge followed by Holcombe Rucker Park; an asphalt-paved parking lot to the east; two single-story commercial/industrial buildings including a Toyota Automotive Repair facility and Ferguson Plumbing Supply store, two four-story mixed-use residential/commercial buildings, and two four- to six-story residential buildings to the south; and by Frederick Douglass Boulevard followed by a two-story mixed-use residential/commercial building to the west. The Site is located within a commercial zoning district (C8-3) and is currently designated for garage/gas station use (G6) by the New York City Department of Finance. A Site location map is provided as Figure 1.
1.3 Proposed Development

The Site is proposed to be developed with a 3-story self-storage building with a cellar level. The cellar and first floor will occupy approximately 31,930-square-feet and approximately 25,795-square-feet, respectively, of the approximate 37,500-square-foot property. The northwestern portion of the site will be used as a paved driveway/parking area with the proposed building constructed overhead. Excavation for the construction of the cellar slab is anticipated to be completed to el 6.5 feet NAVD88 corresponding to between 5 and 10 feet below current site grade (range due to variation Site topography).

Remediation of the Site beyond that which is described herein will be completed in accordance with the forthcoming RAWP subsequent to the IRM Site preparation activities.

1.4 Site Physical Conditions

1.4.1 Topography

Based on a 25 March 1999 survey prepared by Alphonse Pesce Jr.–Land Surveyor, the existing Site grade ranges from about el 14 to about el 17 North American Vertical Datum of 1988 (NAVD88). Based on topography in the vicinity of the subject property and the surrounding area, groundwater flow within the overburden material is anticipated to be to the east, towards the Harlem River.

1.4.2 Site Geology

Based on observations made during environmental and geotechnical investigations completed by Langan in 2019, the subsurface strata at the Site consists of historic fill; generally consisting of fine to coarse sand with varying proportions of silt and gravel and miscellaneous debris, including brick, wood, asphalt, plastic, and metal to depths ranging from 12 to 25 feet below grade. The fill is underlain by a soft upper clay unit, a medium dense silty sand unit, a medium-stiff to stiff lower clay unit, a dense to very dense sand and gravel unit, and weathered/decomposed rock.

According to the USGS Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and
parts of Bergen and Hudson Counties, New Jersey, by Charles A. Baskerville dated 1994, the Site is underlain by Inwood Marble, consisting mainly of white to blueish-gray calcitic and dolomitic marble, and Fordham Gneiss, consisting mainly of black and white layered gneiss. The map indicates the Manhattan Schist formation is also located in close proximity the Site. Based on borings completed during Langan’s 2019 geotechnical investigation, the top of bedrock was observed to range between approximately 33 to 105 feet below grade. Competent bedrock was not encountered in soil borings installed as part of the 2019 environmental investigation.

According to the 1874 Sanitary & Topographical Map of the City and Island of New York by Egbert L. Viele, the Site is located in an area historically inundated by water associated with the Harlem River. As the area is no longer inundated with water, it is likely that the area was subject to historical filling using material of an unknown origin to fill the area and raise grades.

1.4.3 Hydrogeologic Conditions

Groundwater was encountered at depths ranging from about 6 to 10 feet below ground surface (bgs) during Langan investigations. Based on area topography, observed water level measurements, and the proximity of the Site to the Harlem River, groundwater is inferred to flow to the southeast towards the Harlem River. Groundwater in this part of New York City is not used as a potable (drinking) water source. The potable water supply is provided to the Site by the City of New York and is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

1.5 Site History

Based on Langan’s review of previous environmental assessments and investigation reports prepared for the Site, and listed in the subsequent section, and review of available records maintained online by the NYCDOB, historical use and features of the subject property include the presence of a steam laundry building with an associated boiler room and an automotive repair facility. The adjacent property to the south historically operated as an automotive repair facility.
and identified a portion of the subject Site (former Lot 48) as part of an approved gasoline storage and automotive repair parcel.

The 1874 Sanitary & Topographical Map of the City and Island of New York by Egbert L. Viele, identify the Site within the historical extents of the Harlem River and consisting of created land; as such, it is likely that the area was subject to historical filling using material of an unknown origin to raise grades.

The primary contaminants of concern identified as part of the previous environmental investigations are free-phase petroleum (light non-aqueous phase liquid [LNAPL]) in soil and groundwater within the eastern portion of the site, and semi-volatile organic compounds (SVOCs) and metals commonly associated with petroleum impacts and historic fill detected in soil at concentrations exceeding NYSDEC Restricted Use Soil Cleanup Objectives (SCOs) for the proposed commercial site use, and in groundwater at concentrations exceeding NYSDEC Standards and Guidance Values (SGVs) for groundwater. Additionally, petroleum-related volatile organic compounds (VOCs) and chlorinated VOCs were detected in soil vapor.

1.6 Previous Environmental Investigation Findings

Previous environmental correspondence, environmental site assessment reports, and environmental investigation reports were provided for review prior to field investigation activities. Copies of these reports were provided as Appendix C of the 3 June 2020 Remedial Investigation Work Plan. Environmental correspondence, assessments, and investigation reports provided for review are listed below:

- Phase I Environmental Study, prepared by Singer Environmental Group, Ltd. (Singer), dated August 1998
- Phase I Environmental Site Assessment, prepared by P.W. Grosser Consulting, Inc. (P.W. Grosser), dated December 2018
- Environmental Soil Pre-Characterization Investigation, prepared by Langan, dated 2 July 2019
- Phase II Environmental Investigation, prepared by Langan, dated 19 July 2019
- Remedial Investigation Work Plan, prepared by Langan, dated 3 June 2020
1.6.1 Phase I Environmental Study – Singer Environmental Group Ltd. (1998)

Singer Environmental Group, Ltd. (Singer) conducted a Phase I Environmental Study investigation dated 18 August 1998 for former Lots 61 and 62 identified as 2924 & 2926 Frederick Douglass Boulevard in New York, New York. The Phase I did not include former Lot 48. At the time of the assessment, the Site was operated as a parking lot. Based on Singer’s assessment no recognized environmental concerns (RECs), historic recognized environmental concerns (HRECs), or business environmental risks (BERs) were identified on the property.


P.W. Grosser Consulting, Inc. (P.W. Grosser) conducted a Phase I Environmental Site Assessment (ESA) dated December 2018 for former Lots 48, 61, and 62 identified as 2926 Frederick Douglas Boulevard, 225 West 155th Street, and 204 West 155th Street in New York, New York.

P.W. Grosser’s Phase I ESA identified the following RECs:

- Historical site use as a steam laundry facility from approximately 1930 to 1980;
- Subject property identified as a Brownfield property;
- Historical use as automotive repair at adjacent properties;
- An active spill at 250 Bradhurst Avenue, located 0.7 miles upgradient of the subject property; and,
- Two active leaking tanks cases at the Jackie Robinson Rec Center, located upgradient of the subject property.

1.6.3 Environmental Soil Pre-Characterization Investigation – Langan (2018)

Langan conducted a waste characterization investigation in March 2019 for Lot 48 (former Lots 48, 61, and 62). Results of the investigation were summarized in the 3 July 2019 Environmental Soil Pre-Characterization
Results Letter which was submitted to NYSDEC in Attachment C of the BCP Application.

Soil samples were collected from soil borings from depths and locations sufficient to characterize soil that was proposed to be excavated and removed during site construction from depths between 0 to 12 feet bgs and for an elevator pit to extend to 12 to 16 feet bgs.

Evidence of petroleum impacts including the presence of product and/or sheen and odor were encountered in soil at 5 of 22 soil boring locations at depths ranging from 6 to 12 feet bgs. These impacts were observed in the eastern portion of the Site, which was historically approved for automotive repair and fuel storage, and in the vicinity of the boiler room associated with the former steam laundry facility.

Laboratory analytical results are summarized in Table 1 of the 19 July 2019 Phase II Environmental Investigation Report (discussed below) and revealed elevated concentrations of semi volatile organic compounds (SVOCs) exceeding of the NYSDEC Restricted Use Soil Cleanup Objectives (RUSCOs) for Industrial Use including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Exceedances of the RUSCOs for Commercial Use were also detected for the SVOCs benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Exceedances of the RUSCOs for metals include mercury which was detected at a concentration exceeding the Industrial RUSCOs and barium which was detected at concentrations exceeding the Commercial RUSCOs.

1.6.4 **Phase II Environmental Investigation – Langan (2019)**

Langan conducted a Phase II environmental investigation at the Site in 2019. Results of the investigation were summarized in the 19 July 2019 Phase II Environmental Investigation Report which was submitted to NYSDEC in Attachment C of the BCP Application.

The investigation included installation of 13 soil borings, five flush-mount groundwater monitoring wells, four soil vapor sampling points, and collection of soil, groundwater, and soil vapor samples to assess potential
subsurface impacts associated with historical use of the Site as a laundry facility, potential automotive repair and gasoline station operations, and the presence of historic fill due to proximity to historical waterways.

Evidence of petroleum impacts were encountered in soil at 4 of 13 soil boring locations as evidenced by the presence of sheen, odor, LNAPL and elevated photoionization detector (PID) readings. These impacts were observed in the central-eastern portion of the Site within the footprint of former Lot 48, which was historically approved for automotive repair and associated fuel storage, and in the vicinity of the boiler room associated with the former steam laundry facility.

Analytical results of soil samples collected during the 2019 investigation are summarized in Table 2 and on Figure 4 of the Phase II Environmental Investigation Report and were compared to the Title 6 of the Official Compilation of New York Codes, Rules, and Regulations (6 NYCRR) NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) and RUSCOs. Soil analytical results were also compared to NYSDEC Commissioner’s Policy 51 (CP-51) Supplemental SCOs. Analytes detected above Restricted Use SCOs for Commercial Use are listed below.

Groundwater sample results are summarized in Table 3 and on Figure 5 of the Phase II Environmental Investigation Report and were compared to a combination of the 6 NYCRR Part 703.5 Class GA Groundwater Quality Standards and Division of Water Technical and Operational Guidance Series 1.1.1 (collectively referred to as Standards and Guidance Values, or SGVs) for Class GA water, and analytes detected above the regulatory criteria are also summarized below.

Soil vapor sample results are summarized in Table 4 and on Figure 6 of the Phase II Environmental Investigation Report and were evaluated using the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in New York State Soil Vapor/Indoor Air Decision Matrices dated October 2006 and updated May 2017; results are summarized below.
Soil:

Light Non-Aqueous Phase Liquid (LNAPL) was detected in four soil borings between 5 and 11.5 feet and within approximately 2 feet of the observed groundwater interface. Field screening was measured with a photoionization detector (PID) for total VOCs. Concentrations above background were observed in the four soil borings where LNAPL was observed at concentrations between 0.2 parts-per-million (ppm) and 50.5 ppm.

Five SVOCs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene were detected at concentrations above the Commercial and/or Industrial RUSCOs at six of the twelve soil boring locations. Metals arsenic and mercury were detected in soil samples at concentrations above the Commercial and/or Industrial RUSCOs at two of the twelve soil boring locations.

Groundwater:

LNAPL was detected at one groundwater monitoring well. A groundwater sample was not collected from this location. Due to the viscosity of the product, a thickness measurement could not be obtained. Sheen was observed during purging and/or sampling in two of the four groundwater monitoring wells sampled. PID readings at the monitoring well head were detected between 0.0 ppm and 1.5 ppm.

The VOC tert-butyl methyl ether was detected in one groundwater monitoring well at a concentration exceeding the SGVs.

Up to six SVOCs were detected in the four groundwater monitoring wells at concentrations exceeding the SGVs including benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene at all four groundwater monitoring wells, and benzo(b)fluoranthene, benzo(k)fluoranthene, and chrysene at one groundwater monitoring well. The metal lead was detected in one groundwater well at a concentration exceeding the SGVs.
Soil Vapor:

Soil vapor results identified elevated concentrations of petroleum-related VOCs including benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX) at cumulative concentrations that ranged from 39.446 microgram per cubic meter (µg/m$^3$) to 92.558 µg/m$^3$. Benzene was detected in three of the four soil vapor samples, while toluene, ethylbenzene, and xylenes were detected in all four soil vapor samples. Additional petroleum-related VOCs including 1,2,4-trimethylbenzene (13.6 µg/m$^3$–17.9 µg/m$^3$) and 1,3,5-trimethylbenzene (3.5 µg/m$^3$ – 3.75 µg/m$^3$) were also detected.

The chlorinated VOCs (CVOCs) tetrachloroethene (PCE) and 1,1,1-trichloroethane, which are included in the NYSDOH Final Guidance for Evaluation of Soil Vapor Intrusion Matrix B, were detected in soil vapor samples collected at the site. PCE was detected in all four soil vapor samples collected and 1,1,1-trichloroethane was detected in one soil vapor sample collected. PCE was detected at concentrations (189 µg/m$^3$ – 345 µg/m$^3$) above the recommended threshold for monitoring and/or mitigation identified in the NYSDOH Soil Vapor Intrusion Matrix B; 1,1,1-trichloroethane was not detected at concentrations above this threshold.

LNAPL:

Two petroleum identification (fingerprint) samples were collected and submitted for analysis. The product was determined to be a combination of material similar to Diesel Fuel/Fuel Oil #2 and material which is similar to a hydraulic, lubricating, motor, or waste oil type product.

Based on the observations of LNAPL during the Phase II Environmental Investigation, NYSDEC was notified of a release and Spill No. 1902392 was assigned on 6 June 2019.

Areas of Concern:

Based on the results of the 2019 Phase II Environmental Investigation, three Areas of Concern (AOCs) related to historical site operations were identified:
**AOC-1: Petroleum Impacts from Historical Site Operations**

Historic records indicate the adjacent property to the south was operated as an automotive repair garage and that these operations potentially included gasoline storage and automobile repair in the central-eastern portion of the Site. Additionally, historical records also identified that a steam laundry building with a large boiler room operated on the easternmost portion of the Site and that fuel oil use was historically approved for the entire Site.

Environmental investigation results of this AOC identified physical evidence of contamination including elevated PID readings, odors, and observations of LNAPL in soil at LSB-24, LSB-27, LSB-28, and LS-32 and depths between 5 and 11.5 feet bgs and on groundwater at LMW-5. A sheen was also observed on purged groundwater at LMW-1 and LMW-2. Laboratory analysis of the LNAPL determined the sample to be a combination of material similar to Diesel Fuel/Fuel Oil #2 and material which is similar to a hydraulic, lubricating, motor, or waste oil type product. Laboratory analytical results from soils samples also identified SVOCs including polycyclic aromatic hydrocarbons (PAHs) above the NYSDEC SCOs indicative of petroleum impacts and the presence of historic fill. PAHs detected in soil were also detected in groundwater above the NYSDEC SGVs.

Soil vapor results from within this area identified elevated concentrations of petroleum-related VOCs (BTEX). Additional petroleum-related VOCs including 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene were also detected.

**AOC-2: Chlorinated VOC Impacts from Historical Site Operations**

Historic operations included a laundry facility and automotive repair shop. In order to assess the potential for these historical operations to have adversely impacted environmental conditions at the Site, soil vapor sampling was completed and the laboratory analytical results identified that PCE was detected in all soil vapor samples collected at concentrations above the monitoring and/or mitigation threshold according to NYSDOH Soil Vapor Intrusion Matrix B.
AOC-3: Historical Filling Associated with the Harlem River

According to the 1874 Sanitary & Topographical Map of the City and Island of New York by Egbert L. Viele, the site is located within the historical extents of the Harlem River and consists of created land; as such, it is likely that the area was subject to historical filling using material of an unknown origin to raise grades. Soil borings and monitoring wells were advanced throughout the entirety of the Site to assess for the potential subsurface impacts from historical filling.

PAHs commonly associated with historic fill were detected at concentrations exceeding the Commercial and/or Industrial RUSCOs.

Conclusions

Based on the results of soil, groundwater, and soil vapor sampling completed during 2018 Environmental Waste Characterization and 2019 Phase II Environmental Investigations, petroleum impacts in soil, groundwater, and soil vapor and chlorinated VOC impacts in soil vapor were confirmed to be present in the subsurface which may be the result of historical Site uses as an automotive repair facility, gasoline station and a laundry facility. PAH and metal impacts in soil and groundwater are also likely the result of historical filling of the Site using material of an unknown origin to raise grades.

1.6.5 Remedial Investigation Work Plan – Langan (2020)

A Remedial Investigation Work Plan dated 3 June 2020 was prepared by Langan for 280 W 155 ST OWNER LLC. The RIWP was prepared to investigate and characterize “the nature and extent of the contamination at and/or emanating from the brownfield site” including the horizontal delineation of non-aqueous phase liquid (NAPL) within the southeastern portion of the Site documented in Langan’s 19 July 2019 Phase II Environmental Investigation Report and to evaluate potential exposure via soil vapor intrusion at the buildings immediately adjacent to the Site as indicated in the 24 April 2020 NYSDEC Draft RIWP Comment Letter.
The scope of work for the RI presented in the RIWP consisted of:

- A full geophysical survey throughout the Site;
- Advancement of 18 soil borings (LSB-36 through LSB-50 and LSB-52 through LSB-54) and collection of 38 soil samples (including two duplicate samples);
- Installation of four permanent monitoring wells (LMW-6 through LMW-9) and collection of 10 groundwater samples (including one duplicate sample) from LMW-1 through LMW-9;
- Survey and gauging of monitoring wells to evaluate groundwater elevation and flow directions; and,
- Installation of 14 soil vapor points (LSV-5 through LSV-18) and collection of 15 soil vapor samples (including one duplicate sample) and two ambient air samples.

The Remedial Investigation was completed between 27 August and 23 September 2020. Results of the RI will be presented in the forthcoming Remedial Investigation Report.

2.0 SUMMARY OF INTERIM REMEDIAL MEASURES

While the excavation required for the proposed development will be completed to a depth of 5 to 10 feet below current site grades, it is anticipated that excavation of up to 15 feet below current grades will be required to remove petroleum impacted material associated with NYSDEC Spill No. 1902392 in the central portion of the site as well as two hotspots identified during the Remedial Investigation (LSB-37 and LSB-39) which are impacted by elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) and metals above the Commercial Restricted Use Soil Cleanup Objectives (RUSCOs). This remediation is beyond the scope of this IRMWP and will be completed in accordance with the forthcoming RAWP subsequent to the IRM Site preparation activities.
This IRM Work Plan consists of the following tasks:

1. Monitoring well decommissioning;

2. Excavation and disposal of historic fill material impacted with VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals, to between 3 and 5 feet below ground surface (bgs) for the removal of historic fill impacted with SVOCs and metals above the Commercial and/or Industrial RUSCOs;

3. Installation of SOE along the perimeter of the site;

4. Drilling piles throughout the site as part of the initial foundation construction;

5. Continuous screening of soil/fill disturbed during site-wide excavation, installation of SOE, and drilling of piles;

6. Work Zone and Perimeter Air Monitoring for Dust, Vapor and Nuisance Odors; and,

7. Submission of a Construction Completion Report (CCR) documenting activities completed in accordance with this IRMWP.

In addition to the above activities, the following contingent measures have also been included in the event that these conditions are encountered during soil disturbance activities:

1. *Contingent* excavation and off-site disposal of grossly and/or petroleum-impacted soil identified during soil disturbance and/or in the vicinity of any unanticipated USTs;

2. *Contingent* excavation and removal of any unanticipated USTs encountered during soil disturbance activities; and,

3. *Contingent* collection of post-extraction soil end-point samples from any impacted soil removal areas or UST removal excavation areas in accordance with applicable NYSDEC regulations.

The IRM described herein will be performed in accordance with applicable federal, state, and city regulations. A construction health and safety plan (CHASP) is provided as Appendix A.
2.1 Objectives and Rationale

The objective of the IRM Work Plan is to provide appropriate measures to complete the initial foundation construction activities at the Site. These activities will include: site-wide excavation and off-site disposal of non-hazardous contaminated historic fill, installation of the SOE system, and drilling of piles for foundation construction within the parameters and requirements of the amended BCA. All activities that will result in soil disturbance will be completed in accordance with requirements of the Construction Health and Safety Plan (CHASP) and air monitoring requirements of Section 2.4.9 of this IRMWP, in a manner to prevent exposure of potential impacts to site workers and the surrounding community.

2.2 Interim Remedial Measures Program

2.2.1 Monitoring Well Decommissioning

Immediately prior to the initiation of site foundation construction activities to be performed as part of this IRM, all existing groundwater monitoring wells will be properly decommissioned in accordance with NYSDEC policy CP-43 Groundwater Monitoring Well Decommissioning Policy or during the excavation described in Section 2.2.3.

2.2.2 Site Preparation

Site preparation will be completed by the Contractor prior to the implementation of the IRM and will include, but not be limited to, the establishment of work zones, mobilization of support facilities, construction of decontamination facilities, and implementation of site security measures (i.e., erection of security fencing around the Site and staging areas). The Contractor will maintain soil erosion control and sediment control measures prior to and during work operations described in the IRMWP.

The Contractor will ensure that all necessary permits are obtained prior to the commencement of any task included in the proposed IRM.

Prior to intrusive activities, Dig Safely New York (811) will be contacted by the Contractor a minimum of three business days in advance of the work.
Dig Safely New York will be informed of the nature of the work and the intent to excavate at the Site.

### 2.2.3 Site-Wide Excavation and Disposal

The Site will be excavated up to a depth of 3 feet bgs across the entire Site footprint and up to 5 feet bgs within the cellar extents for the removal and off-site disposal of historic fill impacted with SVOCs and metals above the Commercial and/or Industrial RUSCO and to facilitate construction of the SOE and provide a working platform for pile drilling activities. Excavation during the IRM will include partial removal of two shallow hotspots identified during the Remedial Investigation (LSB-36 and LSB-40) which are impacted by elevated concentrations of PAHs and metals above the Commercial Restricted Use Soil Cleanup Objectives (RUSCOs). Full excavation and off-site disposal of these hotspots and subsequent endpoint soil sample collection will be implemented under the forthcoming RAWP.

Investigation and delineation of the horizontal and vertical extents of LNAPL revealed the presence of LNAPL to be shallower than 5 feet bgs in one soil boring (LSB-28) located within the footprint of the future cellar area; this area of the Site will only be excavated to 3 feet bgs to prevent exposure of grossly contaminated material during the IRM. Excavation extents and the delineated extents of LNAPL based on previous investigations and the findings of the RI are presented on Figure 2.

According to environmental and geotechnical investigations completed by Langan between 2018 and 2020, the subsurface strata beneath the Site consists of historic fill that is comprised of fine to coarse sand with varying proportions of silt and gravel and miscellaneous debris, including brick, wood, asphalt, plastic, and metal to depths that ranged from 12 to 25 feet below grade. The estimated volume of historic fill to be removed during the IRM is approximately 6,000 cubic yards.

Excavation will be conducted using conventional hydraulic excavation equipment. Excavated soil will be screened with a PID equipped with a 10.6 electron-volt (eV) lamp. If grossly-impacted soil is observed, it will be segregated for separate stockpiling, handling, and disposal. Soil/ fill that is
not reused will be disposed of at an off-Site permitted disposal facility capable of receiving this type of solid waste and transported by 6 NYCRR Part 364-permitted waste haulers. Proposed disposal facility documentation will be presented to the NYSDEC prior to disposal activities.

2.2.4 Installation of Support-of-Excavation

A SOE consisting of drilled piles and timber lagging on the northern, eastern, and southern boundaries of the future cellar extents will be installed as part of the IRM. SOE for construction of the western cellar boundary will consist of bermed soil. Support of excavation drawings are provided in Appendix B. Soil that is disturbed during SOE installation will be managed in accordance with the soils/materials management procedures detailed in Section 2.4 of this work plan.

2.2.5 Drilling Piles for Foundation Construction

The foundation of the future building will serve as part of the final remedy as an element of the site-wide cover system. Prior to the excavation of the Site down to development depth for the construction of foundation elements, piles will be drilled into the ground to provide foundation support. Foundation drawings showing pile locations are provided in Appendix B. Soil that is disturbed while drilling piles will be managed in accordance with the soils/materials management procedures detailed in Section 2.4 of this Work Plan.

2.2.6 Documentation Sampling

If grossly and/or petroleum-impacted materials are encountered during IRM excavation or a UST is encountered/removed, post-excision soil samples will be collected in accordance with the requirements of CP-51. Specifically, sidewall samples will be collected at a frequency of one per 30 liner-feet of excavation and one base sample per 900 square-feet of excavation area. For any excavation area where documentation soil sampling is required no less than five samples (four sidewall samples and one base sample) will be collected plus required quality assurance/quality control (QA/QC) samples.
Documentation samples will be collected from areas with the greatest apparent contamination as evidenced by odors, staining, and/or PID readings.

Samples will be analyzed for CP-51 List VOCs and SVOCs and compared to the CP-51 Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils or Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil and the 6 NYCRR Part 375-6.8(a) Unrestricted Use SCOs, depending on the contents of the USTs. A Quality Assurance Project Plan is included as Appendix C.

2.3 Interim Remedial Measures Oversight

The Remediation Engineer (RE), Satyajit Vaidya, P.E. of Langan, will oversee implementation of the IRM. The RE is responsible for documenting that the activities completed as part of this IRM Work Plan are performed in accordance with their intended objectives. The documentation collected will be provided to the NYSDEC as part of the Construction Completion Report (CCR) described below in Section 3.2. A field engineer/scientist/geologist, under the supervision of the RE, will provide full-time oversight during initial foundation construction activities that will result in soil disturbance as part of the implementation of the IRM Work Plan. Work conducted in accordance with this IRM Work Plan will be properly documented in daily field reports, monthly BCP progress reports, and in the CCR.

2.4 Soil/Materials Management

Soil/materials management activities specific to the handling as well as transportation/disposal materials generated during IRMWP are described in this section. A Langan representative will monitor and document handling of material exported from the Site that is transported and disposed of in accordance with applicable laws and regulations. Excavated material will be screened by visual and olfactory methods and with a PID, to identify if soil is impacted with VOCs. Excavated material will be stockpiled onsite. Excavation extents included in this Work Plan have been selected to prevent encountering and exposing grossly impacted material associated with Spill No. 1902392. Remediation of LNAPL will be completed as part of the final remedy and will be included in the forthcoming RAWP.
It is reasonably anticipated that historic fill impacted with VOCs, SVOCs, pesticides, PCBs, and metals above Unrestricted Use, Restricted Use SCO for Commercial Use, and/or Restricted Use SCO for Industrial Use will be encountered during IRM activities. Historic fill material and petroleum impacted material, if encountered, will be managed separately to avoid comingling.

### 2.4.1 Soil Screening Methods

Visual, olfactory, and instrumental soil screening will be performed using a PID equipped with a 10.6 electron volt (eV) bulb that will be calibrated daily. Soil screening will take place during excavation and invasive work performed as part of the interim remedy and development-related construction including, but not limited to, excavating for remediation, SOE installation, foundation construction, and utility work. Visibly impacted material will be segregated and placed on polyethylene sheeting for off-Site disposal.

### 2.4.2 Soil Stockpiles

Stockpiles will be constructed as necessary to separate and stage excavated material pending loading or characterization sampling. Stockpile areas will meet the following minimum requirements:

- Separate stockpile areas will be constructed to avoid comingling materials of differing waste types. If stockpiles must be staged in an area of the Site that is characterized as a different waste type, stockpiles will be placed onto a minimum thickness of 6 mil low-permeability liner of sufficient strength and thickness to prevent puncture during use; separate stockpiles will be created where material types are different (e.g., petroleum-impacted material stockpiled in a contaminated soil area). The use of multiple layers of thinner liners is permissible.

- Equipment and procedures will be used to place and remove the soil that will minimize the potential to jeopardize the integrity of the liner;

- Stockpiles will be covered upon reaching their capacity (i.e., about 1,000 cubic yards) until ready for loading. Stockpiles that have not
reached their capacity, whether active or inactive, will be covered at the end of each workday.

- Stockpiles at or above sidewalk grade will be encircled with silt fences and hay bales, as needed, to contain and filter particulates from any rainwater that has drained off the soils and to mitigate the potential for surface water run-off;

- Stockpiles will be inspected at a minimum once each week and after every storm event and any deficiencies will be promptly addressed – any damaged tarps or coverings will be promptly replaced; and,

- Results of inspections will be recorded in a logbook to be maintained at the Site and made available for inspection by NYSDEC upon request.

2.4.3 Material Excavation and Load Out

The Volunteer and its contractors are solely responsible for safe execution of ground-intrusive and other remedial work performed under this IRMWP. The Volunteer and its contractors are solely responsible for the identification of utilities and/or easements that might be affected by the work conducted under this IRMWP.

Loaded vehicles leaving the Site will be appropriately lined (as needed), securely covered, manifested, and placarded in accordance with the appropriate federal, state, and local requirements, including applicable transportation requirements (i.e., New York State Department of Transportation [NYSDOT] and NYCDOT requirements). Trucks hauling historic fill material will not be lined unless free liquids are present or the material is grossly impacted.

Additionally, the Volunteer and its contractor will set up an outbound-truck inspection station close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and clean water will be utilized for the removal of soil from vehicles and equipment, as necessary.
Measures will be taken to ensure that all egress points for truck and equipment transport from the site will be kept clean of project related soils, fill and debris. Locations where vehicles enter or exit the Site will be inspected daily for evidence of off-Site sediment tracking.

The Volunteer and associated parties preparing the remedial documents submitted to New York State, and the parties performing this work, are responsible for the safe performance of ground-intrusive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this IRMWP.

Mechanical processing of historic fill and contaminated soil on-Site is prohibited unless otherwise approved by NYSDEC.

Primary contaminant sources (including, but not limited to, tanks and hotspots) identified during Site characterization, the RI, and implementation of the remedy will be located via field measurements to the nearest permanent structures or property lines. The information will be shown on maps to be included with the CCR.

UST removal contractors (if necessary) will provide the appropriate permits, certifications, and written commitments from disposal facilities to accept the material generated from the UST removal contingency included in this IRM.

### 2.4.4 Material Transport Off-Site

Non-hazardous, impacted material and petroleum-impacted material (if encountered outside of the delineated LNAPL impacted area) will be handled, transported and disposed by a licensed hauler in accordance with applicable 6 NYCRR Part 360, General Provisions and 6 NYCRR Part 364, Waste Transporter Permits regulations and other applicable federal, state and local regulations. The trucking entrance will be
determined prior to the initiation of the remedy. All trucks loaded with Site materials exit the vicinity of the Site using only approved truck routes.

Truck routes are shown on Figure 3. Trucks will be prohibited from excessive stopping and idling in the neighborhood outside of the Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during remediation and development.

To the extent possible, queuing of trucks will be performed on-Site in order to minimize off-Site disturbance. Off-Site queuing will be minimized.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

2.4.5 Material Off-Site Disposal

A waste characterization study was performed for soil intended for off-Site disposal. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC results will be reported in the CCR. Data available for excavated material to be disposed of at a given facility will be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

Disposal facilities will be determined at a later date and will be reported to the NYSDEC Project Manager prior to off-Site transport and disposal of excavated material. Soil/fill/solid waste excavated and removed from the Site will be handled, transported and disposed in accordance with local, State (including 6 NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC’s Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.
The following documentation will be obtained and reported by the RE for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms to applicable laws:

a. A letter from the RE or BCP Volunteer to the receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The letter will provide the project identity and the name and phone number of the RE. The letter will include as an attachment a summary of all chemical data for the material being transported (including waste characterization data).

b. A letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.

These documents will be included in the CCR.

Non-hazardous historic fill material and contaminated soil transported off-Site will be handled, at a minimum, as a solid waste per 6 NYCRR Part 360. Historic fill and contaminated soil excavated from the Site are prohibited from being disposed of at Part 360 Registration Facilities (also known as Soil Recycling Facilities).

Soil that is contaminated but non-hazardous and is being removed from the Site may be sent to a permitted Part 360 landfill. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility.

The CCR will include an accounting of the destination of material removed from the Site during implementation of the remedy, including excavated soil, contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of each material type must also include records and approvals for receipt of the material. This information will also be presented in a table to be included in the CCR.
A “Bill of Lading” system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the CCR. Hazardous wastes derived from the Site, if any, will be stored, transported, and disposed of in compliance with applicable local, state, and federal regulations.

Appropriately licensed haulers, in compliance with applicable local, state, and federal regulations, will be used to transport the material removed from this Site.

2.5 Contingent IRM Work Plan Activities

The potential exists that unforeseen structures or impacts that would require immediate action by the RE may be encountered during implementation of the IRM. In order to address this potential, the following section provides contingency measures for addressing petroleum impacted or otherwise grossly impacted material and USTs should they be encountered during soil disturbance activities.

2.5.1 Petroleum and/or Grossly-Impacted Soil Removal

Based on currently available information for the Site, petroleum and/or grossly-impacted material (i.e., areas of heavily stained and/or odorous soil observed during soil disturbance activities) is not anticipated to be encountered outside of the delineated LNAPL impacted area during the IRM activities. However, should this material be identified outside of the LNAPL impacted area as determined by the above soil screening, it will either be excavated to the extent necessary to remove the impacted material or, should the impacts be determined to not provide a significant threat to human health or the environment, the location of any impacted material will be properly documented to allow for inclusion in the forthcoming remedial action. Grossly-impacted soil that cannot be removed due to structural concerns or other impediments will be further investigated during the forthcoming remedial action in accordance with the approved remedial action work plan. Any grossly impacted materials will be segregated, stockpiled and properly characterized prior to off-site disposal.
If required and to the extents possible, during removal of any petroleum and/or grossly-impacted materials, the excavation areas will be screened and inspected for the presence of impacts to the surrounding soils using a photoionization detector (PID). The QEP will determine when the extents of these impacts have been properly removed based on screening results and will complete documentation sampling in accordance with the requirements defined in Section 2.2.8. As groundwater was determined to be located between approximately 7 and 9 below ground surface, contingent measures for the interim remediation of petroleum impacted groundwater are provided in Section 2.4.8.

### 2.5.2 Underground Storage Tank (UST) Removal Contingency Plan

While it is not anticipated that these USTs will be encountered during IRM activities, if they are encountered or grossly impacted soil is encountered that may be associated with tanks at the Site, their removal and closure may be necessary. If so, removal of the tanks and impacted soil will be completed in accordance with NYSDEC CP-51 Soil Cleanup Guidance and other applicable NYSDEC UST closure requirements.

During UST removal all excavation areas will be screened and inspected for the presence of petroleum-impacts to the surrounding soils. Any petroleum-impacted materials encountered during UST removal activities will be addressed in accordance with the measures identified in Section 2.4.6.

Following removal of any UST(s), affidavits of closure will be submitted to the FDNY, and PBS registration/de-registration applications will be submitted to NYSDEC.

### 2.5.3 Waste Liquid Management

During previous environmental investigations, groundwater was observed at depths ranging from 6 to 10 feet bgs. IRM excavation will not occur to these depths. If needed, liquids to be removed from the Site, including stormwater and dewatering fluids, will be handled, transported and disposed of in accordance with applicable local, state, and federal regulations. Discharge of liquids into the New York City sewer system will
be addressed through an approved NYCDEP permit and conform to pretreatment stipulations of that permit. Dewatering fluids not suitable for discharge to the NYCDEP sewer system may be collected, characterized, and managed off-site.

Untreated dewatering fluids will not be recharged back to the land surface or subsurface of the Site.

### 2.5.4 Community Air Monitoring Plan

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below.

The CAMP will include real-time monitoring for VOCs and particulates at the downwind perimeter of each designated work area when ground-intrusive work is in progress. Continuous monitoring will be required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, soil/fill excavation and handling and utility trenching. Periodic monitoring for VOCs may be required during non-intrusive work such as the collection of soil samples. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location and taking a reading prior to leaving a sample location.

CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a field engineer, scientist, or geologist under the supervision of the RE. The work zone is defined as the general area in which machinery is operating in support of remediation. A portable PID will be used to monitor the work zone and for periodic monitoring of total VOC levels during work such as soil sampling. The Site perimeter will be visually monitored for fugitive dust emissions.

The following actions will be taken based on total VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at the perimeter, work will be temporarily halted
and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work will resume with continued monitoring.

- If total VOC levels at the downwind perimeter of the work zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work will resume provided that the total VOC level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.

- If the total VOC level is above 25 ppm at the perimeter of the hot zone, work will be shut down.

The following actions will be taken based on dust levels measured or visual dust observations:

- If the downwind particulate level is 100 µg/m³ greater than background level for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression must be employed. Work may continue with dust suppression techniques provided that downwind PM10 levels do not exceed 150 µg/m³ above the background level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM10 levels are greater than 150 µg/m³ above the background level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM10 concentration to within 150 µg/m³ of the background level and in preventing visible dust migration.
Sustained concentrations of VOCs or PM10 will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind and work zone CAMP stations will be included in the daily report.

2.5.5 Dust, Vapor and Nuisance Odor Control Plan

Dust, odor, and nuisance control will be accomplished by the remediation contractor as described in this section.

2.5.5.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors off-Site. Specific odor control methods to be used on a routine basis (if needed) will include application of foam suppressants or tarps over the odor or VOC source areas, if encountered. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteers’ RE, who is responsible for certifying the Final Engineering Report (FER). Application of odor controls is the responsibility of the Remedial Contractor.

All necessary means will be employed to prevent on- and off-Site nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using non-PFAS foams to cover exposed odorous soils or PFAS containing foams that will be remediated immediately after use. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (a) direct load-out of soils to trucks for off-Site disposal; (b) use of chemical odorants in spray or misting systems; and, (c) use of staff to monitor odors in surrounding neighborhoods.

Although not anticipated, where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to on-Site conditions or close
proximity to sensitive receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

2.5.5.2 Dust Control Plan

A dust suppression plan that addresses dust management during ground-intrusive on-Site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated water distribution system or on-Site water truck for road wetting, or an alternate source with suitable supply and pressure for use in dust control.

- Stockpiles shall be maintained in accordance with Section 2.4.2.

- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-Site roads will be limited in total area to minimize the area required for water spraying.

2.5.5.3 Other Nuisances

A plan for rodent control will be developed and used by the remediation contractor during Site preparation (including clearing and grubbing) and during remedial work.

A plan for noise control will be developed and used by the remediation contractor during Site preparation and remedial work and will conform, at a minimum, to the NYCDEP noise control standards and the requirements of the Restrictive Declaration.

In addition to all of these controls, the Site will be subject to a Restrictive Declaration including traffic, noise, dust and air emission requirements and controls upon the financial closing.
2.6 Construction Health and Safety Plan

The RE prepared a site-specific CHASP for the IRM, which is included as Appendix A. The CHASP provides a mechanism for establishing on-site safe working conditions, safety organization, procedures, and personal protective equipment (PPE) requirements. The CHASP meets the requirements of 29 CFR 1910 and 29 CFR 1926 (which includes 29 CFR 1910.120 and 29 CFR 1926.65). The CHASP includes, but is not limited to, the following components listed below:

- Organization and Identification of key personnel;
- Training requirements;
- Medical surveillance requirements;
- List of site hazards;
- Excavation safety;
- Work zone descriptions and monitoring procedures;
- Personal safety equipment and protective clothing requirements;
- Decontamination requirements;
- Standard operating procedures;
- Contingency Plan; and
- Material Safety Data Sheets.

2.7 Notification

The NYSDEC will be notified at least 10 days prior to commencement of IRM-related work. A preconstruction meeting will be coordinated between the RE, the Remediation Contractor, and the NYSDEC. This meeting must be coordinated prior to the implementation of this IRM Work Plan.

3.0 REPORTING

Upon completion of the IRM, a CCR will be prepared and submitted to the NYSDEC. The RE responsible for certifying all reports will be an individual licensed to practice engineering in the State of New York. Satyajit Vaidya, P.E. of Langan will have this responsibility. Should Mr. Vaidya become unable to fulfill this responsibility, another suitably qualified New York State professional engineer will take his place. All project
reports will be submitted to the NYSDEC electronically as PDFs. Laboratory analytical data for documentation samples will be submitted in an electronic data deliverable (EDD) format that complies with the NYSDEC’s electronic data warehouse standards.

3.1 Daily Reports

Daily reports will be prepared for the project file and for review by the NYSDEC and NYSDOH Project Managers by the end of each day. Daily reports will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and remediation waste exported from the site;
- References to map for site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP results, including STEL exceedances; and,
- An explanation of notable site conditions.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the IRM Work Plan or other sensitive or time critical information; however, such conditions will also be included in the daily reports. Emergency conditions and changes to the IRM Work Plan will be addressed directly to the NYSDEC Project Manager via personal communication. If site conditions warrant, the RE may request to change from daily to weekly reports that include the above information.

3.2 Construction Completion Report

A CCR will be submitted to the NYSDEC Project Managers within 120 days of completing the interim remedial action. The CCR will document the implementation of the IRM. The CCR will be incorporated into and referenced in the FER for the site when issued. The CCR will provide the following information:
1. The RE will certify that:
   a. The remedial work conformed to the IRM Work Plan;
   b. Dust, odor, and vapor control measures were implemented during invasive work and conformed with the IRM Work Plan with any deviations noted in the report; and
   c. Remediation waste was transported and disposed in accordance with the IRM Work Plan.

2. Description of any problems encountered and their resolutions;

3. Description of changes in the IRM from the elements provided in the IRM Work Plan and associated design documents and the reasons for them;

4. Description of the deviations from the approved IRM Work Plan;

5. Listing of waste streams, quantity of materials disposed, and where they were disposed;

6. List of the remediation standards applied to the remedial actions;

7. Documentation NYSDEC Petroleum Bulk Storage PBS database registry and closure;

8. Affidavits of closure submitted to FDNY for all USTs;

9. A summary of all residual impacted material left on the site;

10. A tabular summary of all sampling results and all material characterization results and other sampling and chemical analysis performed as part of the IRM;

11. Written and photographic documentation of all work performed under this Work Plan;

12. Copies of all the submitted progress reports;
13. Certifications, manifests, and bills of lading for excavated materials transported off-site;

14. An accounting of the destination of all material removed from the site, including excavated impacted soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids; and,

15. Documentation associated with disposal of all material must also include records and approvals for receipt of the material.

### 4.0 SCHEDULE

The table below presents an estimated schedule for the proposed IRM and reporting. If the schedule changes, it will be updated and submitted to NYSDEC.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Months (following approval of IRMWP)</th>
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<tr>
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<td>1</td>
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<tr>
<td>Monitoring Well Decommissioning</td>
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<td>Site-Wide Excavation and Disposal</td>
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<td>Installation of Support-of-Excavation</td>
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<td>Drilling Piles for Foundation Construction</td>
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<tr>
<td>Preparation and Submission of CCR</td>
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FIGURES
Notes:
1. TRUS Topographic basemap provided through Langan's subscription to Esri's ArcGIS and ArcOnline services, 2019.
2. Parcel boundaries obtained from Map Pluto 20v1, provided by the NYC Department of Planning, last updated 2020.
**Legend**

- **Site Boundary**
- **Extents of excavation to a depth of 3 feet below street level to prevent exposure to shallow LNAPL impacts**
- **Extents of excavation to a depth of 3 feet below street level**
- **Extents of excavation to a depth of 5 feet below street level (Future Cellar Extents)**
- **Partial Excavation to 4 feet below ground surface for remediation of PAHs and metals (LSB-36)**
- **Partial Excavation to 4 feet bgs for remediation of metals (LSB-40)**
- **AOC-1: Petroleum Impacts from Former Boiler Room**

**Notes:**


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**Project Title:** INTERIM REMEDIAL MEASURES EXCAVATION EXTENTS

**Project No.:** 100765102

**Date:** 5/5/2021

**Scale:** 1" = 30'
Directions:
1. Head Northwest on Frederick Douglass Boulevard.
2. Take the ramp onto Harlem River Drive.
3. Take Exit 24 to I-95 South toward George Washington Bridge.
4. Keep left at the fork, follow signs for I-95 South/ George Washington Bridge.
5. Continue on to George Washington Bridge.
APPENDIX A

Construction Health and Safety Plan
CONSTRUCTION HEALTH AND SAFETY PLAN

for

280 WEST 155TH STREET DEVELOPMENT
NEW YORK, NEW YORK
NYSDEC BCP No. C231138

Prepared For:

280 W 155TH STREET OWNER, L.L.C.
c/o 299 Park Avenue, 35th Floor
New York, New York 10171

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

December 2020
100765102
ENVIRONMENTAL HEALTH AND SAFETY PLAN

Client: 280 W 155TH STREET OWNER, L.L.C

Project: Environmental Oversight During Excavation

Location: 280 West 155th Street, New York, NY


Prepared By: Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.

Version: 1

Date: December 2020

Client Contact: Pavit Sabharwal (516) 624-9502
Langan Project Manager (PM): Amanda Forsburg (973) 560-4900
Langan Health & Safety Manager (HSM): Tony Moffa, CHMM (215) 491-6545
Langan Health and Safety Officer (HSO): Field Personnel
Langan Incident/Injury Hotline: 1-800-952-6426 or (973) 560-4699

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APPROVALS

By signature, the personnel identified below hereby acknowledge that they have reviewed this Construction Health and Safely Plan (CHASP) and agree to comply with the requirements contained therein as well as the applicable provisions of 29 CFR Parts 1910 and 1926. The undersigned also acknowledge and accept that this CHASP is the project CHASP for the site work described in the Remedial Action Plan (RAP). Furthermore, in reviewing and accepting this CHASP, as currently written, the undersigned agree that to the best of their knowledge, this CHASP adequately identifies the activities and hazards associated with work at this site and describes the appropriate and necessary precautions and protections for site workers required by the applicable OSHA statutes and regulations.

LANGAN Project Manager - PM (Amanda Forsburg) 12/2/2020

LANGAN Health and Safety Manager (Tony Moffa, CHMM) Date

LANGAN Health and Safety Officer – HSO Date
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NJ Certificate of Authorization No. 24GA27996400
1.0 INTRODUCTION

1.1 Purpose and Policy

This Construction Health and Safety Plan (CHASP) has been developed to comply with the regulations under Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120(b)(4), Hazardous Waste Operations and Emergency Response. It addresses foreseeable activities associated with the site work activities to be conducted at the 280 West 155th Street proposed development site which is located at 280 West 155th Street (Block 2050, Lot 48) in New York, New York (see Figure 1). This CHASP establishes personnel protection standards and mandatory safety practices and procedures. Additionally, it assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

Langan personnel involved with inspection of site work activities which involve the displacement of soil and/or material or dewatering of excavations during the proposed development shall comply with the requirements of this CHASP. All Langan personnel engaged in onsite activities will read this document carefully and complete the Safety Briefing Form (Attachment A), a copy of which will be provided to Langan’s Project files. Contractors and subcontractors conducting construction-related activities which will disturb or displace soil in the identified AOC are required to develop and follow their own HASP which must be equal or more stringent than the Langan CHASP. Contractors and subcontractors are responsible for their own workers Health and Safety and providing a safe working environment in accordance with all applicable federal, state and local requirements. Each Subcontractor will have a designated Site Health and Safety Manager who will be responsible for ensuring that the designated procedures are implemented in the field. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the Langan Project Manager. Field personnel must follow the designated health and safety procedures, be alert to the hazards associated with working close to vehicles and equipment, and use common sense and exercise reasonable caution at all times.
This CHASP covers construction related field activities which have the potential to disturb and/or displace contaminated fill material, petroleum impacted material that may be encountered around potential USTs, and previously identified historic fill material containing elevated levels of VOCs, SVOCs, PCBs, pesticides, PFAS, and metals. These activities include, but are not limited to monitoring well decommissioning, excavation, moving and grading of the historic fill material, drilling support of excavation and foundation piles, excavation/handling of petroleum impacted material within the vicinity of the UST(s), if encountered, and soil sample collection, as needed.

This CHASP was prepared in accordance with the following documents and/or guidelines:

- Occupational Safety and Health Administration (OSHA) regulations for hazardous site workers (29 CFR 1910.120 and 29 CFR 1926); and,

Langan’s Health and Safety Program and Safe Operating Procedures support this site-specific CHASP.

The level of protection and the procedures specified in this CHASP represent the minimum health and safety requirements to be observed by site personnel engaged in the referenced oversight of construction related activities. Unknown conditions may exist, and known conditions may change. Should an employee find himself or herself in a potentially hazardous situation, the employee will immediately discontinue the hazardous procedures(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Health and Safety Officer or the Langan Project Manager of the nature of the hazard. In the event of an immediately dangerous or life-threatening situation, the employee always has "stop work" authority. Any necessary revision to the Health and Safety procedures will be recorded in the Field Procedure Change Authorization Form (Attachment B), and will require authorization from the Langan Health and Safety Officer and Project Manager.
THE ULTIMATE RESPONSIBILITY FOR THE HEALTH AND SAFETY OF THE INDIVIDUAL EMPLOYEE RESTS WITH THE EMPLOYEE AND HIS OR HER COLLEAGUES. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above and to follow-up the verbal notification by completing the Unsafe Conditions and Practices Form provided in Attachment C, a copy of which will be provided to the Langan Health and Safety Officer.

"Extenuating" circumstances such as budget or time constraints, equipment breakdown, changing or unexpected conditions, never justify unsafe work practices or procedures. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. ALL SITE PERSONNEL ARE EXPECTED TO CONSIDER "SAFETY FIRST" AT ALL TIMES.

1.2 Site Descriptions

The approximately 37,500-square feet Site is located at 280 West 155th Street in the Harlem neighborhood of Manhattan, New York, and is identified as Block 2040 and Lot 48 (former Lots 48, 61, and 62) on the New York City (NYC) Tax Map. The Site is currently an at-grade asphalt paved parking lot and has been used as a parking lot since 1996. The Site is bound to the north by West 155th Street and the elevated 155th Street Viaduct associated with the Macomb’s Dam Bridge followed by Holcombe Rucker Park; an asphalt-paved parking lot to the east; two single-story commercial/industrial buildings including a Toyota Automotive Repair facility and Ferguson Plumbing Supply store, two four-story mixed-use residential/commercial buildings, and two four- to six-story residential buildings to the south; and by Frederick Douglass Boulevard followed by a two-story mixed-use residential/commercial building to the west. The Site is located within a commercial zoning district (C8-3) and is currently designated for garage/gas station use (G6) by the New York City Department of Finance.
1.3 Scope of Work

The site work activities which will require the oversight by Langan personnel include the following tasks:

- Task 1 – Monitoring well decommissioning;
- Task 2 – Excavation and moving/grading of historic fill material;
- Task 3 – Drilling support of excavation and foundation piles;
- Task 4 – Excavation/handling of petroleum impacted material within the vicinity of USTs, if encountered; and,
- Task 5 - Soil sample collection, as needed.

Details of the scopes of work to be completed in each of the work areas for this project are provided within the December 2020 Interim Remedial Measures Work Plan (IRWMP). Remediation of the remainder of the site will be completed in accordance with the requirements of the forthcoming Remedial Action Work Plan (RAWP).

The Site is proposed to be developed with a 3-story self-storage building with a cellar level. The cellar and first floor will occupy approximately 32,000-square-feet and 26,000-square-feet, respectively, of the approximate 37,500-square-foot property. The remaining site area will generally be utilized as at-grade parking.

During implementation of the scope of work included in the December 2020 IRMWP, all soils excavated or disturbed at the site will be screened for evidence of impacts associated with historical site use, the presence of USTs, or historic fill. Excavated materials exhibiting evidence of impacts will be transported off site for disposal at an approved facility. Personnel conducting activities that will contact the impacted historic fill, petroleum impacted material or impacted groundwater shall abide to the provisions of this CHASP.
2.0 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

This section specifies the Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) Project Organization.

2.1 Langan Project Manager

The Langan Project Manager (PM) is Amanda Forsburg. The PM responsibilities include:

Responsibilities:

- Prepares and organizes the background review of site conditions, the site HASP, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Briefs the field team on their specific assignments.
- Coordinates with the Health and Safety Officer (HSO) to ensure that health and safety requirements are met.
- Serves as the liaison with public officials.
- Ensuring that this HASP is developed and approved prior to on-site activities.
- Ensuring that all the tasks in the project are performed in a manner consistent with Langan’s comprehensive Health and Safety Program for Hazardous Waste Operations and this HASP.

2.2 Health and Safety Manager (HSM)

The Langan Corporate Health and Safety Manager (HSM) is Tony Moffa. His responsibilities include:

- Serving as a resource in the development and implementation of HASPs;
- Assist in reviewing results of Jobsite Safety Inspections;
- Assisting site Health and Safety Officer (HSO) with development of the HASP, updating HASP as dictated by changing conditions, jobsite inspection results, etc.;
- Maintaining all records on personnel (medical evaluation results, training and certifications, accident investigation results, etc.).
2.3 **Health and Safety Officer (HSO)**

The Langan Health and Safety Officer (HSO) will be identified prior to the start of field work. The HSO responsibilities include:

- Participating in the development and implementation of this HASP;
- Conducting Jobsite Safety Inspections (Attachment H) and correcting any shortcomings in a timely manner;
- Helping to select proper PPE (Personal Protective Equipment) and periodically inspecting it;
- Ensuring that PPE is properly stored and maintained;
- Controlling entry into and exit from the contaminated areas or zones of the site;
- Confirming each team member’s suitability for work based on a current physician’s recommendation;
- Monitoring the work parties for signs of stress, such as heat stress, fatigue, and cold exposure;
- Monitoring site hazards and conditions;
- Knowing (and ensuring that all site personnel also know) emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Resolving conflicting situations which may arise concerning safety requirements and working conditions.
- Conducting daily tailgate meetings to review applicable JSAs as well as check-in with site personnel.
- Reporting any health and safety concerns during implementation of the tasks listed above to the Langan Project Manager and the Engineer of Record for the IRMWP.

3.0 **HAZARDS ANALYSIS**

This section presents all assessment of the general, chemical, physical and biological hazards that may be encountered during the tasks specified under this CHASP (Section 1.3). A detail on types of potential contaminants of concern Langan anticipates to encounter at different locations during implementation of the IRMWP is listed in Tables 1 and 2 of this CHASP.
3.1  General Hazard Assessment

A general hazard assessment was conducted for the required field work described in Section 1.3 and the following potential hazards have been identified:

- Inhalation of volatile contaminants;
- Skin and eye contact with contaminants;
- Ingestion of contaminants;
- Inhalation of dusts impacted with SVOCs and metals;
- Physical hazards associated with the use of heavy equipment;
- Excavation hazards;
- Tripping hazards;
- Noise exposure;
- Heat stress (depending on weather conditions);
- Cold exposure (depending on weather conditions);
- Flammable hazards;
- Electrical hazards; and,
- Use of personal protective equipment.

These hazards are further described in the task-by-task hazard analysis in Table 3. Specific chemical, physical and biological hazards are discussed below.

Mitigation and controls will include as needed work procedures, work/rest regiment, dust control measures, personal protective equipment, and respiratory protection as appropriate.

3.2  Chemical Exposure Hazards

The following chemical hazard evaluation for the proposed site development activities is based on the previous environmental investigation of the site. The evaluation has been conducted to identify chemicals/materials that potentially may be present at the site, and to ensure that work activities, personnel protection, and emergency response are consistent with the specific contaminants that potentially could be encountered.
3.2.1 Specific Chemical Hazards Previously Detected at the Site

Impacted fill material has been identified on the subject property as reported in the Environmental Soil Pre-Characterization Results Letter both prepared by Langan dated 2 July 2019 and the Phase II Environmental Investigation prepared by Langan dated 19 July 2019. These investigations identified non-hazardous contaminated historic fill with non-aqueous phase liquid (NAPL) as well as elevated concentrations of VOCs, SVOCs, PCBs, pesticides, and metals.

3.2.2 Chemical Hazard Exposure Routes

Potential hazards and their exposure routes include:

- Inhalation of organic vapors due to the presence of volatile organic compounds in soil, groundwater, or soil vapor and from diesel-powered equipment and minimal volatilization potential related to the presence of SVOCs in soil.

- Inhalation of dust impacted with SVOCs, pesticides, PCBs, and metals associated with excavation/soil disturbance or soil sampling activity.

- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials such as metals.

- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) SVOCs.

- Skin and eye contact with contaminants at the site and decontamination activities.

Exposure limits and health effects of selected chemicals are in Table 2. The probability of exposure for each task is outlined in Table 3.
3.2.3 Control of Exposure to Chemical Hazards

To protect potentially exposed personnel the following procedures and protocols will be adopted and used as needed: work procedures will be adhered to, work zones will be established, dust control will be utilized, respirators (if required) and personal protective equipment will be worn, area air monitoring will be conducted during times of disturbance of the impacted fill material and strict personnel decontamination procedures will be followed.

3.3 Physical Hazards

3.3.1 Temperature Extremes

*Hot Temperatures*
Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE, in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. If onsite workers exhibit the signs of heat exhaustion or heat stroke, they should seek immediate medical attention.

*Cold Temperatures*
Workers may be exposed to the hazard of working in a cold environment. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery surfaces, brittle equipment, poor judgment, and unauthorized procedural changes. In order to prevent frostbite, hypothermia, trench foot and immersion foot, the workers are responsible for dressing warmly in layers with thick socks, gloves, and appropriate head and face gear. Upon the onset of discomfort due to the cold, onsite workers should take regular five to ten minute breaks to warm up inside nearby buildings and to drink warm fluids. Please note that the NYCDEP statute prohibits idling an engine for more than three minutes (one-minute if adjacent to a school). This statute includes the use of a vehicle for the purpose of warming up employees. As such, all contractors and employees shall identify a place to warm up in advance. If discomfort continues and the onsite workers start to exhibit the signs of frostbite, hypothermia, trench foot or immersion foot, they should seek immediate medical attention.
3.3.2 Noise and Air Resources

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Hearing protection is required and shall be used in designated areas of the site as indicated by the posted signs.

3.3.3 Hand and Power Tools

In order to complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Hand and power tools will be inspected prior to use. Proper personal protective equipment shall be worn while utilizing hand and power tools. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.4 Slips, Trips, and Falls

Working in and around the site will pose slip, trip and fall hazards due to equipment, piping, slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Potential adverse health effects include falling to the ground and becoming injured or twisting an ankle. Good housekeeping at the site must be maintained at all times.

3.3.5 Fire and Explosion

Prior to starting all excavation work, a review of appropriate New York City maps will be conducted to identify potential hazards. The possibility of encountering fire and explosion hazards exists from under-ground utilities and gases. Therefore, all excavation equipment must be grounded.

3.3.6 Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting techniques can result in back injuries and strains. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods.
Whenever possible, heavy objects must be lifted and moved by mechanical devices rather than by manual effort. The mechanical devices will be appropriate for the lifting or moving task and will be operated only by trained and authorized personnel. Objects that require special handling or rigging will only be moved under the guidance of a person who has been specifically trained to move such objects, such as a Master Rigger or equivalent. Lifting devices, including equipment, slings, ropes, chains, and straps, will be inspected, certified, and labeled to confirm their weight capacities. Defective equipment will be taken out of service immediately and repaired or destroyed.

The wheels of any trucks being loaded or unloaded, and/or parked on an incline, will be chocked to prevent movement. If applicable, outriggers will be extended on a flat, firm surface during operation. The lift and swing path of a crane/equipment will be watched and maintained clear of obstructions. Personnel will not pass under a raised load, nor will a suspended load be left unattended. Personnel will not be carried on lifting equipment, unless it is specifically designed to carry passengers.

All reciprocating, rotating, or other moving parts will be guarded at all times. Accessible fire extinguishers will be made available in all mechanical lifting devices. All material must be stored in tiers, racked, blocked, or otherwise secure to prevent sliding, falling, or collapse. All loads/material will be verified to be secure before transportation.

### 3.3.7 Confined Space/Excavation Hazards

Personnel entry into trenches or unshored (e.g., lagging) excavations within the designated areas of concern will not be permitted. No other confined spaces are known to exist on Site. If entry into trenches or excavations is required, all work will stop until the CHASP has been revised to address the new hazards.

### 3.3.8 Working Near Equipment

Personnel working in the immediate vicinity of heavy equipment (e.g., excavators, loaders, etc.) may encounter physical hazards resulting from contact with equipment. Field personnel should be aware of the presence of these hazards at all times and take appropriate action to avoid them. Due to the limited ability to communicate when wearing respiratory
protection, the risk is increased. Workers must be careful to communicate with heavy equipment operators regarding their location, and should maintain a safe distance from operating equipment at all times. Prior to working around equipment, the site personnel will review appropriate hand signals with the operator.

Equipment will be equipped with back up alarms.

3.3.9 Electrical Safety

Personnel may utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Ground Fault Circuit Interrupters (GFCIs) are required for all portable electric tools.

3.3.10 Utilities

Prior to the start of any intrusive work, the location of above-ground and underground utilities and other structures will be completed by the contractor/subcontractor responsible for completing construction activities.

3.3.11 Vehicular Traffic

Portions of site activities (load in and load out) will be conducted in the street so vehicular and pedestrian traffic will be present. Appropriate precautions to protect the on-site workers and civilians should be used including the use of cones and traffic vests as appropriate.

3.4 Biological Hazards

During the course of the project, there is a potential for workers to come into contact with biological hazards such as animals and insects. As the potential for exposure to blood borne pathogens during implementation of the IRMWP is anticipated to be low, a Blood Borne Pathogen Exposure Plan (BBPEP) is not required. A BBPEP will be prepared if site operation requires its implementation.

3.4.1 Animals

During site operations, animals such as dogs, cats, pigeons, mice, and rats may be encountered. Workers shall use discretion and avoid all contact
with animals. Bites and scratches from dogs and cats can be painful and if the animal is rabid, the potential for contracting rabies exists. Contact with rat and mice droppings may lead to contracting hantavirus. Inhalation of dried pigeon droppings may lead to psittacosis. Cryptococcosis and histoplasmosis are also diseases associated with exposure to dried bird droppings but these are less likely to occur in this occupational setting.

### 3.4.2 Insects

Insects, including bees, wasps, hornets, mosquitoes, spiders, and ticks may be present at the site. Some individuals may have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. In addition, mosquito bites may lead to St. Louis encephalitis or West Nile encephalitis.

### 3.4.3 Wound Care

A source of occupational exposure may occur when an employee gives First Aid and or CPR to an individual who had infectious blood. The occupational exposure occurs when there is the possibility for an employee’s eyes, mucous membranes, non-intact skin (i.e., cut and abraded skin) to come into contact with potentially infectious materials from another employee. If an accident were to occur where First Aid would need to be administered, the person administering the First Aid will presume that any wounds and materials used are contaminated with BBP and should wear the appropriate PPE to prevent contact with these materials. Additionally, should the use of First Aid materials and or clothing that was potentially contaminated with BBP be encountered these materials should be properly containerized and transported to the nearest hospital for proper disposal.
3.5 Coronavirus

General Preventative Measures
Field personnel must follow general proper hygiene measures while in the field including:

- Avoid touching eyes, nose and mouth.
- Cover cough or sneeze with tissue, and throw in trash.
- Wash hands often with soap and water for 20 seconds after going to bathroom, before eating, after blowing nose, coughing or sneezing.
- Use hand sanitizer with at least 60% alcohol if soap and water are not available.
- Avoid physical contact with other people (e.g., no handshakes).
- Maintain a safe distance of at least 6 feet from other people (social distancing).
- Wear face coverings when around other worker to minimize spread of COVID-19. (May be required in certain states or locations.)

Construction Trailers
Employees should avoid use of shared construction trailers or where employees cannot maintain a safe distance (minimum 6 feet) from other workers. If trailer use is needed, areas such as desks, phones, chairs and other common areas, should be cleaned and disinfected before and after use. Protocols should be developed to minimize trailer use to essential personal, restrict use from any workers who are ill or showing symptoms of being ill, use if face coverings and ensure a safe distance of 6 feet can be established between workers.

Communication
Include Coronavirus topics and prevention topics in daily tailgate meetings to ensure Coronavirus awareness is communicated daily. Discussions can focus on general topics including: social distancing, prevention measures for field personnel, signs and symptoms and recent news on the Coronavirus. Site-specific topics should include minimizing face-to-face contact, disinfecting/sterilizing field equipment, use of PPE to reduce exposure, site security, use of face coverings and other potential exposure issues/concerns.

Sick/Ill Workers
No Langan employee is permitted to be onsite when ill and/or showing potential symptoms of the Coronavirus. Symptoms of the Coronavirus may appear 2-14 days after exposure and can range from mild to severe. The most common
symptoms include: fever, fatigue, dry cough, shortness of breath chills, repeated shaking with chills, muscle pain, headache, sore throat, or new loss of taste or smell. If an employee or subcontractor is observed being ill or exhibiting symptoms of Coronavirus, employees must immediately utilize their Stop Work Authority and contact their project manager to address the situation. If an employee observes another worker onsite exhibiting symptoms of Coronavirus, immediately utilize Stop Work Authority and notify their project manager and site construction manager or safety officer. Work should resume when the safety and health of Langan and subcontractors is adequately addressed.

3.6 Task Hazard Analysis

The tasks to be completed during the proposed site work activities, as summarized in Section 1.3, are listed in Table 3 with a Hazard Analysis for each task.

4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.1 Levels of Protection

PPE must protect workers from the specific hazards they are likely to encounter on site. Selection of the appropriate PPE must take into consideration: (1) identification of the hazards or suspected hazards; (2) potential exposure routes; and, (3) the performance of the PPE construction (materials and seams) in providing a barrier to these hazards. Based on anticipated site conditions and the proposed work activities to be performed at the Site, Level D Protection will be used. The upgrading/downgrading of these levels of protection will be based on continuous air monitoring results as described in Section 5.0. The decision to modify standard PPE will be made by the HSO after conferring with the Langan Project Manager. The levels of protection are described below.

- Level D Protection
  a. Safety glasses with sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Hard hat
  d. Long sleeve work shirt and work pants
  e. Nitrile gloves
  f. Hearing protection (as needed)
  g. Reflective traffic vest
- **Level D Protection (Modified)**
  a. Safety glasses with sideshields or chemical splash goggles
  b. Safety boots/shoes (toe-protected)
  c. Disposable chemical-resistant boot covers
  d. Coveralls (polycoated Tyvek or equivalent to be worn when contact with wet contaminated soil, groundwater, or non-aqueous phase liquids is anticipated)
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Nitrile gloves
  h. Hearing protection (as needed)
  i. Reflective traffic vest

- **Level C Protection**
  a. Full face-piece, air-purifying, cartridge*-equipped, NIOSH-approved respirator [*combo cartridge P100/OV/CL/HC/SD/CD/HS (escape)]
  b. Inner (latex) and outer (nitrile) chemical-resistant glove
  c. Chemical-resistant safety boots/shoes (toe-protected)
  d. Disposable chemical-resistant boot covers
  e. Hard hat
  f. Long sleeve work shirt and work pants
  g. Coveralls (Tyvek or equivalent, poly-coated Tyvek will be worn when contact, or anticipated contact with wet contaminated soils, groundwater, and/or non-aqueous phase liquids (NAPL) is anticipated)
  h. Hearing protection (as needed)
  i. Reflective traffic vest

The action levels used in determining the necessary levels of respiratory protection and upgrading to Level C are provided in Table 4. The written Respiratory Protection Program is maintained by the HSM. The monitoring procedures and equipment are outlined in Section 5.0.
4.2 Respirator Fit-Test

All Langan employees and subcontractors performing site work who could be exposed to hazardous substances at the work site are in possession of a full face-piece, air-purifying respirator and have been successfully quantitative fit-tested within the past year. Quantitative fit-test records are maintained by the HSM.

4.3 Respirator Cartridge Change-Out Schedule

Respiratory protection is required to be worn when certain action levels (Table 2) are reached. A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR 1910.134. The respirator cartridge change-out schedule for this project is as follows:

- Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first.
- If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short the time period was the previous day they were used.

5.0 AIR QUALITY MONITORING AND ACTIONS LEVELS

5.1 Monitoring During Site Operations

Atmospheric air monitoring results are used to provide data to determine when exclusion zones need to be established and when certain levels of personal protective equipment are required. For all instruments there are Site-specific action level criteria which are used in making field health and safety determinations. Other data, such as the visible presence of contamination or the steady state nature of air contaminant concentration, are also used in making field health and safety decisions. Therefore, the HSO may establish an exclusion zone or require a person to wear a respirator even though atmospheric air contaminant concentrations are below established CHASP action levels.
During site work involving disturbance of impacted materials, real time air monitoring will be conducted for volatile organic compounds (VOCs) and dust. A photoionization detector (PID) and/or flame ionization detector (FID) will be used to monitor concentrations of VOCs at personnel breathing-zone height. Dust monitoring will be accomplished with an aerosol monitor. Air monitoring will be the responsibility of the HSO or designee. Air monitoring will be conducted approximately every 30 minutes during ground intrusive activities in the AOC on the project site. All manufacturers’ instructions for instrumentation and calibration will be available onsite.

Subcontractors’ air monitoring plans must be equal or more stringent as the Langan plan.

An air monitoring calibration log is provided in Attachment D of this CHASP.

5.1.1 Volatile Organic Compounds

Monitoring with a PID, such as a MiniRAE 3000 (10.6v) or equivalent will occur during intrusive work outlined in the December 2020 IRM. Colormetric Indicator Tubes for benzene may be used as backup for the PID, if measurements remain above background monitor every 2 hours. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, etc.) since the last measurement. If VOC levels are observed above 5 ppm for longer than 5 minutes or if the site PPE is upgraded to Level C, the HSO will begin monitoring the site perimeter at a location downwind of the work zone every 30 minutes in addition to the employee breathing zone. Instrument action levels for monitored gases are provided in Table 4.

5.1.2 Dust

During invasive procedures which have the potential for creating airborne dust, such as excavation of dry soils, a real time airborne dust monitor such as a Mini-Ram should be used to monitor for air particulates. The HSO will monitor the employee breathing zone at least every 30 minutes, or whenever there is any indication that concentrations may have changed (appearance of visible dust) since the last measurement. Instrument action levels for dust monitoring are provided in Table 4.
5.2 Monitoring Equipment Calibration and Maintenance

Instrument calibration shall be documented and included in project the field book. All instruments shall be calibrated before each shift. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

All instruments shall be operated in accordance with the manufacturers’ specifications. Manufacturers’ literature, including an operations manual for each piece of monitoring equipment will be maintained on site by the HSO for reference.

5.3 Determination of Background Levels

Background (BKD) levels for VOCs and dust will be established prior to intrusive activities within the AOC at an upwind location. A notation of BKD levels will be referenced in the daily monitoring log. BKD levels are a function of prevailing conditions. BKD levels will be taken in an appropriate upwind location as determined by the HSO.

Table 4 lists the instrument action levels.

6.0 COMMUNITY HEALTH AND SAFETY CONSIDERATIONS

Community air monitoring will be conducted in compliance with the NYSDOH Generic CAMP outlined below.

The CAMP will include real-time monitoring for VOCs and particulates at the downwind perimeter of each designated work area when ground-intrusive work is in progress. Continuous monitoring will be required for all ground-intrusive work. Ground-intrusive work includes, but is not limited to, soil/fill excavation and handling and utility trenching. Periodic monitoring for VOCs may be required during non-intrusive work such as the collection of soil samples. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location and taking a reading prior to leaving a sample location.

CAMP monitoring of total VOC levels will be conducted using PIDs, and monitoring for particulates will be conducted using particulate sensors equipped with filters that can detect airborne particulates less than 10 microns in diameter (PM10). Monitoring for particulates and odors will be conducted during ground-intrusive work by a field engineer,
scientist, or geologist under the supervision of the RE. The work zone is defined as the
general area in which machinery is operating in support of remediation. A portable PID
will be used to monitor the work zone and for periodic monitoring of total VOC levels
during work such as soil sampling. The site perimeter will be visually monitored for
fugitive dust emissions.

The following actions will be taken based on total VOC levels measured:

- If total VOC levels exceed 5 ppm above background for the 15-minute average at
  the perimeter, work will be temporarily halted and monitoring continued. If levels
  readily decrease (per instantaneous readings) below 5 ppm above background,
  work will resume with continued monitoring.

- If total VOC levels at the downwind perimeter of the work zone persist at levels
  in excess of 5 ppm above background but less than 25 ppm, work will be halted,
  the source of vapors identified, corrective actions taken to abate emissions, and
  monitoring continued. After these steps, work will resume provided that the
  total VOC level 200 feet downwind of the hot zone or half the distance to the
  nearest potential receptor or residential/commercial structure, whichever is
  less – but in no case less than 20 feet, is below 5 ppm above background for the
  15-minute average.

- If the total VOC level is above 25 ppm at the perimeter of the hot zone, work will
  be shut down.

The following actions will be taken based on dust levels measured or visual dust
observations:

- If the downwind particulate level is 100 µg/m³ greater than background (upwind
  perimeter) for the 15-minute period or if airborne dust is observed leaving the work
  area, then dust suppression must be employed. Work may continue with dust
  suppression techniques provided that downwind PM10 levels do not exceed
  150 µg/m³ above the background level and provided that no visible dust is
  migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM10 levels
  are greater than 150 µg/m³ above the background level, work must be stopped
  and a re-evaluation of activities initiated. Work can resume provided that dust
  suppression measures and other controls are successful in reducing the
downwind PM10 concentration to within 150 µg/m³ of the background level and
  in preventing visible dust migration.
Sustained concentrations of VOCs or PM10 will be reported to the NYSDEC and NYSDOH Project Managers and included in the daily report. In addition, a map showing the location of the downwind CAMP station will be included in the daily report.

7.0 WORK ZONES AND DECONTAMINATION

7.1 Site Control

Work zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas.

Any person working in an area where the potential for exposure to site contaminants exists will only be allowed access after providing the HSO with proper training and medical documentation.

*Exclusion Zone (EZ)* - All activities which may involve exposure to site contaminants, hazardous materials and/or conditions should be considered an EZ. Decontamination of field equipment will also be conducted in the Contaminant Reduction Zone (CRZ) which will be located on the perimeter of the EZ. The EZ and the CRZ will be clearly delineated by cones, tapes or other means. The HSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

7.2 Contamination Control

7.2.1 Personnel Decontamination Station

Personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

7.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the chance of contact with contaminated materials. This involves a conscientious effort to keep "clean" during site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination as PPE is intended to minimize accidental contact. This
may ultimately minimize the degree of decontamination required and the
 generation of waste materials from site operations.

Field procedures will be developed to control over spray and runoff and to
ensure that unprotected personnel working nearby are not affected.

7.2.3 Personnel Decontamination Sequence

Decontamination will be performed by removing all PPE used in EZ and
placing it in drums/trash cans at the CRZ. Baby wipes shall be available for
wiping hands and face. Drums/trash cans will be labeled by the field crews
in accordance with all local, state, and federal requirements. Management
plans for contaminated PPE, tools and Investigative Derived Waste
(i.e., soil cutting) are provided below.

7.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily
removed, then remove gross contamination and wrap injured personnel
with clean garments/blankets to avoid contaminating other personnel or
transporting equipment. If the injured person can be moved, he/she will be
decontaminated by site personnel as described above before emergency
responders handle the victim. If the person cannot be moved because of
the extent of the injury (a back or neck injury), provisions shall be made to
ensure that emergency response personnel will be able to respond to the
victim without being exposed to potentially hazardous atmospheric
conditions. If the potential for inhalation hazards exist, such as with open
evacuation, this area will be covered with polyethylene sheeting to
eliminate any potential inhalation hazards. All emergency personnel are to
be immediately informed of the injured person’s condition, potential
contaminants, and provided with all pertinent data.

7.2.5 Hand-Held Equipment Decontamination

Hand-held equipment includes all monitoring instruments as stated earlier,
samples, hand tools, and notebooks. The hand-held equipment is dropped
at the first decontamination station to be decontaminated by one of the
decontamination team members. These items must be decontaminated or
discarded as waste prior to removal from the CRZ.
To aid in decontamination, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Sampling equipment, hand tools, etc. will be cleaned with non-phosphorous soap to remove any potentially contaminated soil, and rinsed with deionized water. All decontamination fluids will be containerized and stored on-site pending waste characterization sampling and appropriate off-site disposal.

7.2.6 Heavy Equipment Decontamination

All heavy equipment and vehicles arriving at the work site will be free from contamination from offsite sources. Any vehicles arriving to work that are suspected of being impacted will not be permitted on the work site. Potentially contaminated heavy equipment will not be permitted to leave the EZ unless it has been thoroughly decontaminated and visually inspected by the HSO or his designee.

7.3 Communications

The following communications equipment will be utilized as appropriate.

- Telephones - A cellular telephone will be located with the HSO for communication with the HSM and emergency support services/facilities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals are the following:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand gripping throat</td>
<td>Out of air, can’t breathe</td>
</tr>
<tr>
<td>Grip on partner’s wrist or placement of both hands around partner’s waist</td>
<td>Leave area immediately, no debate</td>
</tr>
<tr>
<td>Hands on top of head</td>
<td>Need assistance</td>
</tr>
<tr>
<td>Thumbs up</td>
<td>Okay, I’m all right, I understand</td>
</tr>
<tr>
<td>Thumbs down</td>
<td>No, negative</td>
</tr>
</tbody>
</table>
8.0 MEDICAL SURVEILLANCE

All personnel who will be performing field work involving potential exposure to toxic and hazardous substances will be required to have passed an initial baseline medical examination, with annual follow-up medical exams thereafter, consistent with 29 CFR 1910.120(f). Medical evaluations will be performed by, or under the direction of, a physician board-certified in occupational medicine. Results of medical evaluations are maintained by the HSM.

9.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures. In case of emergency, in addition to 911 the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) should be called as soon as possible.

9.1 Responsibilities

9.1.1 Health and Safety Officer (HSO)

The HSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The HSO is responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The HSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can notify OSHA within the required time frame.

9.1.2 Emergency Coordinator

The HSO or their designated alternate will serve as the Emergency Coordinator. The Emergency Coordinator is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation.
They are also responsible for ensuring the HSM are notified of all incidents, all injuries, near misses, fires, spills, releases or equipment damage. The Emergency Coordinator is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized.

The Emergency Coordinator shall locate emergency phone numbers and identify hospital routes prior to beginning work on the sites. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator is responsible for implementing the Emergency Response Plan.

### 9.1.3 Site Personnel

Project site personnel are responsible for knowing the Emergency Response Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency. Project site personnel, including all subcontractors will be trained in the Emergency Response Plan.

### 9.2 Communications

Once an emergency situation has been stabilized or as soon as practically possible, the HSO will contact the Langan Incident/Injury Hotline (1-800-952-6426 or 973-560-4699) and Project Manager of identify any emergency situation.

### 9.3 Local Emergency Support Units

In order to be able to deal with any emergency that might occur during investigative activities at the site, Attachment E will be available in the field vehicles and provided to all personnel conducting work within the EZ.

Figure 2 shows the hospital route map. Outside emergency number 911 and local ambulance should be relied on for response to medical emergencies and transport to emergency rooms. Due to traffic congestion that is prevalent in the New York metropolitan area, alternate hospital routes will need to be considered. The Emergency Coordinator will determine the appropriate route based on time of day and traffic patterns. Changes in the referenced primary facilities shall be
documented with the CHASP Field Change Authorization Request Form (Attachment B).

The Emergency Phone Numbers listed are preliminary. Upon mobilization, the HSO shall verify all numbers and document the changes in the Site Logbook. Any changes shall also be documented with the CHASP Field Change Authorization Request Form.

Hospital route maps will be provided to all field personnel.

9.4 Pre-Emergency Planning

Langan will communicate directly with administrative personnel from the emergency room at the hospital in order to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from any of the contaminants expected to be found on the site. Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

9.5 Emergency Medical Treatment

The procedures and rules in this CHASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the HSO on site immediately. First-aid equipment will be available on site at the following locations:

First Aid Kit: Vehicles
Emergency Eye Wash: Vehicles

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

Personnel with current first aid and CPR certification will be identified.
Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance.

Nearest hospital:  
NYP/Columbia University Irving Medical Center  
630 West 168th Street  
New York, NY 10032  
(212) 305-6204  
(directions from site to hospital found on Figure 2)

9.6 Non-Emergency Medical Treatment

In case of injury to personnel, which is not a medical emergency the employee will contact WorkCare at (1-888-449-7787). WorkCare provides access 24 hours / 7 days a week to experienced occupational health nurses and physicians who confer with employees at the onset of a work-related injury or illness. WorkCare will provide over the phone injury treatment or direct employees to medical treatment by third party provider, if appropriate.

9.7 Emergency Site Evacuation Routes and Procedures

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs as a result of implementation of the IRMWP, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, the Langan Project Manager will be verbally notified immediately. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the nearest intersection to be accounted for and to receive further instructions.

9.8 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site and notification of the Langan Project Manager. Portable fire extinguishers will be provided at the work zone. The extinguishers located in the various locations should also be identified prior to the start of work. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).
9.8.1 Fire Prevention

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases away from oxidizers.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities.

The person responsible for the control of fuel source hazards and the maintenance of fire prevention and/or control equipment is the HSO.

9.9 Significant Vapor Release

Based on the proposed tasks, the potential for a significant vapor release is low. However, if a release occurs, the following steps will be taken:

- Move all personnel to an upwind location. All non-essential personnel shall evacuate.
- Upgrade to Level C Respiratory Protection.
- Downwind perimeter locations shall be monitored for volatile organics.
- If the release poses a potential threat to human health or the environment in the community, the Emergency Coordinator shall notify the Langan Project Manager.
- Local emergency response coordinators will be notified.

9.10 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet (MSDS) will be followed, when necessary.

SKIN AND EYE: Use copious amounts of soap and water from eye-wash kits and portable hand wash stations.
CONTACT: Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Skin shall also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs. Affected items of clothing shall also be removed from contact with skin.

Providing wash water and soap will be the responsibility of each individual contractor or subcontractor on-site.

9.11 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or omitted. The HSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

9.12 Incident Reporting

Once first aid and/or emergency response needs have been met, the following parties are to be contacted:

- WorkCare (1-888-449-7787)
- Langan Incident/Injury Report Hotline (973-560-4699)
- Langan Project Manager, Amanda Forsburg (973-560-4900) or Steve Ciambruschini (973-560-4900)
- Langan Health and Safety Manager, Tony Moffa (215-491-6500)
- The employer of any injured worker who is not a Langan employee
For emergencies involving personal injury and/or exposure including near-misses, the HSO or designee will complete and submit an Incident Report form (Attachment F) within 24 hours. If the employee involved is not a Langan employee, his employer shall receive a copy of the report.

9.13 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work will continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries.
- Potential for cold stress and cold-related injuries.
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds).
- Limited visibility (fog).
- Potential for electrical storms.
- Earthquakes.
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The HSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

9.14 Spill Control and Response

All small spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining proper waste characterization and the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. All spill containment materials will be
properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill.

All contractor vehicles shall have spill kits on them with enough material to contain and absorb the worst-case spill from that vehicle. All vehicles and equipment shall be inspected prior to be admitted on site. Any vehicle or piece of equipment that develops a leak will be taken out of service and removed from the job site.

The following seven steps shall be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spills.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify the HSO immediately.
4. Use proper PPE in consultation with the HSO.
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosion-proof equipment to contain or clean up the spill (diesel-only vehicles, air-operated pumps, etc.)
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.

In addition to the spill control and response procedures described in this CHASP, Langan personnel will coordinate with the designated project manager relative to spill response and control actions. Notification to the Project Manager must be immediate and, to the extent possible, include the following information:

- Time and location of the spill.
- Type and nature of the material spilled.
- Amount spilled.
- Whether the spill has affected or has a potential to affect a waterway or sewer.
- A brief description of affected areas/equipment.
- Whether the spill has been contained.
- Expected time of cleanup completion. If spill cleanup cannot be handled by Langan’s on-site personnel alone, such fact must be conveyed to the Project Manager immediately.
Langan shall not make any notification of spills to outside agencies. The client will notify regulatory agencies as per their reporting procedures.

9.15 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on site:

- Industrial first aid kit.
- Fire extinguishers (one per site).

9.16 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers.
- Refilling medical supplies.
- Recharging eyewashes and/or showers.
- Replenishing spill control supplies.

10.0 TRAINING

10.1 General Health and Safety Training

Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA’s 29 CFR 1910.120(e) is required for all employees who will perform work in areas where the potential for a toxic exposure exists. Annual 8-hour refresher training is also required to maintain competencies to ensure a safe work environment.

10.2 Site-Specific Training

Prior to commencement of site activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include a documented verbal review of the entire CHASP and all the provisions within the
CHASP document. Should any new employees arrive on-site, they will also be given a documented full CHASP review – or one that address the appropriate tasks that remain at the time of the new employee’s arrival.

10.3 Onsite Safety Briefings

Project personnel and visitors will participate in documented daily on-site health and safety briefings (“Tailgate Talks”) led by the HSO to assist site personnel in safely conducting their work activities. The briefings will include information on operations to be conducted that shift, changes in work practices or changes in the site’s environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity for the work crews to be updated on monitoring results. Prior to starting any new activity, a training session will be held for crew members involved in the activity. The Safety Briefing form (Attachment A) can be used to facilitate this effort.

10.4 Hazard Communication

All material brought on-site will be in the appropriate containers and will be properly labeled. The SDS for unleaded gasoline, diesel fuel, and hydraulic fluid are attached. Langan’s written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM.

11.0 RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

11.1 Field Change Authorization Request

A field change authorization request is to be completed for requesting a change to this CHASP (Attachment B). Any changes to the work to be performed that is not included in the CHASP will require an Addendum that is approved by the Langan Project Manager and Langan HSM to be prepared. Approved changes will be reviewed with all field personnel at a safety briefing.
11.2 **Medical and Training Records**

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training, documentation of three-day OJT, and respirator fit-test records) and medical clearance for Site work and respirator use will be maintained in the office and available upon request. Records for all subcontractor employees must also be available upon request. All employee medical records will be maintained by the HSM.

11.3 **Onsite Log**

A log of personnel on site each day will be kept by the HSO or designee.

11.4 **Daily Safety Meetings (“Tailgate Talks”)**

Completed Safety Briefing forms will be maintained by the HSO.

11.5 **Exposure Records**

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained by the HSO during site work. At the end of the project they will be maintained according to 29 CFR 1910.1020.

11.6 **Hazard Communication Program/MSDS**

Material Safety Data Sheets (MSDS) have been obtained for applicable substances and are included in this CHASP (Attachment G). Langan’s written Hazard Communication program, in compliance with 29 CFR 1910.1200, is maintained by the HSM in Parsippany, New Jersey.

11.7 **Documentation**

Employees are required to contact WorkCare at (1-888-449-7787) to document incidents/injuries which are not medical emergencies. Immediately following an incident or near miss, unless emergency medical treatment is required, either the employee or a coworker must contact the Langan Incident/Injury Hotline at (973-560-4699) and the client representative to report the incident or near miss. A written report must be completed and submitted to the client representative within 24 hours of the incident. For emergencies involving personnel injury and/or
exposure, employee will complete and submit the Langan Incident/Injury Report to the Langan Corporate Health and Safety Manager as soon as possible following the incident. Accidents will be investigated in-depth to identify all causes and to recommend hazard control measures.

12.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have been verbally given a full CHASP review by Langan personnel, and understand the provisions of this EHS Plan. It is maintained on site by the HSO as a project record.

Each field team member shall sign this section after Site-specific training is completed and before being permitted to work onsite.

<table>
<thead>
<tr>
<th>Name (Print and Sign)</th>
<th>Company</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
# TABLE 1
**SUSPECTED CONTAMINANTS OF CONCERN**

**280 WEST 155TH STREET**
**NEW YORK, NEW YORK**

<table>
<thead>
<tr>
<th>Contaminant Of Concern</th>
<th>Affected Media</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VOLATILES</strong></td>
<td></td>
</tr>
<tr>
<td>Acetone</td>
<td>Soil</td>
</tr>
<tr>
<td>Tert-Butyl Methyl Ether</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Tetrachloroethene (PCE)</td>
<td>Soil Vapor</td>
</tr>
<tr>
<td>Total Volatiles</td>
<td>Soil / Soil Vapor</td>
</tr>
</tbody>
</table>

**SEMI-VOLATILES**

<table>
<thead>
<tr>
<th>Common Historic Fill Contaminants:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 &amp; 4 Methylphenol (m&amp;p Cresol)</td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
</tr>
<tr>
<td>Chrysene</td>
</tr>
<tr>
<td>Dibenzo(a,h)anthracene</td>
</tr>
<tr>
<td>Indeno (1,2,3-cd) pyrene</td>
</tr>
<tr>
<td>Fluoranthene</td>
</tr>
<tr>
<td>Fluorene</td>
</tr>
<tr>
<td>Phenanthrene</td>
</tr>
<tr>
<td>Phenol</td>
</tr>
<tr>
<td>Pyrene</td>
</tr>
<tr>
<td>Naphthalene</td>
</tr>
<tr>
<td>Acenaphthene</td>
</tr>
<tr>
<td>Anthracene</td>
</tr>
<tr>
<td>Dibenzofuran</td>
</tr>
</tbody>
</table>

**PESTICIDES**

<table>
<thead>
<tr>
<th>p,p' -DDE</th>
<th>Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>p,p' -DDT</td>
<td>Soil</td>
</tr>
</tbody>
</table>

**POLYCHLORINATED BIPHENYLS**

<table>
<thead>
<tr>
<th>Total Aroclor</th>
<th>Soil</th>
</tr>
</thead>
</table>
TABLE 1
SUSPECTED CONTAMINANTS OF CONCERN
280 WEST 155TH STREET
NEW YORK, NEW YORK

<table>
<thead>
<tr>
<th>METALS</th>
<th>Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Soil / Groundwater</td>
</tr>
<tr>
<td>Antimony</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Soil</td>
</tr>
<tr>
<td>Barium</td>
<td>Soil</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Soil</td>
</tr>
<tr>
<td>Chromium</td>
<td>Soil</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>Soil</td>
</tr>
<tr>
<td>Iron</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Manganese</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Mercury</td>
<td>Soil / Groundwater</td>
</tr>
<tr>
<td>Copper</td>
<td>Soil</td>
</tr>
<tr>
<td>Nickel</td>
<td>Soil</td>
</tr>
<tr>
<td>Selenium</td>
<td>Soil</td>
</tr>
<tr>
<td>Silver</td>
<td>Soil</td>
</tr>
<tr>
<td>Sodium</td>
<td>Groundwater</td>
</tr>
<tr>
<td>Zinc</td>
<td>Soil</td>
</tr>
<tr>
<td>Chemical</td>
<td>Permissible Exposure Limit</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Acetone</td>
<td>1,000 ppm</td>
</tr>
<tr>
<td>Tetrachloroethene (PCE)</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Total Volatile Organics</td>
<td>15 ppm</td>
</tr>
<tr>
<td>3 &amp; 4 Methylphenol (m&amp;p Cresol)</td>
<td>2.3 ppm</td>
</tr>
<tr>
<td>Benzo(a)anthracene</td>
<td>0.2 mg/m3</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>0.2 mg/m3</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
<td>0.2 mg/m3</td>
</tr>
</tbody>
</table>
## TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
280 WEST 155TH STREET
NEW YORK, NEW YORK

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Permissible Exposure Limit</th>
<th>IDLH Limit</th>
<th>Exposure Routes</th>
<th>Exposure Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(a)pyrene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Chrysene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Dibenzo(a,h)anthracene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Flouranthene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Indeno (1,2,3-cd) pyrene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Phenol</td>
<td>5 ppm</td>
<td>250 ppm</td>
<td>Inhalation, Skin Absorption, Ingestion, skin and/or eye contact</td>
<td>Irritation eyes, nose, throat; anorexia, weight loss; lassitude (weakness, exhaustion), muscle ache, pain; dark urine; cyanosis; liver, kidney damage; skin burns; dermatitis; ochronosis; tremor, convulsions, twitching</td>
</tr>
<tr>
<td>Pyrene</td>
<td>0.2 mg/m3</td>
<td>80 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion</td>
<td>Irritate eyes, skin, upper respiratory system, cough</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>10ppm / 50mg/m3</td>
<td>250 ppm</td>
<td>Inhalation, Ingestion</td>
<td>Headache; dizziness, drowsiness, nausea, vomiting</td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>0.2 mg/m3</td>
<td>NA</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>Irritation eyes, skin, upper respiratory system</td>
</tr>
<tr>
<td>Dibenzofuran</td>
<td>NA</td>
<td>NA</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>NA</td>
</tr>
</tbody>
</table>
### TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
280 WEST 155TH STREET
NEW YORK, NEW YORK

<table>
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<tr>
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<th>Permissible Exposure Limit</th>
<th>IDLH Limit</th>
<th>Exposure Routes</th>
<th>Exposure Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>0.05 mg/mg3</td>
<td>100 mg/mg3</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.5 mg/m3</td>
<td>50 mg/m3</td>
<td>Inhalation, ingestion, skin and/or eye contact</td>
<td>irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.010 mg/m3</td>
<td>5 mg/m3</td>
<td>Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact</td>
<td>Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]</td>
</tr>
<tr>
<td>Barium</td>
<td>0.5 mg/m3</td>
<td>50 mg/m3</td>
<td>Inhalation, ingestion, skin and/or eye contact</td>
<td>irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia</td>
</tr>
</tbody>
</table>
# TABLE 2
**SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS**

280 WEST 155TH STREET  
NEW YORK, NEW YORK

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Permissible Exposure Limit</th>
<th>IDLH Limit</th>
<th>Exposure Routes</th>
<th>Exposure Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium (dust)</td>
<td>0.005 mg/m³</td>
<td>9 mg/m³</td>
<td>inhalation, ingestion</td>
<td>pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]</td>
</tr>
<tr>
<td>Hexavalent Chromium</td>
<td>5 mg/m³</td>
<td>250 mg/m³</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>Irritation eyes, skin; lung fibrosis (histologic)</td>
</tr>
<tr>
<td>Total Chromium</td>
<td>5 mg/m³</td>
<td>250 mg/m³</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>Irritation eyes, skin; lung fibrosis (histologic)</td>
</tr>
<tr>
<td>Copper</td>
<td>1 mg/m³</td>
<td>100 mg/m³</td>
<td>Inhalation, Ingestion, Skin and/or Eye Contact</td>
<td>Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing; [potential occupational carcinogen]</td>
</tr>
<tr>
<td>Iron*</td>
<td>5 mg/m³</td>
<td>2,500 mg/m³</td>
<td>inhalation</td>
<td>Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)</td>
</tr>
<tr>
<td>Manganese*</td>
<td>5 mg/m³</td>
<td>500 mg/m³</td>
<td>inhalation, ingestion</td>
<td>Asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage</td>
</tr>
<tr>
<td>Chemical</td>
<td>Permissible Exposure Limit</td>
<td>IDLH Limit</td>
<td>Exposure Routes</td>
<td>Exposure Symptoms</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>Mercury</td>
<td>0.1 mg/m³</td>
<td>10 mg/m³</td>
<td>Inhalation, Ingestion, Skin Absorption, Skin and/or Eye Contact</td>
<td>Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria</td>
</tr>
<tr>
<td>Nickel</td>
<td>1 mg/m³</td>
<td>10 mg/m³</td>
<td>Inhalation, Skin Absorption, Ingestion, skin and/or eye contact</td>
<td>Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.2 mg/m³</td>
<td>1 mg/m³</td>
<td>Inhalation, ingestion, skin and/or eye contact</td>
<td>Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage</td>
</tr>
<tr>
<td>Silver</td>
<td>0.01 mg/m³</td>
<td>10 mg/m³</td>
<td>Inhalation, ingestion, skin and/or eye contact</td>
<td>Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance</td>
</tr>
<tr>
<td>Sodium*</td>
<td>- -</td>
<td>- -</td>
<td>Inhalation</td>
<td>Irritate the eyes, nose, throat, skin, lungs; headache; nausea; vomiting; diarrhea; abdominal pain</td>
</tr>
</tbody>
</table>
### TABLE 2
SELECTED POTENTIAL CHEMICAL EXPOSURE LIMITS AND HEALTH EFFECTS
280 WEST 155TH STREET
NEW YORK, NEW YORK

<table>
<thead>
<tr>
<th>Chemical</th>
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<th>IDLH Limit</th>
<th>Exposure Routes</th>
<th>Exposure Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>5 mg/m3</td>
<td>5,000 mg/m3</td>
<td>inhalation</td>
<td>Chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function</td>
</tr>
<tr>
<td>p,p'-DDE</td>
<td>NA</td>
<td>NA</td>
<td>Inhalation, Skin Absorption, Ingestion, skin and/or eye contact</td>
<td>Irritation eye, skin, upper respiratory tract; [carcinogenic]</td>
</tr>
<tr>
<td>p,p'-DDT</td>
<td>1.0 mg/m3</td>
<td>500 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion, skin and/or eye contact</td>
<td>Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]</td>
</tr>
<tr>
<td>Total Aroclor</td>
<td>0.5 mg/m3</td>
<td>5 mg/m3</td>
<td>Inhalation, Skin Absorption, Ingestion, skin and/or eye contact</td>
<td>Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]</td>
</tr>
</tbody>
</table>

--- No exposure limits listed in the NIOSH Pocket Guide to Chemical Hazards dated November 2010
<table>
<thead>
<tr>
<th>Task</th>
<th>Potential Risk</th>
<th>Description</th>
<th>Control Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Lifting equipment</td>
<td>Improper lifting/carrying of equipment and materials</td>
<td>Follow safe lifting and general material handling</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Noise</td>
<td>Loud sounds caused by the machines during drilling, or excavation</td>
<td>Wear proper PPE (hearing protection)</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Working near heavy machinery</td>
<td>Close proximity to drill rig and/or construction equipment</td>
<td>Be aware of surroundings, wear safety vest and hard hat</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Slips, trips, and falls</td>
<td>Any number of injuries from slips, trips, and falls in carrying out these tasks</td>
<td>Good housekeeping at site, constant awareness and focus on the task</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Inhalation of Dust</td>
<td>Breathing in visible dust from earthwork using drills or excavators</td>
<td>Wear proper PPE, monitor air for dust concentrations, use dust suppression techniques</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Inhalation of Volatiles</td>
<td>Breathing in volatiles from earthwork using drills or excavators causing dust</td>
<td>Wear proper PPE, monitor air for volatile concentrations, use dust suppression techniques</td>
</tr>
<tr>
<td>1, 2, 3, 5, 6</td>
<td>Utilities</td>
<td>Hitting utility lines during drilling and or excavating</td>
<td>Use proper mark out of underground utilities before beginning earthwork</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Skin contact with contaminated material</td>
<td>Material falls on skin; gets in eye</td>
<td>Wear proper PPE; follow safe work practices</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5</td>
<td>Ingestion of contaminated material</td>
<td>Material falls on skin; gets into mouth</td>
<td>Wear proper PPE; follow safe work practices</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Skin and eye contact with contaminated material</td>
<td>Material falls on skin; gets in eye</td>
<td>Wear proper PPE; follow safe work practices</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Heat Stress</td>
<td>Stress or exhaustion related to high temperatures</td>
<td>Hydrate and rest as needed</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Cold Stress</td>
<td>Stress or exhaustion related to low temperatures; hypothermia</td>
<td>Wear proper PPE; follow safe work practices</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Bites and stings</td>
<td>Bee stings, ticks, snake bites</td>
<td>Wear proper PPE, be watchful, follow safe work practices</td>
</tr>
<tr>
<td>1, 2, 3, 4, 5, 6</td>
<td>Lacerations and abrasions</td>
<td>Many opportunities working with hand tools</td>
<td>Inspect equipment being used for sharp edges, wear proper PPE; follow safe work practices</td>
</tr>
</tbody>
</table>
### TABLE 4
INSTRUMENTATION ACTION LEVELS
280 WEST 155TH STREET
NEW YORK, NEW YORK

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Action Level</th>
<th>Level of Protection / Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PID</strong></td>
<td>Background to 5 ppm</td>
<td>Level D/No respirator; no further action required</td>
</tr>
</tbody>
</table>
|                                     | > 5 ppm for > 5 minutes                | 1. Temporarily discontinue all activities and evaluate potential causes of the excessive readings. If these levels persist and cannot be mitigated (i.e., by slowing drilling or excavation activities), contact HSO to review conditions and determine source and appropriate response action.  
2. If PID readings remain above 5 ppm, temporarily discontinue work and upgrade to Level C protection.  
3. If sustained PID readings fall below 1 ppm, downgrading to Level D protection may be permitted |
|                                     | > 5 ppm but < 150 ppm for > 5 minutes  | Level C/  
1. Discontinue all work; all workers shall move to an area upwind of the jobsite.  
2. Evaluate potential causes of the excessive readings and allow work area to vent until VOC concentrations fall below 5 ppm.  
3. Level C protection will continue to be used until PID readings fall below 1 ppm |
| Total Dust Aerosol Monitor          | > 0.100 mg/m above BKD (steady state condition) at perimeter of AOC zone for 15 minutes or visible dust | Stop Work / Implement dust control / Continue dust monitoring if dust levels are less than 150 mg/m3 |
|                                     | < 0.150 mg/m above BKD (following dust suppression measures) | Stop Work / implement dust control, continue work once levels are <150 mg/m3 |
|                                     | >5 mg/m3                               | Level C                                                                                               |

Notes:
1. 1 ppm level based on OSHA Permissible Exposure Limit (PEL) for benzene.
2. 5 ppm level based on OSHA Short Term Exposure Limit (STEL) maximum exposure for vinyl chloride for any 15 minute period.
3. 150 ppm level based on NIOSH Immediately Dangerous to Life and Health (IDLH) for tetrachloroethylene
**TABLE 5**
PERSONAL PROTECTIVE EQUIPMENT
280 WEST 155TH STREET
NEW YORK, NEW YORK

### Respiratory Protection:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level D:</td>
<td>No respirator required.</td>
</tr>
<tr>
<td>Level C:</td>
<td>Half-face, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols) and organic vapor cartridges. The respirator will be NIOSH-approved.</td>
</tr>
<tr>
<td>Level C - supplemental by task</td>
<td>Fullface, Air Purifying Respirator (APR) with combination HEPA (dusts, fumes, aerosols), acid gas, organic vapor cartridges. The respirator will be NIOSH-approved.</td>
</tr>
</tbody>
</table>

### Personal Protective Clothing:

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level D:</td>
<td>Hard-hat, traffic vest (if working on or adjacent to the roadway), long sleeve work shirt &amp; work pants of natural fibers, safety glasses or goggles, steel-toed boots, hearing protection (if needed), nitril inner gloves and leather outer gloves.</td>
</tr>
<tr>
<td>Level D - supplemental PPE by task</td>
<td>Tyvek disposal suit</td>
</tr>
<tr>
<td>Level C:</td>
<td>Chemically resistant outer boots and Chemical resistant Tyvek disposal suite.</td>
</tr>
</tbody>
</table>
FIGURES
© 2013 Langan

Notes:
1. USGS Topographic basemap provided through Langan's subscription to Esri's ArcGIS and ArcOnline services, 2019.
2. Parcel boundaries obtained from Map Pluto 20v1, provided by the NYC Department of Planning, last updated 2020.
Emergency Route to New York Presbyterian Hospital (P# +12123052500)

1. Start travelling northwest and turn right onto Frederick Douglas Blvd.
2. Take Willie Mays Dr. to Adam Clayton Powell Jr. Blvd
3. Take W 155th to Edgecombe Ave.
4. Continue onto Amsterdam Ave.
5. Turn right onto Amsterdam Abve.
6. Turn left onto W 168th St.

MAP REFERENCE: Google Maps
ATTACHMENT A

Health and Safety Briefing Statement
ATTACHMENT A

HEALTH AND SAFETY BRIEFING STATEMENT

The following personnel were present at a pre-job safety briefing conducted at __________(time) on ________________ (date) at ______________________________(location), and have read this Health and Safety Plan for the above Site and are familiar with its provisions:

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
</tr>
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<tbody>
<tr>
<td>______________________</td>
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</tbody>
</table>

Fully charged ABC class fire extinguisher available on Site? __________
Fully stocked First Aid Kit available on Site? __________
All project personnel advised of location of nearest phone? __________
All project personnel advised of location of designated medical facility? __________

Name of Field Team Leader or Site Safety Officer

_________________________________________________

Signature _____________________________ Date _____________________________
ATTACHMENT B

Field Procedures Change Authorization Form
ATTACHMENT B

FIELD PROCEDURES CHANGE AUTHORIZATION FORM

Section to be changed:____________________________________________________________

Duration of Authorization Requested

Date:________________________________

______ Today only

______ Duration of Task

______ Other___________________________________________________________

Description of Procedures Modification:

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

Justification:

____________________________________
Person Requesting Change

Name

Title

Signature

Approvals:

_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

Verbal Authorization Received From:

Name

Time

Title
ATTACHMENT C

Unsafe Conditions and Practices Form
ATTACHMENT C

UNSAFE CONDITIONS AND PRACTICES FORM

DESCRIPTION OF CIRCUMSTANCES REGARDING UNSAFE CONDITION OR PRACTICE:

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

IS THIS CONDITION EXISTING OR POTENTIAL?______________________________________

REPORTED TO:_______________________________________________________________

REPORTED BY:_______________________________________________________________

DATE REPORTED:_____________________________________________________________

COMMENTS:____________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________
ATTACHMENT D

Calibration Log
**ATTACHMENT D**

**PROJECT:** ______________

**DATE:** ______________

**CALIBRATION LOG**

<table>
<thead>
<tr>
<th>Time</th>
<th>Inst Type</th>
<th>Inst #</th>
<th>Media</th>
<th>Initial Reading</th>
<th>Span #</th>
<th>Calib Reading</th>
<th>Performed By</th>
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</tbody>
</table>
ATTACHMENT E

Emergency Notification Numbers
## ATTACHMENT E

### EMERGENCY NOTIFICATION NUMBERS

The following list provides names and telephone numbers for emergency contact personnel.

<table>
<thead>
<tr>
<th>ORGANIZATION</th>
<th>CONTACT</th>
<th>TELEPHONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York City Police</td>
<td></td>
<td>911</td>
</tr>
<tr>
<td>New York City Fire</td>
<td></td>
<td>911</td>
</tr>
<tr>
<td>NYP/Columbia University Irving Medical Center</td>
<td></td>
<td>212-305-6204</td>
</tr>
<tr>
<td>Langan Incident/Injury Hotline</td>
<td></td>
<td>973-560-4699</td>
</tr>
<tr>
<td>Langan Project Manager</td>
<td>Amanda Forsburg</td>
<td>201-615-9726</td>
</tr>
<tr>
<td>CHEMTREC (US)</td>
<td></td>
<td>800-262-8200</td>
</tr>
<tr>
<td></td>
<td>(worldwide)</td>
<td>703-741-5500</td>
</tr>
<tr>
<td>TSCA HOTLINE</td>
<td></td>
<td>202-554-1404</td>
</tr>
<tr>
<td>RCRA HOTLINE</td>
<td></td>
<td>800-424-9346</td>
</tr>
<tr>
<td>CDC</td>
<td></td>
<td>800-232-4636</td>
</tr>
<tr>
<td></td>
<td>(regional poison control)</td>
<td>800-222-1222</td>
</tr>
<tr>
<td>BUREAU OF ALCOHOL, TOBACCO &amp; FIREARMS (local)</td>
<td></td>
<td>800-800-3855</td>
</tr>
<tr>
<td></td>
<td></td>
<td>202-648-7777</td>
</tr>
<tr>
<td>NATIONAL RESPONSE CENTER</td>
<td></td>
<td>800-424-8802</td>
</tr>
<tr>
<td>PESTICIDE INFORMATION SERVICE</td>
<td></td>
<td>800-858-7378</td>
</tr>
<tr>
<td>BUREAU OF EXPLOSIVES, A.A. RAILWAYS (Support Services)</td>
<td></td>
<td>202-639-2265</td>
</tr>
<tr>
<td></td>
<td></td>
<td>719-584-7151</td>
</tr>
<tr>
<td>FEDERAL EXPRESS - HAZARDOUS MATERIAL INFO</td>
<td></td>
<td>800-463-3339</td>
</tr>
<tr>
<td></td>
<td>*call and say ‘Hazardous Materials’</td>
<td></td>
</tr>
</tbody>
</table>
ATTACHMENT F

Accident / Incident Report Form
ATTACHMENT F

INCIDENT REPORT

LANGAN EMPLOYEE EXPOSURE/INJURY INCIDENT REPORT
(Submit a Separate Report for Each Employee and/or Incident)

Date: ______________________

Employee’s Name: ____________________________________________ Employee No: ______________

Sex:  M _____  F _____  Age: ______

Region: __________________________________________________ Location: _________________________

Project: ______________________________________________ Project No: ______________

Incident: ____________________________________________________________________________________

Type:  Possible Exposure ______  Exposure ______  Physical Injury ______

Location: ____________________________________________________________________________________

Date of Incident: ___________________________  Time of Incident: _________________________________

Date of Report Incident: _______________________________________________________________________

Person(s) to Whom Incident was Reported: ____________________________________________________________________________________

Weather Conditions During Incident:  Temperature _______  Humidity _______

Wind Speed and Direction: ___________________________  Cloud Cover: ____________________________

Clear: ___________________________________________  Precipitation: ____________________________

Materials Potentially Encountered: ____________________________________________________________________________________

Chemical (give name of description - liquid, solid, gas, vapor, fume, mist):

________________________________________________________________________________________

________________________________________________________________________________________

Radiological: _______________________________________________________________________________

Other: ___________________________________________________________________________________
Nature of the Exposure/Injury: (State the nature of the exposure/injury in detail and list the parts of the body affected. Attach extra sheets if necessary).

_____________________________________________________________________________________
_____________________________________________________________________________________ 
_____________________________________________________________________________________ 
_____________________________________________________________________________________ 
_____________________________________________________________________________________ 

Did you receive medical care? Yes ______ No ______ If so, when _______________________

Where? On-Site ____________ Off-Site ____________

By Whom: 
Name of Paramedic: _________________________________________________________________
Name of Physician: _________________________________________________________________
Other: ___________________________________________________________________________

If Off-Site, name facility (hospital, clinic, etc): __________________________________________

Length of stay at the facility? _________________________________________________________

Was the Site Safety Officer contacted? Yes ______ No ______ When? ______________

Was the Corporate Health and Safety Officer contacted? Yes ______ No ______

If so, who was the contact? _________________________________________________________

Did the exposure/injury result in permanent disability? Yes ______ No ______

If so, explain: _____________________________________________________________________

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Has the employee returned to work? Yes ______ No ______

List the names of other persons affected during this incident:

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
List the names of persons who witnessed the exposure/injury incident:

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Possible cause of the exposure/injury incident:

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

What was the name and title of the field team leader or immediate supervisor at the site of the incident?  

_____________________________________________________________________________________

Was the operation being conducted under an established Health and Safety Plan?  
Yes __________ No ___________
If yes, attach a copy. If no, explain

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Describe protective equipment and clothing used by the employee:

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Did any limitations in safety equipment or protective clothing contribute to or affect exposure? If so, explain:

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

What was the employee doing when the exposure/injury occurred? (Describe briefly as Site Reconnaissance, Site Characterization, or Sampling, etc.):

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Where exactly on site or off site did the exposure/injury occur?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

How did the exposure/injury occur? (Describe fully what factors led up to and/or contributed to the incident):

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Name of person(s) initiating report, job title, phone number:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Employee Signature
Date

Site Safety Officer Signature or Field Team Leader Signature
Date
ATTACHMENT G

Safety Data Sheets (SDS)
1,1-Dichloro-2,2-bis(4-chlorophenyl-d₄)ethylene

Section 1. Chemical product and company identifications

Product code: D-3005
Chemical formula: C₁₄D₈Cl₄
CAS: 93952-19-3
CAS (unlabelled): 72-55-9
Synonyms: 4,4'-DDE, 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene

Supplier / Manufacturer:
C/D/N Isotopes Inc.
88 Leacock Street
Pointe-Claire (Québec) H9R 1H1
Phone: 514-697-6254
Toll-Free (Canada & USA): 1-800-565-4696
Fax: 514-697-6148
Website: www.cdnisotopes.com

In case of emergency:
TOXYSCAN HOTLINE: 1-855-780-0599

Section 2. Hazards identifications

Physical state: Solid
Warning: Harmful if swallowed. Suspected of causing cancer.
Routes of entry: Inhalation, skin and eyes

GHS (Globally Harmonized System of Classification and Labelling of Chemicals):

GHS Classification:
- Acute toxicity, Oral (Category 4)
- Carcinogenicity (Category 2)

GHS Label elements:
- Pictograms:
  - Signal word: Warning

Hazard statement:
- H302 Harmful if swallowed.
- H351 Suspected of causing cancer.

Precautionary statement:
- P281 Use personal protective equipment as required.

Section 3. Composition and information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS</th>
<th>Concentration %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1-Dichloro-2,2-bis(4-chlorophenyl-d₄)ethylene</td>
<td>93952-19-3</td>
<td>&gt; 98</td>
</tr>
</tbody>
</table>

Section 4. First aid measures

Eye contact: Flush eyes with water as a precaution.
Skin contact: Wash off with soap and plenty of water. Consult a physician.
Inhalation: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.
General advice: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.
Section 5. Firefighting measures

**Flammability of the product:** Not flammable or combustible.
**Lower explosion limit:** No data available.
**Upper explosion limit:** No data available.
**Auto-ignition temperature:** No data available.
**Flash point:** No data available.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Firefighting media and instructions:** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
**Special protective equipment for firefighters:** Wear self-contained breathing apparatus for firefighting if necessary.

Section 6. Accidental release measures

**Personal precautions:** Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.
**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.
**Methods for cleaning up:** Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

Section 7. Handling and storage

**Handling:** Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.
**Storage:** Store at room temperature. Adequate ventilation. Protect from light.

Section 8. Exposure Controls, Personal Protections

**Engineering controls:** Use mechanical exhaust or laboratory fumehood to avoid exposure.
**Eyes:** Safety glasses with side-shields conforming to NIOSH (US).
**Respiratory:** Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose 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).
**Hands:** Handle with gloves. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.
**Skin/body:** Impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Section 9. Physical and chemical properties (unlabelled)

**Molecular weight:** 318.03 g/mol
**Physical status:** Solid
**Color:** White-pale yellow
**Odour:** No data available
**Density:** No data available
**Melting point:** 88 - 90 °C (190 - 194 °F)
**Boiling point:** 336 °C (637 °F)
**Vapour pressure:** < 0.00001 hPa (< 0.00001 mmHg)
**Vapour density:** No data available
**Partition coefficient (octanol/water):** log Pow: 6.51
**Water solubility:** 0.04 mg/L

Section 10. Stability and reactivity

**Stability and reactivity:** Stable under recommended storage conditions.
**Incompatibility:** Strong oxidizing agents, strong bases.
**Products of combustion:** Hazardous decomposition products formed under fire conditions: Carbon oxides, hydrogen chloride gas.
**Reactivity conditions:** No data available.
**Section 11. Toxicological information (unlabelled)**

**Toxicological data:** 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene

**Information on ingredients:**

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS</th>
<th>LD&lt;sub&gt;50&lt;/sub&gt;</th>
<th>LC&lt;sub&gt;50&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene</td>
<td>72-55-9</td>
<td>Oral - rat - 880 mg/kg</td>
<td>No data available</td>
</tr>
</tbody>
</table>

**Potential acute effects**
- **Eyes:** May cause eye irritation.
- **Skin:** Harmful if absorbed through skin. May cause skin irritation.
- **Inhalation:** May be harmful if inhaled. May cause respiratory tract irritation.
- **Ingestion:** Harmful if swallowed.

**Potential chronic effects**
- **Carcinogenic effects:** This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies. 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. ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
- **Mutagenic effects:** No data available.
- **Teratogenic effects:** No data available.
- **Medical conditions aggravated by overexposure:** No data available.

**Section 12. Ecological information**

**Ecological data:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Results</th>
<th>Species</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene</td>
<td>0.2 - 0.3 mg/l LC50</td>
<td>Lepomis macrochirus</td>
<td>96 h</td>
</tr>
<tr>
<td>(4-chlorophenyl)ethylene</td>
<td>0.03 - 0.04 mg/l LC50</td>
<td>Oncorhynchus mykiss</td>
<td>96 h</td>
</tr>
<tr>
<td></td>
<td>0.05 - 0.18 mg/l LC50</td>
<td>Salmo salar</td>
<td>96 h</td>
</tr>
</tbody>
</table>

**Effects on environment:** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

**Mobility:** No data available.

**Environmental precautions:** No data available.

**Persistence and degradability:** No data available.

**Bioaccumulative potential:** Gambusia affinis (Mosquito fish) - 33 d. Bioconcentration factor (BCF): 12,037.

**Section 13. Disposal considerations**

**Waste disposal:** Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

**Section 14. Transportation information**

**Classification DOT/IMDG/IATA label:**

**Shipping name:** Not dangerous goods

**UN number:** None

**Class:** None

**Packaging group:** None

**Additional information:** None
Section 15. Regulatory information

UNITED STATES:
NFPA classification

Health: 1
Flammable: 0
Reactivity: 0
Specials conditions: None

Legend: 4: Severe, 3: High, 2: Moderate, 1: Slightly, 0: Not hazardous

U.S. Federal regulations:
TSCA 8(b) inventory: 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethylene
SARA 302/304/311/312 extremely hazardous substances: Not Listed
SARA 302/304 emergency planning and notification: Not Listed
SARA 302/304/311/312 hazardous chemicals: Not Listed
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard: Not Listed
CWA (Clean Water Act) 307: Not Listed
CWA (Clean Water Act) 311: Not Listed
CAA (Clean Air Act) 112 accidental release prevention: Not Listed
CAA (Clean Air Act) 112 regulated flammable substances: Not Listed
CAA (Clean Air Act) 112 regulated toxic substances: Not Listed

State regulations:
DEA List I Chemicals (Precursor Chemicals): Not Listed
DEA List II Chemicals (Essential Chemicals): Not Listed
Substances in Massachusetts: Not Listed
New York – Dangerous substances with acute effects: Not Listed
Dangerous substances in Pennsylvania – right to know: Not Listed

WHMIS (Canada):
Not WHMIS controlled.

Section 16. Additional information

References:
- Manufacturer’s Material Safety Data Sheet.
- 49CFR Table List of Hazardous Materials, UN#, Proper Shipping Names, PG. -Canada
- Federal act on the controlled products
- Toxicological repertory, HSC.
- Material safety data sheet from the components.

Date of issue: February 20th, 2017
Version: 1
Elaborated by: Toxyscan Inc., 1-866-780-0599
Notice to reader: To the best of our knowledge, the information contained herein is accurate. However, C/D/N Isotopes Inc., Toxyscan Inc., or any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
1. IDENTIFICATION

Catalog Number / Product Name: 32203 / 4,4'-DDT Standard
Company: Restek Corporation
Address: 110 Benner Circle
          Bellefonte, Pa. 16823
Phone#: 814-353-1300
Fax#: 814-353-1309
Emergency#: 800-424-9300 (CHEMTREC)
           703-527-3887 (Outside the US)
Email: www.restek.com
Revision Number: 8
Intended use: For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1
Flammable Liquid Category 2
Acute Toxicity - Inhalation Dust / Mist Category 3
Acute Toxicity - Dermal Category 3
Acute Toxicity - Oral Category 3

GHS Signal Word: Danger
GHS Hazard: Highly flammable liquid and vapour.
            Toxic if swallowed, in contact with skin or if inhaled.
            Causes damage to organs.

GHS Precautions:
Safety Precautions: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
                  Ground/bond container and receiving equipment.
                  Use explosion-proof electrical/ventilation and lighting equipment.
                  Use only non-sparking tools.
                  Take precautionary measures against static discharge.
                  Do not breathe dust/fume/gas/mist/vapours/spray.
                  Wash hands and skin thoroughly after handling.
                  Do not eat, drink or smoke when using this product.
                  Use only outdoors or in a well-ventilated area.
                  Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures: IF SWALLOWED: Immediately call a POISON CENTER/doctor/....
                   IF ON SKIN: Wash with plenty of soap and water.
                   IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
                   IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
                   IF exposed: Call a POISON CENTER or doctor/physician.
                   Call a POISON CENTER or doctor/physician.
                   Call a POISON CENTER or doctor/physician if you feel unwell.
                   Specific treatment see section 4.
                   Rinse mouth.
                   Take off immediately all contaminated clothing and wash it before reuse.
                   In case of fire: Use extinguishing media in section 5 for extinction.
Storage: Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: No data available.

Repeated Exposure Target Organs: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>EINEC #</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>methanol</td>
<td>67-56-1</td>
<td>200-659-6</td>
<td></td>
</tr>
<tr>
<td>4,4’-DDT</td>
<td>50-29-3</td>
<td>200-024-3</td>
<td></td>
</tr>
</tbody>
</table>

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately.

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.
7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment.

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>IDLH</th>
<th>ACGIH STEL</th>
<th>ACGIH TLV-TWA</th>
<th>OSHA Exposure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>methanol</td>
<td>67-56-1</td>
<td>6000 ppm</td>
<td>250 ppm</td>
<td>200 ppm TWA</td>
<td>200 ppm TWA; 260 mg/m3 TWA</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>50-29-3</td>
<td>500 mg/m3</td>
<td>IDLH</td>
<td>1 mg/m3 TWA</td>
<td>1 mg/m3 TWA (listed under Dichlorodiphenyltrichloroethane)</td>
</tr>
</tbody>
</table>

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

Respiratory Protection: Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms. If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color: No data available.

Odor: Mild

Physical State: No data available.

pH: No data available.

Vapor Pressure: No data available.

Vapor Density: 1.1 (air = 1)

Boiling Point: No data available.

Melting Point: -98 °C

Flash Point: 52

Flammability: Highly Flammable

Upper Flammable/Explosive Limit, % in air: 36

Lower Flammable/Explosive Limit, % in air: 6

Autoignition Temperature: 464 deg C

Decomposition Temperature: No data available.

Specific Gravity: 0.791 - 0.792 g/cm3 at 20 °C

Evaporation Rate: No data available.

Odor Threshold: No data available.

Solubility: Moderate; 50-99%

Partition Coefficient: n-octanol in water: No data available.

VOC % by weight: 99.9

Molecular Weight: 32.04

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: No data available.

Materials to Avoid / Chemical Incompatibility: Strong oxidizing agents

Hazardous Decomposition Products: Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION
Routes of Entry: Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure: Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:
Inhalation Irritation: Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity: Harmful! Can cause systemic damage (see "Target Organs) Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact: Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact: Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation: Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea. Highly toxic and may be fatal if swallowed.
Ingestion Toxicity: Toxic if swallowed. May cause target organ failure and/or death. May be fatal if swallowed.

Long-Term (Chronic) Health Effects:
Carcinogenicity: Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity: Contains a known human reproductive and/or developmental hazard.
Inhalation: Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact: Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion: Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:
NIOSH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol</td>
<td>67-56-1</td>
<td>Inhalation LC50 Rat 22500 ppm 8 h</td>
</tr>
<tr>
<td>DDT</td>
<td>50-29-3</td>
<td>Dermal LD50 Rabbit 300 - 2820 mg/kg</td>
</tr>
</tbody>
</table>

Component Carcinogenic Data:
OSHA:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>50-29-3</td>
</tr>
</tbody>
</table>

ACGIH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>50-29-3</td>
</tr>
</tbody>
</table>

NIOSH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>50-29-3</td>
</tr>
</tbody>
</table>

NTP:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data.</td>
<td></td>
</tr>
</tbody>
</table>

IARC:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data.</td>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>DDT</td>
<td>50-29-3</td>
<td>Group 2A</td>
</tr>
<tr>
<td>No data.</td>
<td></td>
<td>Group 2B</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION
Overview: Moderate ecological hazard. This product may be dangerous
13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.
Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:
DOT Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3
Packing Group: II

International:
IATA Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3(6.1)
Packing Group: II

Marine Pollutant: No

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>Marine Pollutant</th>
<th>Severe Marine Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No data available.

15. REGULATORY INFORMATION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>CERCLA</th>
<th>SARA 313</th>
<th>SARA EHS 313</th>
<th>TSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>methanol</td>
<td>67-56-1</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>50-29-3</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

The following chemicals are listed on CA Prop 65:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>50-29-3</td>
<td>Prop 65 Cancer</td>
</tr>
<tr>
<td>Methanol</td>
<td>67-56-1</td>
<td>Prop 65 Develop Tox</td>
</tr>
<tr>
<td>p,p''-DDT</td>
<td>50-29-3</td>
<td>Prop 65 Develop Tox</td>
</tr>
<tr>
<td>p,p''-DDT</td>
<td>50-29-3</td>
<td>Prop 65 Rep Female</td>
</tr>
<tr>
<td>p,p''-DDT</td>
<td>50-29-3</td>
<td>Prop 65 Rep Male</td>
</tr>
</tbody>
</table>

State Right To Know Listing:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>methanol</td>
<td>67-56-1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>50-29-3</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Prior Version Date: 09/30/14
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References: No data available.
Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose.
prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Arsenic
Product Number: 202657
Brand: Aldrich
Index-No.: 033-001-00-X
CAS-No.: 7440-38-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 3), H331
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 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H302 Harmful if swallowed.
H331 Toxic if inhaled.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash 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.
P273 Avoid release to the environment.
P301 + P312 + P330  IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P304 + P340 + P311  IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor.
P391  Collect spillage.
P403 + P233  Store in a well-ventilated place. Keep container tightly closed.
P405  Store locked up.
P501  Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Formula</th>
<th>Molecular weight</th>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>As</td>
<td>74.92 g/mol</td>
<td>7440-38-2</td>
<td>231-148-6</td>
<td>033-001-00-X</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. Take victim immediately to hospital. Consult a physician.

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. 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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.
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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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
Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSORAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>7440-38-2</td>
<td>TWA</td>
<td>0.01 mg/m³</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks: Lung cancer Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>7440-38-2</td>
<td>inorganic arsenic plus methylated metabolites</td>
<td>35µg As/l</td>
<td>In urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>7440-38-2</td>
<td>inorganic arsenic plus methylated metabolites</td>
<td>35µg As/l</td>
<td>In urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of the workweek (After four or five consecutive working days)
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.

- **Full contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested:Dermatri® (KCL 740 / Aldrich Z677272, Size M)

- **Splash contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested:Dermatri® (KCL 740 / Aldrich Z677272, Size M)

Data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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 N99 (US) or type P2 (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.

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>Appearance</td>
<td>Form: Pieces</td>
</tr>
<tr>
<td></td>
<td>Colour: grey</td>
</tr>
<tr>
<td>Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>No data available</td>
</tr>
</tbody>
</table>

End of the workweek (After four or five consecutive working days with exposure)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>inorganic arsenic plus methylated metabolites</td>
<td>35µg As/l Urine ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

With exposure)
d) pH
No data available

e) Melting point/freezing point
Melting point/range: 817 °C (1,503 °F) - lit.

f) Initial boiling point and boiling range
613 °C (1,135 °F) - 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
No data available

l) Vapour density
No data available

m) Relative density
5.727 g/mL at 25 °C (77 °F)

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

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 Exposure to air may affect product quality.

10.5 Incompatible materials
Oxidizing agents, Halogens, Palladium undergoes a violent reaction with arsenic, Zinc, Platinum oxide, Nitrogen trichloride, Bromine azide

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Arsenic oxides
Other decomposition products - No data available
In the event of fire: see section 5
11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 763 mg/kg
Remarks: Behavioral/Ataxia. Diarrhoea

LD50 Oral - Mouse - 145 mg/kg
Remarks: Behavioral/Ataxia. Diarrhoea

Inhalation: No data available
Dermal: No data available
No data available

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
This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

IARC: 1 - Group 1: Carcinogenic to humans (Arsenic)
NTP: Known to be human carcinogen (Arsenic)
Known to be human carcinogen (Arsenic)
OSHA: OSHA specifically regulated carcinogen (Arsenic)

Reproductive toxicity
No data available

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: CG0525000
Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer.
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish
LC50 - Pimephales promelas (fathead minnow) - 9.9 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 3.8 mg/l - 48 h

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1558  Class: 6.1  Packing group: II
Proper shipping name: Arsenic
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1558  Class: 6.1  Packing group: II  EMS-No: F-A, S-A
Proper shipping name: ARSENIC
Marine pollutant: yes

IATA
UN number: 1558  Class: 6.1  Packing group: II
Proper shipping name: Arsenic

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-38-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>7440-38-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>
Pennsylvania Right To Know Components
Arsenic

New Jersey Right To Know Components
Arsenic

California Prop. 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer.
Arsenic

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox. Acute toxicity
Aquatic Acute Acute aquatic toxicity
Aquatic Chronic Chronic aquatic toxicity
H302 Harmful if swallowed.
H331 Toxic if inhaled.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

HMIS Rating
Health hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating
Health hazard: 2
Fire Hazard: 0
Reactivity Hazard: 0

Further information
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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 05/23/2016 Print Date: 06/23/2016
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Benz[a]anthracene

Product Number : 48563
Brand : Supelco
Index-No. : 601-033-00-9

CAS-No. : 56-55-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1B), H350
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 GHS Label elements, including precautionary statements

Pictogram

Signal word : Danger

Hazard statement(s)
H350 : May cause cancer.
H410 : Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 : Obtain special instructions before use.
P202 : Do not handle until all safety precautions have been read and understood.
P273 : Avoid release to the environment.
P281 : Use personal protective equipment as required.
P308 + P313 : IF exposed or concerned: Get medical advice/ attention.
P391 : Collect spillage.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Synonyms : 1,2-Benzanthracene
Tetraphene

Formula : C_{18}H_{12}
Molecular weight : 228.29 g/mol
CAS-No. : 56-55-3
EC-No. : 200-280-6
Index-No. : 601-033-00-9

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benz[a]anthracene</td>
<td>Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H350, H410</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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
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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available
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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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
Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters
Contains no substances with occupational exposure limit values.

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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
Impervious 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 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.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1 Information on basic physical and chemical properties

- **Appearance**
  - Form: solid

- **Odour**
  - No data available

- **Odour Threshold**
  - No data available

- **pH**
  - No data available

- **Melting point/freezing point**
  - Melting point/range: 157 - 159 °C (315 - 318 °F)

- **Initial boiling point and boiling range**
  - 437.6 °C (819.7 °F)

- **Flash point**
  - No data available

- **Evaporation rate**
  - No data available

- **Flammability (solid, gas)**
  - No data available

- **Upper/lower flammability or explosive limits**
  - No data available

- **Vapour pressure**
  - No data available

- **Vapour density**
  - No data available

- **Relative density**
  - No data available

- **Water solubility**
  - No data available

- **Partition coefficient: n-octanol/water**
  - No data available

- **Auto-ignition temperature**
  - No data available

- **Decomposition temperature**
  - No data available

- **Viscosity**
  - No data available

- **Explosive properties**
  - No data available
9.2 Other safety information
No data available

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
Hazardous decomposition products formed under fire conditions.
- Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - > 200 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
This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Benz[a]anthracene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

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: Not available
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG

IATA
UN number: 3077 Class: 9 Packing group: III Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benz[a]anthracene)
Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benz[a]anthracene</td>
<td>56-55-3</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benz[a]anthracene</td>
<td>56-55-3</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benz[a]anthracene</td>
<td>56-55-3</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benz[a]anthracene</td>
<td>56-55-3</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute  Acute aquatic toxicity
Aquatic Chronic  Chronic aquatic toxicity
Carc.  Carcinogenicity
H350  May cause cancer.
H400  Very toxic to aquatic life.
H410  Very toxic to aquatic life with long lasting effects.

HMIS Rating
Health hazard:  2
Chronic Health Hazard:  *
Flammability:  0
Physical Hazard  0

NFPA Rating
Health hazard:  2
Fire Hazard:  0
Reactivity Hazard:  0
Further information
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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.6 Revision Date: 06/02/2016 Print Date: 07/20/2017
SAFETY DATA SHEET

Revision Date  22-May-2017
Revision Number  2

1. Identification

Product Name  Benzo[a]pyrene, 98%
Cat No. :  AC105600010; AC105601000
Synonyms  Benzo[def]chrysene.; 3,4-Benzopyrene; 3,4-Benzpyrene
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>Skin Sensitization</th>
<th>Category 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germ Cell Mutagenicity</td>
<td>Category 1A</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1A</td>
</tr>
<tr>
<td>Reproductive Toxicity</td>
<td>Category 1A</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word  Danger

Hazard Statements
May cause an allergic skin reaction
May cause genetic defects
May cause cancer
May damage fertility or the unborn child
Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Avoid breathing dust/fume/gas/mist/vapors/spray
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Response
IF exposed or concerned: Get medical attention/advice
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Storage
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>50-32-8</td>
<td>&gt; 96</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.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes.

Inhalation
Move to fresh air.

Ingestion
Do not induce vomiting.

Most important symptoms/effects
May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media
No information available

Flash Point
Method -
No information available

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
Keep product and empty container away from heat and sources of ignition.
6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions
See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up
No information available.

7. Handling and storage

Handling
Ensure adequate ventilation.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
<th>Mexico OEL (TWA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td></td>
<td>TWA: 0.2 mg/m³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures
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>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
<td>Powder Solid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Dark yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>aromatic</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td></td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>175 179 °C</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>°C @ 760 mmHg</td>
</tr>
</tbody>
</table>
Benzo[a]pyrene, 98%

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point</td>
<td>No information available</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>No information available</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble in water</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>C20H12</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>252.31</td>
</tr>
</tbody>
</table>

11. Toxicological information

<table>
<thead>
<tr>
<th>Component Information</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicologically Synergistic Products</td>
<td>No information available</td>
</tr>
<tr>
<td>Delayed and immediate effects as well as chronic effects from short and long-term exposure</td>
<td></td>
</tr>
<tr>
<td>Irritation</td>
<td>No information available</td>
</tr>
<tr>
<td>Sensitization</td>
<td>No information available</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>The table below indicates whether each agency has listed any ingredient as a carcinogen.</td>
</tr>
</tbody>
</table>

<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>Benzo[a]pyrene</td>
<td>50-32-8</td>
<td>Group 1</td>
<td>Reasonably Anticipated</td>
<td>A2</td>
<td>X</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
Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information
No information available

<table>
<thead>
<tr>
<th>Component</th>
<th>EU - Endocrine Disrupters Candidate List</th>
<th>EU - Endocrine Disruptors - Evaluated Substances</th>
<th>Japan - Endocrine Disruptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>Group III Chemical</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>6.06</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.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene - 50-32-8</td>
<td>U022</td>
<td>-</td>
</tr>
</tbody>
</table>

14. Transport information

DOT
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

TDG
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

IATA
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

IMDG/IMO
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

15. Regulatory information

International Inventories
Benzo[a]pyrene, 98%  

Revision Date 22-May-2017

<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>Benzo[a]pyrene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-028-5</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>-</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.
- 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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>50-32-8</td>
<td>&gt; 96</td>
<td>0.1</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazard Categories

- Acute Health Hazard Yes
- Chronic Health Hazard Yes
- Fire Hazard No
- Sudden Release of Pressure Hazard No
- Reactive Hazard No

CWA (Clean Water Act)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration Not applicable

CERCLA Not applicable

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>1 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65 This product does not contain any Proposition 65 chemicals

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[a]pyrene</td>
<td>50-32-8</td>
<td>Carcinogen</td>
<td>0.06 µg/day</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

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>Benzo[a]pyrene</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</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

Revision Date  22-May-2017
Print Date  22-May-2017
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
SAFETY DATA SHEET

1. Identification

Product Name: Barium

Cat No. : AC317860000; AC317860250; AC317861000; AC317865000

Synonyms: None Known.

Recommended Use: Laboratory chemicals.

Uses advised against: No Information available

Company: Fisher Scientific
Education / Business Name: Acros Organics
Company Address: One Reagent Lane, Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
For information US call: 001-800-ACROS-01
Europe: +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)

| Flammable solids               | Category 2 |
| Acute oral toxicity             | Category 3 |
| Skin Corrosion/irritation       | Category 2 |
| Serious Eye Damage/Eye Irritation| Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. |

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Toxic if swallowed
Causes skin irritation
Causes serious eye irritation
May cause respiratory 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
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
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

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

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: Immediately call a POISON CENTER or doctor/physician
Rinse mouth

Fire
Explosion risk in case of 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)
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>Barium</td>
<td>7440-39-3</td>
<td>99.9</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.
Obtain 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. Obtain medical attention.

**Ingestion**
Do not induce vomiting. Call a physician or Poison Control Center immediately.

**Most important symptoms/effects**
No information available.

**Notes to Physician**
Treat symptomatically

---

**5. Fire-fighting measures**

**Suitable Extinguishing Media**
Dry chemical.

**Unsuitable Extinguishing Media**
No information available.

**Flash Point**
No information available.

**Method -**
No information available.

**Autoignition Temperature**
No information available.

**Explosion Limits**
No data available.

**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**
Contact with water liberates toxic gas. Water reactive. Combustible material. Produce flammable gases on contact with water.

**Hazardous Combustion Products**
None known.

**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.

---

**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**
Sweep up or vacuum up spillage and collect in suitable container for disposal.

---

**7. Handling and storage**

**Handling**
Avoid contact with skin and eyes. Do not breathe dust. Do not breathe vapors or spray mist. Handle under inert gas, protect from moisture. Wear personal protective equipment.

**Storage**
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Protect from moisture. Never allow product to get in contact with water during storage. Store under an inert atmosphere.

---

**8. Exposure controls / personal protection**

**Exposure Guidelines**

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium</td>
<td>TWA: 0.5 mg/m³ (Vacated) TWA: 0.5 mg/m³</td>
<td>(Vacated) TWA: 0.5 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Grey</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>No information available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>725 °C / 1337 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>1640 °C / 2984 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</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>No data available</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Reactive Hazard</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability</td>
<td>Moisture sensitive. Air sensitive.</td>
</tr>
<tr>
<td>Conditions to Avoid</td>
<td>Exposure to air. Incompatible products. Exposure to moisture.</td>
</tr>
<tr>
<td>Incompatible Materials</td>
<td>Acids, Water, Alcohols, Halogens</td>
</tr>
</tbody>
</table>
Hazardous Decomposition Products: None under normal use conditions.

Hazardous Polymerization: Hazardous polymerization does not occur.

Hazardous Reactions: None under normal processing.

### 11. Toxicological information

#### Acute Toxicity

**Product Information**

**Oral LD50**

Category 3. ATE = 50 - 300 mg/kg.

**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>Barium</td>
<td>132 mg/kg (Rat)</td>
<td>Not listed</td>
<td>Not listed</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, respiratory system and skin.

**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>Barium</td>
<td>7440-39-3</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**

Respiratory system.

**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. See actual entry in RTECS for complete information.

### 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: UN1400
Proper Shipping Name: BARIUM
Hazard Class: 4.3
Packing Group: II

TDG
UN-No: UN1400
Proper Shipping Name: BARIUM
Hazard Class: 4.3
Packing Group: II

IATA
UN-No: UN1400
Proper Shipping Name: Barium
Hazard Class: 4.3
Packing Group: II

IMDG/IMO
UN-No: UN1400
Proper Shipping Name: Barium
Hazard Class: 4.3
Packing Group: II

15. Regulatory information

International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TSCA</th>
<th>DSL</th>
<th>NSDL</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>Barium</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-149-1</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium</td>
<td>7440-39-3</td>
<td>99.9</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

Acute Health Hazard Yes
Chronic Health Hazard No
Fire Hazard Yes
Sudden Release of Pressure Hazard No
Reactive Hazard Yes

Clean Water Act Not applicable
Clean Air Act
Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
Not applicable

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barium</td>
<td>1000 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65
This product does not contain any Proposition 65 chemicals

State Right-to-Know

<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>Barium</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</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

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
B4  Flammable solid
B6  Reactive flammable material
D2B Toxic materials
D1A Very toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Revision Date 10-Feb-2015
Print Date 10-Feb-2015
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 on 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 guide for safe handling, use, processing, storage,
transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. IDENTIFICATION

Catalog Number / Product Name: 31272 / Benzo(b)fluoranthene Standard

Company: Restek Corporation
Address: 110 Benner Circle
         Bellefonte, Pa. 16823
Phone#: 814-353-1300
Fax#: 814-353-1309
Emergency#: 800-424-9300 (CHEMTREC)
         703-527-3887 (Outside the US)
Email: www.restek.com
Revision Number: 9
Intended use: For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
- Flammable Liquid Category 2
- Serious Eye Damage/Eye Irritation Category 2
- Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

GHS Signal Word: Danger

GHS Hazard:
- Highly flammable liquid and vapour.
- Causes serious eye irritation.
- May cause drowsiness or dizziness.

GHS Precautions:

Safety Precautions:
- Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilation and lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Wash hands and skin thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
- Continue rinsing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- If eye irritation persists: Get medical advice/attention.
- In case of fire: Use extinguishing media in section 5 for extinction.

Storage:
- Store in a well-ventilated place. Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Store locked up.

Disposal:
- Dispose of contents/container according to section 13 of the SDS.
3. COMPOSITION / INFORMATION ON INGREDIENT

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>EINEC #</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>200-662-2</td>
<td>99.900000</td>
</tr>
<tr>
<td>benzo (b) fluoranthene</td>
<td>205-99-2</td>
<td>205-911-9</td>
<td>0.100000</td>
</tr>
</tbody>
</table>

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately.

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE-FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from
8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>IDLH</th>
<th>ACGIH STEL</th>
<th>ACGIH TLV-TWA</th>
<th>OSHA Exposure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>2500 ppm</td>
<td>500 ppm STEL; 1782 mg/m3 STEL</td>
<td>250 ppm TWA; 1188 mg/m3 TWA</td>
<td>1000 ppm TWA; 2400 mg/m3 TWA</td>
</tr>
<tr>
<td>benzo (b) fluoranthene</td>
<td>205-99-2</td>
<td>ND</td>
<td>No TLV</td>
<td>No data available.</td>
<td></td>
</tr>
</tbody>
</table>

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

Respiratory Protection: No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Medical Conditions Aggravated By Exposure: Respiratory disease including asthma and bronchitis.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance, color:</td>
<td>Depends upon product selection</td>
</tr>
<tr>
<td>Odor:</td>
<td>Strong</td>
</tr>
<tr>
<td>Physical State:</td>
<td>No data available.</td>
</tr>
<tr>
<td>pH:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Vapor Density:</td>
<td>2.0 (air = 1)</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>-95.4 °C Melting Point</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>39</td>
</tr>
<tr>
<td>Upper Flammable/Explosive Limit, % in air:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Lower Flammable/Explosive Limit, % in air:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Autoignition Temperature:</td>
<td>465 deg C</td>
</tr>
<tr>
<td>Decomposition Temperature:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Specific Gravity:</td>
<td>0.7845 g/cm3 at 25 °C</td>
</tr>
<tr>
<td>Evaporation Rate:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Odor Threshold:</td>
<td>ND</td>
</tr>
<tr>
<td>Solubility:</td>
<td>Complete; 100%</td>
</tr>
<tr>
<td>Partition Coefficient: n-octanol in water:</td>
<td>No data available.</td>
</tr>
<tr>
<td>VOC % by weight:</td>
<td>0</td>
</tr>
<tr>
<td>Molecular Weight:</td>
<td>58.08</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to Avoid: No data available.

Materials to Avoid / Chemical Incompatibility: Strong oxidizing agents Strong acids

Hazardous Decomposition Products: Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, Skin Contact, Eye Contact. Ingestion

Target Organs Potentially Affected By Exposure: Eyes, Central nervous system stimulation, Respiratory Tract, Skin

Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:
Inhalation Irritation: Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Can cause minor skin irritation, defatting, and dermatitis.

Eye Contact: Can cause minor irritation, tearing and reddening.

Ingestion Irritation: May be harmful if swallowed.

Ingestion Toxicity: Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity: Contains a probable or known human carcinogen.

Reproductive and Developmental Toxicity: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Inhalation: Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:

NIOSH:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>Dermal LD50 Rabbit &gt;15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h</td>
</tr>
</tbody>
</table>

Component Carcinogenic Data:

OSHA:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>205-99-2</td>
<td>A2 - Suspected Human Carcinogen</td>
</tr>
</tbody>
</table>

ACGIH:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>A4 - Not Classifiable as a Human Carcinogen</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>205-99-2</td>
<td></td>
</tr>
</tbody>
</table>

NIOSH:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NTP:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td></td>
</tr>
</tbody>
</table>

IARC:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>No data</td>
<td></td>
<td>Group 2A</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene</td>
<td>205-99-2</td>
<td>Group 2B</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

Overview: This material is not expected to be harmful to the ecology.

Mobility: No data

Persistence: No data

Bioaccumulation: No data

Degradability: No data

Ecological Toxicity Data: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.

Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States: DOT Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

International:
IATA Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

Marine Pollutant: No

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>Marine Pollutant</th>
<th>Severe Marine Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No data available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. REGULATORY INFORMATION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>CERCLA</th>
<th>SARA 313</th>
<th>SARA EHS 313</th>
<th>TSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>benzo (b) fluoranthene</td>
<td>205-99-2</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

The following chemicals are listed on CA Prop 65:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[b]fluoranthene</td>
<td>205-99-2</td>
<td>Prop 65 Cancer</td>
</tr>
</tbody>
</table>

State Right To Know Listing:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>benzo (b) fluoranthene</td>
<td>205-99-2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Prior Version Date: 03/23/15
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available.

Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.
1 Identification

Product identifier

Product name: Benzene

Stock number: L14012
CAS Number: 71-43-2
EC number: 200-753-7
Index number: 601-020-00-8

Relevant identified uses of the substance or mixture and uses advised against.
Identified use: SU24 Scientific research and development

Details of the supplier of the safety data sheet
Manufacturer/Supplier:
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4767
Email: tech@alfa.com
www.alfa.com

Information Department: Health, Safety and Environmental Department
Emergency telephone number:
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660. After normal business hours, call Carechem 24 at (866) 928-0789.

2 Hazard(s) identification

Classification of the substance or mixture in accordance with 29 CFR 1910 (OSHA HCS)

GHS02 Flame
Flam. Liq. 2 H225 Highly flammable liquid and vapor.

GHS08 Health hazard
Muta. 1B H340 May cause genetic defects.
Carc. 1A H350 May cause cancer.
STOT RE 1 H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Asp. Tox. 1, H304 May be fatal if swallowed and enters airways.

GHS07
Skin Irrit. 2 H315 Causes skin irritation.
Eye Irrit. 2 H319 Causes serious eye irritation.

Hazards not otherwise classified No information known.

Label elements
GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms

GHS02 GHS07 GHS08

Signal word Danger
Hazard statements
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.

Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor...
P303+P361+P330 IF on skin (or hair): 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.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

WHMIS classification
B2 - Flammable liquid
D2A - Very toxic material causing other toxic effects

Classification system
HMS ratings (scale 0-4)
(Hazardous Materials Identification System)

Red Health (acute effects) = 2
Yellow Flammability = 3
Green Physical Hazard = 1

(Contd. on page 2) USA
3 Composition/information on ingredients

Chemical characterization: Substances
CAS® Description:
71-43-2 Benzene
Identification number(s):
EC number: 200-753-3
Index number: 601-020-00-8

4 First-aid measures

Description of first aid measures
After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.
After skin contact
Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.
After eye contact
Rinse opened eye for several minutes under running water. Then consult a doctor.
After swallowing
Seek medical treatment.

Information for doctor
Most important symptoms and effects, both acute and delayed
No further relevant information available.
Indication of any immediate medical attention and special treatment needed
No further relevant information available.

5 Fire-fighting measures

Extinguishing media
Suitable extinguishing agents Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
Special hazards arising from the substance or mixture
If this product is involved in a fire, the following can be released:
Carbon monoxide and carbon dioxide
Advice for firefighters
Protective equipment:
Wear self-contained respirator.
Wear fully protective impervious suit.

6 Accidental release measures

Personal precautions, protective equipment and emergency procedures
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
Environmental precautions: Do not allow product to reach sewage system or any water course.
Methods and material for containment and cleaning up:
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose of contaminated material as waste according to section 13.
Ensure adequate ventilation.
Prevention of secondary hazards: Keep away from ignition sources.

Reference to other sections
See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

Handling
Precautions for safe handling
Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.
Open and handle container with care.
Information about protection against explosions and fires:
Protect against electrostatic charges.
Fumes can combine with air to form an explosive mixture.
Keep ignition sources away.

Conditions for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles: Store in a cool location.
Information about storage In one common storage facility:
Do not store together with acids.
Store away from strong bases.
Store away from oxidizing agents.
Store away from halogens.
Further information about storage conditions:
Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

Additional information about design of technical systems:
Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.
Product name: Benzene

Control parameters

Components with limit values that require monitoring at the workplace:

71-43-2 Benzene (100.0%)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL (USA) Short-term value</td>
<td>15 mg/m³, 5 ppm</td>
</tr>
<tr>
<td>Long-term value</td>
<td>3 mg/m³, 1 ppm</td>
</tr>
<tr>
<td>REL (USA) Short-term value</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Long-term value</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>See Pocket Guide App, A</td>
<td></td>
</tr>
<tr>
<td>TLV (USA) Short-term value</td>
<td>8 mg/m³, 2.5 ppm</td>
</tr>
<tr>
<td>Long-term value</td>
<td>1.6 mg/m³, 0.5 ppm</td>
</tr>
<tr>
<td>Skirr, BEI</td>
<td></td>
</tr>
<tr>
<td>EL (Canada) Short-term value</td>
<td>2.5 ppm</td>
</tr>
<tr>
<td>Long-term value</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>Skirr, ACGIH A1, IARC 1</td>
<td></td>
</tr>
<tr>
<td>EV (Canada) Short-term value</td>
<td>2.5 ppm</td>
</tr>
<tr>
<td>Long-term value</td>
<td>0.5 ppm</td>
</tr>
</tbody>
</table>

Ingredients with biological limit values:

71-43-2 Benzene (100.0%)

<table>
<thead>
<tr>
<th>BEI (USA)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 µg/g creatinine</td>
<td></td>
</tr>
<tr>
<td>Medium: urine</td>
<td></td>
</tr>
<tr>
<td>Time: end of shift Parameter</td>
<td></td>
</tr>
<tr>
<td>Parameter: S-Phenylmercapturic acid (background)</td>
<td></td>
</tr>
<tr>
<td>500 µg/g creatinine</td>
<td></td>
</tr>
<tr>
<td>Medium: urine</td>
<td></td>
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<tr>
<td>Time: end of shift Parameter</td>
<td></td>
</tr>
<tr>
<td>Parameter: t,t-Muconic acid (background)</td>
<td></td>
</tr>
</tbody>
</table>

Additional information: No data

Exposure controls

Personal protective equipment

General protective and hygienic measures

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.
Maintain an ergonomically appropriate working environment.

Recommended filter device for short term use:

Use a respirator with organic vapor/acid gas cartridges as a backup to engineering controls. Risk assessment should be performed to determine if air-purifying respirators are appropriate. Only use equipment tested and approved under appropriate government standards such as NIOSH (USA) or CEN (EU).

Protection of hands:

Impervious gloves

Check protective gloves prior to each use for their proper condition.
The selection of suitable gloves not only depends on the material, but also on quality. Quality will vary from manufacturer to manufacturer.

Material of gloves Fluorocarbon rubber (Viton)

Penetration time of glove material (in minutes) Not determined

Eye protection: Safety glasses

Body protection: Protective work clothing.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance: Liquid
Color: Colorless
Odor: Aromatic
Odor threshold: Not determined.
pH-value: Not determined.

Change in condition

Melting point/Melting range: 5 °C (41 °F)
Boiling point/Boiling range: 80 °C (176 °F)
Sublimation temperature / start: Not determined

Flash point: -11 °C (12 °F)
Flammability (solid, gaseous) Not determined.
Ignition temperature: 555 °C (1031 °F)
Decomposition temperature: Not determined
Auto igniting: Not determined.

Danger of explosion: Product is not explosive. However, formation of explosive air/vapor mixtures is possible.

Explosion limits:

Lower: 1.2 Vol %
Upper: 8 Vol %

Vapor pressure at 20 °C (68 °F): 101 hPa (76 mm Hg)
Density at 20 °C (68 °F): 0.674 g/cm³ (7.294 lbs/gal)
Relative density: Not determined

Vapor density: Not determined
Evaporation rate: Not determined

Solubility in / Miscibility with Water at 25 °C (77 °F): 1.8 g/l
Partition coefficient (n-octanol/water): Not determined.

Viscosity:

dynamic at 20 °C (68 °F): 0.66 mPas

(Contd. on page 4) USA
Product name: Benzene

10 Stability and reactivity

Reactivity: No information known.
Chemical stability: Stable under recommended storage conditions.
Thermal decomposition / conditions to be avoided: Decomposition will not occur if used and stored according to specifications.
Possibility of hazardous reactions: Reacts with strong oxidizing agents
Conditions to avoid: No further relevant information available.
Incompatible materials:
Acids
Oxidizing agents
Bases
Halogens
Hazardous decomposition products: Carbon monoxide and carbon dioxide

11 Toxicological information

Information on toxicological effects
Acute toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains acute toxicity data for this substance.

LD/LC50 values that are relevant for classification:

<table>
<thead>
<tr>
<th></th>
<th>Oral</th>
<th>Dermal</th>
<th>Inhalative</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50</td>
<td>&gt;930 mg/kg (rat)</td>
<td>&gt;9400 µL/kg (rabbit)</td>
<td>LC50/7H 10000 ppm/7H (rat)</td>
</tr>
</tbody>
</table>

Skin irritation or corrosion: Causes skin irritation.
Eye irritation or corrosion: Causes serious eye irritation.
Sensitization: No sensitizing effects known.
Germ cell mutagenicity: May cause genetic defects.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains mutation data for this substance.
Carcinogenicity:
EPA: Human carcinogen: sufficient evidence from epidemiologic studies to support a causal association between exposure and cancer.
IARC: 1: Carcinogenic to humans: sufficient evidence of carcinogenicity.
NTP: Known to be carcinogenic: sufficient evidence from human studies.
The Registry of Toxic Effects of Chemical Substances (RTECS) contains tumorigenic and/or carcinogenic and/or neoplastic data for this substance.
Reproductive toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains reproductive data for this substance.
Specific target organ system toxicity: Causes damage to the lung, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
Specific target organ system toxicity - single exposure: No effects known.
Aspiration hazard: May be fatal if swallowed and enters airways.
Subacute to chronic toxicity: The Registry of Toxic Effects of Chemical Substances (RTECS) contains multiple dose toxicity data for this substance.
Additional toxicological information: To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.

12 Ecological information

Toxicity:
Aquatic toxicity: No further relevant information available.
Persistence and degradability: No further relevant information available.
Bioaccumulative potential: No further relevant information available.
Mobility in soil: No further relevant information available.
Additional ecological information:
General notes:
Do not allow product to reach ground water, watercourse or sewage system, even in small quantities.
Danger to drinking water if even extremely small quantities leak into the ground.
Avoid transfer into the environment.

Results of PBT and vPvB assessment:
PBT: Not applicable.
vPvB: Not applicable.
Other adverse effects: No further relevant information available.

13 Disposal considerations

Waste treatment methods
Recommendation: Consult state, local or national regulations to ensure proper disposal.

Uncleaned packagings:
Recommendation: Disposal must be made according to official regulations.

14 Transport information

UN-Number DOT, IMDG, IATA: UN1114

UN proper shipping name
DOT: RO Benzene
IMDG, IATA: BENZENE

Transport hazard class(es)

<table>
<thead>
<tr>
<th></th>
<th>Class</th>
<th>Label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT</td>
<td>3</td>
<td>3</td>
<td>Flammable liquids.</td>
</tr>
</tbody>
</table>

United States of America
Safety Data Sheet
per OSHA HazCom 2012

Product name: Benzene

Label
IMDG, IATA

Class
Label
3 Flammable liquids.

Packing group
DOT, IMDG, IATA
II

Environmental hazards:
Not applicable.

Special precautions for user
Warning: Flammable liquids

EMS Number:
F-E-S-D

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

Transport/Additional information:

DOT
Hazardous substance: 10 lbs, 4.54 kg
Marine Pollutant (DOT): No

UN "Model Regulation": UN1114, Benzene, 3, II

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

GHS label elements The product is classified and labeled in accordance with 29 CFR 1910 (OSHA HCS)

Hazard pictograms

GHS02 GHS07 GHS08

Signal word Danger

Hazard statements
H225 Highly flammable liquid and vapor.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H372 Causes damage to the lungs, the kidneys, the liver, the spleen, the blood, the brain and the endocrine system through prolonged or repeated exposure. Route of exposure: Oral, Inhalative, Dermal.
H304 May be fatal if swallowed and enters airways.

Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor/…
P303+P361+P353 If on skin (or hair). 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.
P405 Store locked up.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

National regulations
All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory. All components of this product are listed on the Canadian Domestic Substances List (DSL).

SARA Section 313 (specific toxic chemical listings)
71-43-2 Benzene

California Proposition 65
Prop 65 - Chemicals known to cause cancer
71-43-2 Benzene

Prop 65 - Developmental toxicity
71-43-2 Benzene

Prop 65 - Developmental toxicity, female Substance is not listed.

Prop 65 - Developmental toxicity, male
71-43-2 Benzene

Information about limitation of use:
Workers are not allowed to be exposed to this hazardous material. Exceptions can be made by the authorities in certain cases.
For use only by technically qualified individuals.

Other regulations, limitations and prohibitive regulations
Substance of Very High Concern (SVHC) according to the REACH Regulations (EC) No. 1907/2006. Substance is not listed.
The conditions of restrictions according to Article 67 and Annex VII of the Regulation (EC) No 1907/2006 (REACH) for the manufacturing, placing on the market and use must be observed.

Substance is not listed.

Annex XIV of the REACH Regulations (requiring Authorisation for use) Substance is not listed.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

Department issuing SDS: Global Marketing Department

Date of preparation / last revision 11/22/2015 -

Abbreviations and acronyms:
ADS: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
EINECS: European Inventory of Existing Commercial Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent
vPvB: very Persistent and very Bioaccumulative
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Beryllium
Product Number: 378135
Brand: Aldrich
CAS-No.: 7440-41-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 2), H330
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Specific target organ toxicity - repeated exposure (Category 1), H372

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H301  Toxic if swallowed.
H315  Causes skin irritation.
H317  May cause an allergic skin reaction.
H319  Causes serious eye irritation.
H330  Fatal if inhaled.
H335  May cause respiratory irritation.
H350  May cause cancer.
Causes damage to organs through prolonged or repeated exposure.

Precautionary statement(s)
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.
P264 Wash 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.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284 Wear respiratory protection.
P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Rinse mouth.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
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.
P308 + P313 IF exposed or concerned: Get medical advice/attention.
P333 + P313 If skin irritation or rash occurs: Get medical advice/attention.
P337 + P313 If eye irritation persists: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Formula : Be
Molecular weight : 9.01 g/mol
CAS-No. : 7440-41-7
EC-No. : 231-150-7

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beryllium foil</td>
<td>Acute Tox. 3; Acute Tox. 2; Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 1B; STOT SE3; STOT RE 1; H301, H315, H317, H319, H330, H335, H350, H372</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. 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
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

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
Beryllium oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.

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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
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
Keep container tightly closed in a dry and well-ventilated place.
Keep in a dry place.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters
<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beryllium foil</td>
<td>7440-41-7</td>
<td>TWA</td>
<td>2.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEIL</td>
<td>5.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peak</td>
<td>25.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>2.0000000 microg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
</tbody>
</table>

Remarks

- Z27.29-1970
  - CEIL 5.0000000 microg/m³ USA. Occupational Exposure Limits (OSHA) - Table Z-2
- Z27.29-1970
  - Peak 25.0000000 microg/m³ USA. Occupational Exposure Limits (OSHA) - Table Z-2
- Z27.29-1970
  - TWA 0.000050 mg/m³ USA. ACGIH Threshold Limit Values (TLV)

Beryllium sensitization
Chronic beryllium disease (berylliosis)
Confirmed human carcinogen
Danger of cutaneous absorption
Sensitizer

C 0.000500 mg/m³ USA. NIOSH Recommended Exposure Limits

Potential Occupational Carcinogen
See Appendix A

See Table Z-2

<table>
<thead>
<tr>
<th>TWA</th>
<th>2.0000000 microg/m³</th>
<th>USA. Occupational Exposure Limits (OSHA) - Table Z-2</th>
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</thead>
<tbody>
<tr>
<td>Z27.29-1970</td>
<td></td>
<td></td>
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</tbody>
</table>

CEIL 5.0000000 microg/m³ USA. Occupational Exposure Limits (OSHA) - Table Z-2

Z27.29-1970

Peak 25.0000000 microg/m³ USA. Occupational Exposure Limits (OSHA) - Table Z-2

Z27.29-1970

Peak 25.0000000 microg/m³ USA. Occupational Exposure Limits (OSHA) - Table Z-2

TWA 0.000050 mg/m³ USA. ACGIH Threshold Limit Values (TLV)
Chronic beryllium disease (berylliosis)
Adopted values or notations enclosed are those for which changes are proposed in the NIC
See Notice of Intended Changes (NIC)
Confirmed human carcinogen
Danger of cutaneous absorption
Sensitizer

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>USA. NIOSH Recommended Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.000500 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen
See Appendix A

See Table Z-2

<table>
<thead>
<tr>
<th></th>
<th>USA. Occupational Exposure Limits (OSHA) - Table Z-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>2 microgram per cubic meter</td>
</tr>
<tr>
<td>CEIL</td>
<td>5 microgram per cubic meter</td>
</tr>
<tr>
<td>Peak</td>
<td>25 microgram per cubic meter</td>
</tr>
</tbody>
</table>

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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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.

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: grey</td>
</tr>
<tr>
<td>b) Odour</td>
<td>odourless</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>Melting point/range: 1,278 °C (2,332 °F) - lit.</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>2,970 °C (5,378 °F) - lit.</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>1.85 g/cm³ at 25 °C (77 °F)</td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>No data available</td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>p) Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>q) Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>r) Viscosity</td>
<td>No data available</td>
</tr>
<tr>
<td>s) Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>t) Oxidizing properties</td>
<td>No data available</td>
</tr>
</tbody>
</table>

9.2 Other safety information
No data available

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**
Alkali metals

10.6 **Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

11. **TOXICOLOGICAL INFORMATION**

11.1 **Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available

Dermal: No data available

LD50 Intravenous - Rat - 0.496 mg/kg
Remarks: Liver: Hepatitis (hepatocellular necrosis), zonal.

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
No data available

**Germ cell mutagenicity**
Hamster
Lungs
Result: negative

**Carcinogenicity**
Carcinogenicity - Rat - Intratracheal
Tumorigenic: Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration: Tumors. Lungs, Thorax, or Respiration: Bronchiogenic carcinoma.

Carcinogenicity - Rabbit - Intravenous
Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal: Tumors.

Possible human carcinogen

IARC: 1 - Group 1: Carcinogenic to humans (Beryllium foil)
NTP: Known to be human carcinogen (Beryllium foil)
Known to be human carcinogen
The reference note has been added by TD based on the background information of the NTP. (Beryllium foil)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
No data available
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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1567      Class: 6.1 (4.1)      Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1567      Class: 6.1 (4.1)      Packing group: II      EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER

IATA
UN number: 1567      Class: 6.1 (4.1)      Packing group: II
Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beryllium foil</td>
<td>7440-41-7</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

| Beryllium foil | CAS-No. 7440-41-7 | Revision Date 1993-04-24 |

Pennsylvania Right To Know Components

| Beryllium foil | CAS-No. 7440-41-7 | Revision Date 1993-04-24 |

New Jersey Right To Know Components

| Beryllium foil | CAS-No. 7440-41-7 | Revision Date 1993-04-24 |

California Prop. 65 Components

| Beryllium foil | CAS-No. 7440-41-7 | Revision Date 2008-10-10 |

WARNING! This product contains a chemical known to the State of California to cause cancer.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

| Acute Tox. | Acute toxicity |
| Carc. | Carcinogenicity |
| Eye Irrit. | Eye irritation |
| H301 | Toxic if swallowed. |
| H315 | Causes skin irritation. |
| H317 | May cause an allergic skin reaction. |
| H319 | Causes serious eye irritation. |
| H330 | Fatal if inhaled. |
| H335 | May cause respiratory irritation. |
| H350 | May cause cancer. |
| H372 | Causes damage to organs through prolonged or repeated exposure. |
| Skin Irrit. | Skin irritation |
| Skin Sens. | Skin sensitisation |

HMIS Rating

Health hazard: 4
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 4
Fire Hazard: 3
Reactivity Hazard: 3

Further information

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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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling
or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing
slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
1. IDENTIFICATION

Catalog Number / Product Name: 31274 / Benzo(k)fluoranthene Standard
Company: Restek Corporation
Address: 110 Benner Circle
         Bellefonte, Pa. 16823
Phone#: 814-353-1300
Fax#: 814-353-1309
Emergency#: 800-424-9300 (CHEMTREC)
         703-527-3887 (Outside the US)
Email: www.restek.com
Revision Number: 10
Intended use: For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
- Flammable Liquid Category 2
- Serious Eye Damage/Eye Irritation Category 2
- Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

GHS Signal Word: Danger

GHS Hazard: Highly flammable liquid and vapour.
Causes serious eye irritation.
May cause drowsiness or dizziness.

GHS Precautions:

Safety Precautions:
- Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilation and lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Wash hands and skin thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.
  Continue rinsing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- If eye irritation persists: Get medical advice/attention.
- In case of fire: Use extinguishing media in section 5 for extinction.

Storage:
- Store in a well-ventilated place. Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Store locked up.

Disposal:
- Dispose of contents/container according to section 13 of the SDS.
Single Exposure Target Organs: No data available.
Repeated Exposure Target Organs: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>EINEC #</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>200-662-2</td>
<td>99.900000</td>
</tr>
<tr>
<td>benzo (k) fluoranthene</td>
<td>207-08-9</td>
<td>205-916-6</td>
<td>0.100000</td>
</tr>
</tbody>
</table>

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately.

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from
incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>IDLH</th>
<th>ACGIH STEL</th>
<th>ACGIH TLV-TWA</th>
<th>OSHA Exposure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>2500 ppm</td>
<td>500 ppm</td>
<td>250 ppm TWA</td>
<td>1000 ppm TWA; 2400 mg/m3 TWA</td>
</tr>
<tr>
<td>benzo (k) fluoranthene</td>
<td>207-08-9</td>
<td>ND</td>
<td>No TLV</td>
<td>No data available.</td>
<td></td>
</tr>
</tbody>
</table>

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapors from handling or thermal processing.

Respiratory Protection: No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Medical Conditions Aggravated By Exposure: Respiratory disease including asthma and bronchitis.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance, color:</td>
<td>Depends upon product selection</td>
</tr>
<tr>
<td>Odor:</td>
<td>Strong</td>
</tr>
<tr>
<td>Physical State:</td>
<td>No data available.</td>
</tr>
<tr>
<td>pH:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Vapor Density:</td>
<td>2.0 (air = 1)</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Melting Point:</td>
<td>-95.4 °C Melting Point</td>
</tr>
<tr>
<td>Flash Point:</td>
<td>39</td>
</tr>
<tr>
<td>Flammability:</td>
<td>Highly Flammable</td>
</tr>
<tr>
<td>Upper Flammable/Explosive Limit%</td>
<td>No data available.</td>
</tr>
<tr>
<td>Lower Flammable/Explosive Limit%</td>
<td>No data available.</td>
</tr>
<tr>
<td>Autoignition Temperature:</td>
<td>465 deg C</td>
</tr>
<tr>
<td>Decomposition Temperature:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Specific Gravity:</td>
<td>0.7845 g/cm3 at 25 °C</td>
</tr>
<tr>
<td>Evaporation Rate:</td>
<td>No data available.</td>
</tr>
<tr>
<td>Odor Threshold:</td>
<td>ND</td>
</tr>
<tr>
<td>Solubility:</td>
<td>Complete; 100%</td>
</tr>
<tr>
<td>Partition Coefficient: n-octanol</td>
<td>No data available.</td>
</tr>
<tr>
<td>in water:</td>
<td></td>
</tr>
<tr>
<td>VOC % by weight:</td>
<td>0</td>
</tr>
<tr>
<td>Molecular Weight:</td>
<td>58.08</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

| Stability:                      | Stable under normal conditions.               |
| Conditions to Avoid:            | No data available.                            |
| Materials to Avoid / Chemical Incompatibility: | Strong oxidizing agents Strong acids |
| Hazardous Decomposition Products: | Carbon dioxide Carbon monoxide |

11. TOXICOLOGICAL INFORMATION

| Routes of Entry:                | Inhalation, Skin Contact, Eye Contact, Ingestion |
| Target Organs Potentially Affected By Exposure: | Eyes, Central nervous system stimulation, Respiratory Tract, Skin |
| Chemical Interactions That Change Toxicity:     | None Known                                    |

Immediate (Acute) Health Effects by Route of Exposure:
Inhalation Irritation: Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Can cause minor skin irritation, defatting, and dermatitis.

Eye Contact: Can cause minor irritation, tearing and reddening.

Ingestion Irritation: May be harmful if swallowed.

Ingestion Toxicity: Harmful if swallowed. May cause systemic poisoning.

**Long-Term (Chronic) Health Effects:**

- **Carcinogenicity:** Contains a probable or known human carcinogen.
- **Reproductive and Developmental Toxicity:** No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Inhalation:

Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact:

Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

**Component Toxicological Data:**

**NIOSH:**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>Dermal LD50 Rabbit &gt;15700 mg/kg; Oral LD50 Rat 5800 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h</td>
</tr>
</tbody>
</table>

**Component Carcinogenic Data:**

**OSHA:**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo(k)fluoranthene</td>
<td>207-08-9</td>
<td>Present</td>
</tr>
</tbody>
</table>

**ACGIH:**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>A4 - Not Classifiable as a Human Carcinogen</td>
</tr>
</tbody>
</table>

**NIOSH:**

No data available.

**NTP:**

No data available.

**IARC:**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data.</td>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>No data.</td>
<td></td>
<td>Group 2A</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene</td>
<td>207-08-9</td>
<td>Group 2B</td>
</tr>
</tbody>
</table>

**12. ECOLOGICAL INFORMATION**

- **Overview:** This material is not expected to be harmful to the ecology.
- **Mobility:** No data
- **Persistence:** No data
- **Bioaccumulation:** No data
- **Degradability:** No data
- **Ecological Toxicity Data:** No data available.

**13. DISPOSAL CONSIDERATIONS**

- **Waste Description of Spent Product:** Spent or discarded material is a hazardous waste.
- **Disposal Methods:** Dispose of by incineration following Federal, State, Local, or Provincial regulations.
- **Waste Disposal of Packaging:** Comply with all Local, State, Federal, and Provincial Environmental Regulations.

**14. TRANSPORTATION INFORMATION**

**United States:**

- **DOT Proper Shipping Name:** Acetone
- **UN Number:** UN1090
Hazard Class: 3
Packing Group: II

International:
IATA Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

Marine Pollutant: No

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>Marine Pollutan</th>
<th>Severe Marine Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>benzo (k) fluoranthene</td>
<td>207-08-9</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

No data available.

15. REGULATORY INFORMATION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>CERCLA</th>
<th>SARA 313</th>
<th>SARA EHS 313</th>
<th>TSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>benzo (k) fluoranthene</td>
<td>207-08-9</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The following chemicals are listed on CA Prop 65:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzo[k]fluoranthene</td>
<td>207-08-9</td>
<td>Prop 65 Cancer</td>
</tr>
</tbody>
</table>

State Right To Know Listing:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>benzo (k) fluoranthene</td>
<td>207-08-9</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Prior Version Date: 05/15/15
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available.

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SAFETY DATA SHEET

1. Identification

Product Name     Carbazole
Cat No. :         AC108260000; AC108260010; AC108260050; AC108260250; AC108262500; AC108265000
Synonyms         9-Azafluorene; Dibenzopyrrole; Diphenylenimine
Recommended Use  Laboratory chemicals.
Uses advised against No Information available

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Respiratory system. | |

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause cancer
Precautionary Statements

Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area

Response
IF exposed or concerned: Get medical attention/advice

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

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

Storage
Store locked up
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)
Very toxic to aquatic life with long lasting effects

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>9H-Carbazole</td>
<td>86-74-8</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. Obtain 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. Obtain medical attention.

Ingestion         Clean mouth with water. Get medical attention.

Most important symptoms/effects No information available.
Notes to Physician Treat symptomatically

5. Fire-fighting measures
Suitable Extinguishing Media

Unsuitable Extinguishing Media
No information available

Flash Point
Method -
No information available

Autoignition Temperature
540 °C / 1004 °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
Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Nitrogen oxides (NOx) 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
Health 2 Flammability 1 Instability 0 Physical hazards N/A

6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment. Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up
Sweep up or vacuum up spillage and collect in suitable container for disposal. 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 ingest. Use only in area provided with appropriate exhaust ventilation.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

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

Hygiene Measures

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>Beige</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>240 - 246 °C / 464 - 474.8 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>355 °C / 671 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>220 °C / 428 °F</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>400 mmHg @ 323 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Relative Density</td>
<td>1.1</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>540 °C / 1004 °F</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>C12 H9 N</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>167.21</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Hazard</td>
<td>None known, based on information available</td>
</tr>
<tr>
<td>Stability</td>
<td>Stable under normal conditions.</td>
</tr>
<tr>
<td>Conditions to Avoid</td>
<td>Incompatible products.</td>
</tr>
<tr>
<td>Incompatible Materials</td>
<td>Strong oxidizing agents, Strong bases</td>
</tr>
<tr>
<td>Hazardous Decomposition Products</td>
<td>Nitrogen oxides (NOx), Carbon monoxide (CO), Carbon dioxide (CO₂)</td>
</tr>
<tr>
<td>Hazardous Polymerization</td>
<td>Hazardous polymerization does not occur.</td>
</tr>
<tr>
<td>Hazardous Reactions</td>
<td>None under normal processing.</td>
</tr>
</tbody>
</table>

11. Toxicological information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity</td>
<td></td>
</tr>
<tr>
<td>Product Information</td>
<td></td>
</tr>
<tr>
<td>Component Information</td>
<td></td>
</tr>
<tr>
<td>Component</td>
<td>LD50 Oral</td>
</tr>
<tr>
<td>9H-Carbazole</td>
<td>&gt;5000 mg/kg ( Rat )</td>
</tr>
<tr>
<td>LD50 Dermal</td>
<td>Not listed</td>
</tr>
<tr>
<td>LC50 Inhalation</td>
<td>Not listed</td>
</tr>
<tr>
<td>Toxicologically Synergistic  Products</td>
<td>No information available</td>
</tr>
<tr>
<td>Delayed and immediate effects as well as chronic effects from short and long-term exposure</td>
<td></td>
</tr>
</tbody>
</table>
Irritation
No information available

Sensitization
No information available

Carcinogenicity
The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

<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>9H-Carbazole</td>
<td>86-74-8</td>
<td>Group 2B</td>
<td>Not listed</td>
<td>Not listed</td>
<td>X</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
No information available

Endocrine Disruptor Information
No information available

Other Adverse Effects
The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

<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>9H-Carbazole</td>
<td>6.7 mg/L EC50 = 60 h</td>
<td>1 mg/L LC50 48 h</td>
<td>EC50 = 10.6 mg/L 15 min EC50 = 11.6 mg/L 30 min EC50 = 13.6 mg/L 5 min</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Insoluble in water Persistence is unlikely

Bioaccumulation/ Accumulation
No information available.

Mobility
Is not likely mobile in the environment due its low water solubility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>9H-Carbazole</td>
<td>3.84</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
UN-No
UN3077
Proper Shipping Name
Environmentally hazardous substance, solid, n.o.s.
Proper technical name
9H-Carbazole
Hazard Class
9
Packing Group
III
UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s.
Hazard Class 9
Packing Group III

IATA
UN-No UN3077
Proper Shipping Name Environmentally hazardous substance, solid, n.o.s.
Hazard Class 9
Packing Group III

IMDG/IMO
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

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>9H-Carbazole</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>201-696-0</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 Hazardous Categorization

<table>
<thead>
<tr>
<th>Acute Health Hazard</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Health Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

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 contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
</table>

Page 6 / 7
<table>
<thead>
<tr>
<th>Compound</th>
<th>CAS Number</th>
<th>Classification</th>
<th>Value</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>9H-Carbazole</td>
<td>86-74-8</td>
<td>Carcinogen</td>
<td>4.1 µg/day</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

**State Right-to-Know**

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
- **Canada**: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

**WHMIS Hazard Class**

D2A Very toxic materials

---

**16. Other information**

<table>
<thead>
<tr>
<th>Prepared By</th>
<th>Regulatory Affairs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thermo Fisher Scientific</td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:EMSDS.RA@thermofisher.com">EMSDS.RA@thermofisher.com</a></td>
</tr>
</tbody>
</table>

**Creation Date**

14-May-2010

**Revision Date**

23-Dec-2014

**Print Date**

23-Dec-2014

**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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

*End of SDS*
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Chlordane - Sandy Loam 2
Product Number: CRM825
Brand: Sigma-Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), H373
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H350 May cause cancer.
H373 May cause damage to organs through prolonged or repeated exposure if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
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.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz</td>
<td>Carc. 2; STOT RE 2; H351, H373</td>
<td>&gt;= 90 - &lt;= 100 %</td>
</tr>
</tbody>
</table>

| Chlordane | Acute Tox. 3; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301 + H311, H351, H410 | < 0.1 % |

CAS-No. 14808-60-7
EC-No. 238-878-4
Index-No. 602-047-00-8

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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
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

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

silicon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available
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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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
Keep container tightly closed in a dry and well-ventilated place.
Store at Room Temperature.
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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz</td>
<td>14808-60-7</td>
<td>TWA</td>
<td>0.025 mg/m3</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks: Suspected human carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>0.025 mg/m3</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks: Lung cancer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks: Pulmonary fibrosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks: Suspected human carcinogen</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
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
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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 | No data available |
| e) Melting point/freezing point | No data available |
| f) Initial boiling point and boiling range | No data available |
| g) Flash point | No data available |
| 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 | No data available |
| l) Vapour density | No data available |
| m) Relative density | No data available |
| 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
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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available
Dermal: No data available
No data available

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: 1 - Group 1: Carcinogenic to humans (Quartz)
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: Known to be human carcinogen (Quartz)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available
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: Not available
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Liver - Irregularities - Based on Human Evidence
Liver - Irregularities - Based on Human Evidence
Nerves. - (Chlordane)

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
</table>

Quartz 14808-60-7 1994-04-01
Chlordane 57-74-9 2007-07-01

Pennsylvania Right To Know Components
Quartz 14808-60-7 1994-04-01
Chlordane 57-74-9 2007-07-01

New Jersey Right To Know Components
Quartz 14808-60-7 1994-04-01

California Prop. 65 Components
Quartz 14808-60-7 2007-09-28
Chlordane 57-74-9 2007-09-28

16. OTHER INFORMATION
Full text of H-Statements referred to under sections 2 and 3.

Acute Tox. Acute toxicity
Aquatic Acute Acute aquatic toxicity
Aquatic Chronic Chronic aquatic toxicity
Carc. Carcinogenicity
H301 + H311 Toxic if swallowed or in contact with skin
H350 May cause cancer.
H351 Suspected of causing cancer.
H373 May cause damage to organs through prolonged or repeated exposure if inhaled.
H402 Harmful to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.
H412 Harmful to aquatic life with long lasting effects.
STOT RE Specific target organ toxicity - repeated exposure

HMIS Rating
Health hazard: 0
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating
Health hazard: 0
Fire Hazard: 0
Reactivity Hazard: 0

Further information
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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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling
or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing
slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 04/21/2015 Print Date: 05/13/2016
# SAFETY DATA SHEET
Methyl Chloride (R40)

## Section 1. Identification

<table>
<thead>
<tr>
<th>GHS product identifier</th>
<th>Methyl Chloride (R40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>chloromethane</td>
</tr>
<tr>
<td>Other means of identification</td>
<td>methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)</td>
</tr>
<tr>
<td>Product use</td>
<td>Synthetic/Analytical chemistry.</td>
</tr>
<tr>
<td>Synonym</td>
<td>methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)</td>
</tr>
<tr>
<td>SDS #</td>
<td>001036</td>
</tr>
</tbody>
</table>
| Supplier's details     | Airgas USA, LLC and its affiliates  
259 North Radnor-Chester Road  
Suite 100  
Radnor, PA 19087-5283  
1-610-687-5253 |
| Emergency telephone number (with hours of operation) | 1-866-734-3438 |

## Section 2. Hazards identification

<table>
<thead>
<tr>
<th>OSHA/HCS status</th>
<th>This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).</th>
</tr>
</thead>
</table>
| Classification of the substance or mixture | FLAMMABLE GASES - Category 1  
GASES UNDER PRESSURE - Liquefied gas  
ACUTE TOXICITY (inhalation) - Category 4  
CARCINOGENICITY - Category 2  
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (central nervous system (CNS)) - Category 2 |

**GHS label elements**

**Hazard pictograms**: [Image of pictograms]

**Signal word**: Danger

**Hazard statements**:  
Extremely flammable gas.  
May form explosive mixtures with air.  
Contains gas under pressure; may explode if heated.  
May cause frostbite.  
May displace oxygen and cause rapid suffocation.  
Harmful if inhaled.  
Suspected of causing cancer.  
May cause damage to organs through prolonged or repeated exposure. (central nervous system (CNS))

## Precautionary statements

| Date of issue/Date of revision | 5/20/2015. | Date of previous issue | 10/15/2014. | Version | 0.03 | 1/14 |
Section 2. Hazards identification

General: Read and follow all Safety Data Sheets (SDS’S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention: Never Put cylinders into unventilated areas of passenger vehicles. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Do not breathe gas. Use and store only outdoors or in a well ventilated place.

Response: Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage: Store locked up. Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal: Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified: Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

Substance/mixture: Substance
Chemical name: chloromethane
Other means of identification: methyl chloride; Methane, chloro-; Methane, chloro- (methyl chloride)

CAS number/other identifiers

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>100</td>
<td>74-87-3</td>
</tr>
</tbody>
</table>

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
Section 4. First aid measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact: Liquid can cause burns similar to frostbite.
Inhalation: Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Skin contact: Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.
Frostbite: Try to warm up the frozen tissues and seek medical attention.
Ingestion: Ingestion of liquid can cause burns similar to frostbite.

Over-exposure signs/symptoms

Eye contact: Adverse symptoms may include the following: frostbite
Inhalation: No specific data.
Skin contact: Adverse symptoms may include the following: frostbite
Ingestion: Adverse symptoms may include the following: frostbite

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments: No specific treatment.
Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)
Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media: Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Gas may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back, causing fire or explosion.

Hazardous thermal decomposition products: Decomposition products may include the following materials:
- carbon dioxide
- carbon monoxide
- halogenated compounds
- carbonyl halides

Special protective actions for fire-fighters: 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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

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. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: Accidental releases pose a serious fire or explosion hazard. 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. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions: Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. 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 and materials for containment and cleaning up

Small spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.
Section 7. Handling and storage

Precautions for safe handling

**Protective measures**: Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>ACGIH TLV (United States, 3/2012). Absorbed through skin. TWA: 50 ppm 8 hours. TWA: 103 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 207 mg/m³ 15 minutes. OSHA PEL 1989 (United States, 3/1989). TWA: 50 ppm 8 hours. TWA: 105 mg/m³ 8 hours. STEL: 100 ppm 15 minutes. STEL: 210 mg/m³ 15 minutes. OSHA PEL Z2 (United States, 11/2006). TWA: 100 ppm 8 hours. CEIL: 200 ppm AMP: 300 ppm 5 minutes.</td>
</tr>
</tbody>
</table>

Appropriate engineering controls

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. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
Section 8. Exposure controls/personal protection

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.

Individual protection measures

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.

Eye/face protection: 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, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection: 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. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection: 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. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection: 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.

Section 9. Physical and chemical properties

Appearance

Physical state: Gas. [Liquefied compressed gas.]
Color: Colorless.
Molecular weight: 50.49 g/mole
Molecular formula: C-H3-Cl
Boiling/condensation point: -23.7°C (-10.7°F)
Melting/freezing point: -97°C (-142.6°F)
Critical temperature: 143.65°C (290.6°F)
Odor: Mild. Sweetish.
Odor threshold: Not available.
pH: Not available.
Flash point: Closed cup: 10°C (50°F)
Section 9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burning time</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Burning rate</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.</td>
</tr>
<tr>
<td>Lower and upper explosive (flamable) limits</td>
<td>Lower: 8.1%  Upper: 17.4%</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>58.7  (psig)</td>
</tr>
<tr>
<td>Vapor density</td>
<td>1.8  (Air = 1)</td>
</tr>
<tr>
<td>Specific Volume (ft^3/lb)</td>
<td>1.0977</td>
</tr>
<tr>
<td>Gas Density (lb/ft^3)</td>
<td>0.911  (25°C / 77 to °F)</td>
</tr>
<tr>
<td>Relative density</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Solubility</td>
<td>Not available.</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>5.32 g/l</td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>0.91</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>632°C (1169.6°F)</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>SADT</td>
<td>Not available.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not applicable.</td>
</tr>
</tbody>
</table>

Section 10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactivity</td>
<td>No specific test data related to reactivity available for this product or its ingredients.</td>
</tr>
<tr>
<td>Chemical stability</td>
<td>The product is stable.</td>
</tr>
<tr>
<td>Possibility of hazardous reactions</td>
<td>Under normal conditions of storage and use, hazardous reactions will not occur.</td>
</tr>
<tr>
<td>Conditions to avoid</td>
<td>Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow gas to accumulate in low or confined areas.</td>
</tr>
<tr>
<td>Incompatibility with various substances</td>
<td>Extremely reactive or incompatible with the following materials: oxidizing materials.</td>
</tr>
<tr>
<td>Hazardous decomposition products</td>
<td>Under normal conditions of storage and use, hazardous decomposition products should not be produced.</td>
</tr>
<tr>
<td>Hazardous polymerization</td>
<td>Under normal conditions of storage and use, hazardous polymerization will not occur.</td>
</tr>
</tbody>
</table>

Date of issue/Date of revision : 5/20/2015.  Date of previous issue : 10/15/2014.  Version : 0.03
Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>8300 ppm</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

Irritation/Corrosion
Not available.

Sensitization
Not available.

Mutagenicity
Not available.

Carcinogenicity
Not available.

Classification

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>OSHA</th>
<th>IARC</th>
<th>NTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

Reproductive toxicity
Not available.

Teratogenicity
Not available.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>Category 2</td>
<td>Not determined</td>
<td>central nervous system (CNS)</td>
</tr>
</tbody>
</table>

Aspiration hazard
Not available.

Information on the likely routes of exposure
Not available.

Potential acute health effects

Eye contact
Liquid can cause burns similar to frostbite.

Inhalation
Harmful if inhaled. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Skin contact
Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Ingestion
Ingestion of liquid can cause burns similar to frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact
Adverse symptoms may include the following:
\[\text{frostbite}\]
Section 11. Toxicological information

**Inhalation**
- No specific data.

**Skin contact**
- Adverse symptoms may include the following: frostbite

**Ingestion**
- Adverse symptoms may include the following: frostbite

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**
- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Long term exposure**
- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Potential chronic health effects**
- General: May cause damage to organs through prolonged or repeated exposure.
- Carcinogenicity: Suspected of causing 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.

**Numerical measures of toxicity**

**Acute toxicity estimates**
- Not available.

Section 12. Ecological information

**Toxicity**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>Acute LC50 270000 µg/l Marine water</td>
<td>Fish - Menidia beryllina</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

**Persistence and degradability**
- Not available.

**Bioaccumulative potential**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP_{ow}</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>0.91</td>
<td>-</td>
<td>low</td>
</tr>
</tbody>
</table>

**Mobility in soil**

*Powered by IHS*
Section 12. Ecological information

**Soil/water partition coefficient (K\text{OC})**

: Not available.

**Other adverse effects**

: No known significant effects or critical hazards.

Section 13. Disposal considerations

**Disposal methods**

: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

United States - RCRA Toxic hazardous waste "U" List

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS #</th>
<th>Status</th>
<th>Reference number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methyl chloride (I,T); Methane, chloro- (I, T)</td>
<td>74-87-3</td>
<td>Listed</td>
<td>U045</td>
</tr>
</tbody>
</table>

Section 14. Transport information

<table>
<thead>
<tr>
<th>DOT</th>
<th>TDG</th>
<th>Mexico</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN number</td>
<td>UN1063</td>
<td>UN1063</td>
<td>UN1063</td>
<td>UN1063</td>
</tr>
<tr>
<td>UN proper shipping name</td>
<td>METHYL CHLORIDE, OR REFRIGERANT GAS R 40</td>
<td>METHYL CHLORIDE; OR REFRIGERANT GAS R 40</td>
<td>METHYL CHLORIDE, OR REFRIGERANT GAS R 40</td>
<td>METHYL CHLORIDE (REFRIGERANT GAS R 40)</td>
</tr>
<tr>
<td>Transport hazard class(es)</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Packing group</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional information</td>
<td>Reportable quantity: 100 lbs / 45.4 kg</td>
<td>Explosive Limit and Limited Quantity Index: 0.125</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Limited quantity: Yes.</td>
<td>ERAP Index: 3000</td>
<td>Passenger Carrying Aircraft Quantity limitation: 5 kg</td>
<td>Passenger and Cargo Aircraft/Quantity limitation: 0 Forbidden</td>
</tr>
<tr>
<td></td>
<td>Packaging instruction: Passenger aircraft</td>
<td>Passenger Carrying Ship Index: Forbidden</td>
<td>Cargo aircraft</td>
<td>Cargo Aircraft Only</td>
</tr>
<tr>
<td></td>
<td>Quantity limitation: 100 kg</td>
<td>Passenger Carrying Road or Rail Index: Forbidden</td>
<td>-</td>
<td>Quantity limitation: 100 kg</td>
</tr>
</tbody>
</table>

**Date of issue/Date of revision**: 5/20/2015.  
**Date of previous issue**: 10/15/2014.  
**Version**: 0.03
### Section 14. Transport information

<table>
<thead>
<tr>
<th>Special provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>T50</td>
</tr>
</tbody>
</table>

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

**Special precautions for user:** Transport within user’s premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:** Not available.

### Section 15. Regulatory information

**U.S. Federal regulations**

- Clean Water Act (CWA) 307: chloromethane
- Clean Air Act (CAA) 112 regulated toxic substances: chloromethane
- **Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs):** Listed
- **Clean Air Act Section 602 Class I Substances:** Not listed
- **Clean Air Act Section 602 Class II Substances:** Not listed
- **DEA List I Chemicals (Precursor Chemicals):** Not listed
- **DEA List II Chemicals (Essential Chemicals):** Not listed
- **SARA 302/304**
  - SARA 304 RQ: Not applicable.
- **SARA 311/312**
  - **Classification:** Fire hazard
    - Sudden release of pressure
    - Immediate (acute) health hazard
    - Delayed (chronic) health hazard

**Composition/information on ingredients**

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>chloromethane</td>
<td>100</td>
<td>Yes.</td>
<td>Yes.</td>
<td>No.</td>
<td>Yes.</td>
<td>Yes.</td>
</tr>
</tbody>
</table>

**SARA 313**

**Date of issue/Date of revision:** 5/20/2015

**Date of previous issue:** 10/15/2014

**Version:** 0.03

powered by IHS
Section 15. Regulatory information

<table>
<thead>
<tr>
<th>Product name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form R - Reporting requirements</td>
<td>chloromethane</td>
<td>74-87-3</td>
</tr>
<tr>
<td>Supplier notification</td>
<td>chloromethane</td>
<td>74-87-3</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts: This material is listed.
New York: This material is listed.
New Jersey: This material is listed.
Pennsylvania: This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

<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>chloromethane</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
</tr>
</tbody>
</table>

Canada inventory: This material is listed or exempted.

International regulations

International lists

Australia inventory (AICS): This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals: Not listed
Chemical Weapons Convention List Schedule II Chemicals: Not listed
Chemical Weapons Convention List Schedule III Chemicals: Not listed

Canada

WHMIS (Canada): Class A: Compressed gas.
Class B-1: Flammable gas.
Class B-6: Reactive flammable material.
Class D-2A: Material causing other toxic effects (Very toxic).

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.
Section 16. Other information

Canada Label requirements : Class A: Compressed gas.  
Class B-1: Flammable gas.  
Class B-6: Reactive flammable material  
Class D-2A: Material causing other toxic effects (Very toxic).

Hazardous Material Information System (U.S.A.)

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History
Date of printing : 5/20/2015.
Date of issue/Date of revision : 5/20/2015.
Date of previous issue : 10/15/2014.
Version : 0.03
Key to abbreviations : ATE = Acute Toxicity Estimate  
BCF = Bioconcentration Factor  
GHS = Globally Harmonized System of Classification and Labelling of Chemicals  
IATA = International Air Transport Association  
IBC = Intermediate Bulk Container  
IMDG = International Maritime Dangerous Goods  
LogPow = logarithm of the octanol/water partition coefficient  
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists  
AIHA – American Industrial Hygiene Association  
CAS – Chemical Abstract Services  
CEPA – Canadian Environmental Protection Act  
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

References

\[
\text{Not available.}
\]

\[
\text{Indicates information that has changed from previously issued version.}
\]

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
1. Identification

Product Name Chromium

Cat No. : C318-500

Synonyms Chrome

Recommended Use Laboratory chemicals.

Uses advised against No Information available

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)

Specific target organ toxicity (single exposure) Category 3
Target Organs - Respiratory system.

Label Elements

Signal Word Warning

Hazard Statements
May cause respiratory irritation

Precautionary Statements
Prevention
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
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

Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up

Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Very toxic to aquatic life

---

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

---

4. First-aid measures

General Advice
If symptoms persist, call a physician.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain 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. Obtain medical attention.

Ingestion
Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects
None reasonably foreseeable.

Notes to Physician
Treat symptomatically

---

5. Fire-fighting measures

Unsuitable Extinguishing Media
Carbon dioxide (CO2)

Flash Point
Not applicable

Method -
No information available

Autoignition Temperature
Not applicable

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
Dust can form an explosive mixture in air. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Chromium oxide

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>2</td>
<td>1</td>
<td>1</td>
<td>N/A</td>
</tr>
</tbody>
</table>
6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation. Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Environmental Precautions
Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up
Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling
Avoid dust formation. Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>TWA: 0.5 mg/m³</td>
<td>(Vacated) TWA: 1 mg/m³ TWA: 1 mg/m³</td>
<td>IDLH: 250 mg/m³ TWA: 0.5 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>TWA: 0.5 mg/m³</td>
<td>TWA: 0.5 mg/m³</td>
<td>TWA: 0.5 mg/m³</td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

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>Powder</td>
</tr>
<tr>
<td>Appearance</td>
<td>Silver</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>No information available</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>1857.2 °C / 3375 °F</td>
</tr>
</tbody>
</table>
### 10. Stability and reactivity

**Reactive Hazard**
None known, based on information available

**Stability**
Sensitive to air.

**Conditions to Avoid**

**Incompatible Materials**
Strong oxidizing agents, Strong acids

**Hazardous Decomposition Products**
Chromium oxide

**Hazardous Polymerization**
Hazardous polymerization does not occur.

**Hazardous Reactions**
None under normal processing.

### 11. Toxicological information

**Acute Toxicity**

**Component Information**

**Toxicologically Synergistic Products**
No information available

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation**
May cause irritation of respiratory tract

**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>Chromium</td>
<td>7440-47-3</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**
Respiratory system

**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. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms.

<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>Chromium</td>
<td>Not listed</td>
<td>LC50: 14.3 mg/l/96 H (Pimephales promelas)</td>
<td>Not listed</td>
<td>EC50: 0.07 mg/l/48 H</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Insoluble in water

Bioaccumulation / Accumulation
No information available.

Mobility
Is not likely mobile in the environment due its low 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
<table>
<thead>
<tr>
<th>UN-No</th>
<th>ENVIROMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN-No</td>
<td>ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>9</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
</tr>
<tr>
<td>TDG Not regulated</td>
<td></td>
</tr>
<tr>
<td>UN-No UN3077</td>
<td></td>
</tr>
<tr>
<td>Hazard Class</td>
<td>9</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
</tr>
<tr>
<td>IATA UN-No UN3077</td>
<td></td>
</tr>
<tr>
<td>Hazard Class</td>
<td>9</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
</tr>
</tbody>
</table>

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>Chromium</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-157-5</td>
<td>-</td>
<td>X</td>
<td>-</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.
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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>7440-47-3</td>
<td>&gt;95</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Clean Water Act

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depletors</th>
<th>Class 2 Ozone Depletors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OSHA Occupational Safety and Health Administration

Not applicable

CERCLA

Not applicable

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chromium</td>
<td>5000 lb 10 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65

This product does not contain any Proposition 65 chemicals

State Right-to-Know

<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>Chromium</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</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

Revision Date 21-Jul-2015
Mexico - Grade  
No information available

Canada  
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class  
D2B  Toxic materials

16. Other information

Prepared By  
Regulatory Affairs  
Thermo Fisher Scientific  
Email: EMSDS.RA@thermofisher.com

Creation Date  
13-Sep-2013

Revision Date  
21-Jul-2015

Print Date  
21-Jul-2015

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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name : Chrysene
Product Number : 35754
Brand : Sigma-Aldrich
Index-No. : 601-048-00-0
CAS-No. : 218-01-9

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet
Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
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 GHS Label elements, including precautionary statements
Pictogram
Signal word : Danger
Hazard statement(s)
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H410 Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Formula</th>
<th>Molecular weight</th>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_{18}H_{12}</td>
<td>228.29 g/mol</td>
<td>218-01-9</td>
<td>205-923-4</td>
<td>601-048-00-0</td>
</tr>
</tbody>
</table>

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysene</td>
<td>Muta. 2; Carc. 1B; Aquatic Acute 1; Aquatic Chronic 1; H341, H350, H410</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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
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

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
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.

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
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysene</td>
<td>218-01-9</td>
<td>TWA 0.200000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA 0.200000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
<tr>
<td>1910.1002</td>
<td></td>
<td></td>
<td>1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen</td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>0.100000 mg/m3</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen
NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar
products. cyclohexane-extractable fraction
See Appendix C
See Appendix A

### Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysene</td>
<td>218-01-9</td>
<td>1-Hydroxypyrene (1-HP)</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
<td></td>
</tr>
</tbody>
</table>

#### Remarks
End of shift at end of workweek

#### 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.

- **Full contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

- **Splash contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

  data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Body Protection**
impervious 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 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.
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  No data available
e) Melting point/freezing point  Melting point/range: 252 - 254 °C (486 - 489 °F) - lit.
f) Initial boiling point and boiling range  448 °C (838 °F) - lit.
g) Flash point  No data available
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  No data available
l) Vapour density  No data available
m) Relative density  No data available
n) Water solubility  insoluble
o) Partition coefficient: n-octanol/water  log Pow: 5.73
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

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
11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

**Acute toxicity**
No data available
Inhalation: No data available
Dermal: No data available
LD50 Intraperitoneal - Mouse - > 320 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**
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

**Carcinogenicity**
This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.
Possible human carcinogen

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Chrysene)
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: OSHA specifically regulated carcinogen (Chrysene)

**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: GC0700000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 1.90 mg/l - 2 h
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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life.
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077   Class: 9   Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chrysene)
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 3077   Class: 9   Packing group: III   EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chrysene)
Marine pollutant:yes

IATA
UN number: 3077   Class: 9   Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chrysene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysene</td>
<td>218-01-9</td>
<td>1994-04-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

Cas-No.  
Revision Date
### Chrysene

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>218-01-9</td>
<td>1994-04-01</td>
</tr>
</tbody>
</table>

### Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>218-01-9</td>
<td>1994-04-01</td>
</tr>
</tbody>
</table>

### New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>218-01-9</td>
<td>1994-04-01</td>
</tr>
</tbody>
</table>

### California Prop. 65 Components

**WARNING!** This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>218-01-9</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

- **Aquatic Acute**
  - Acute aquatic toxicity
- **Aquatic Chronic**
  - Chronic aquatic toxicity
- **Carc.**
  - Carcinogenicity
- **H341**
  - Suspected of causing genetic defects.
- **H350**
  - May cause cancer.
- **H400**
  - Very toxic to aquatic life.
- **H410**
  - Very toxic to aquatic life with long lasting effects.

### HMIS Rating

- Health hazard: 0
- Chronic Health Hazard: *
- Flammability: 0
- Physical Hazard: 0

### NFPA Rating

- Health hazard: 0
- Fire Hazard: 0
- Reactivity Hazard: 0

### Further Information

Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

### Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 03/04/2015 Print Date: 05/13/2016
SAFETY DATA SHEET

1. Identification

Product Name: cis-1,2-Dichloroethylene
Cat No.: AC113380000; AC113380025; AC113380100; AC113380500
Synonyms: cis-Acetylene dichloride.
Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

- Flammable liquids: Category 2
- Acute oral toxicity: Category 4
- Acute Inhalation Toxicity - Vapors: Category 4
- Skin Corrosion/irritation: Category 2
- Serious Eye Damage/Eye Irritation: Category 4
- Specific target organ toxicity (single exposure): Category 2
- Target Organs - Respiratory system: Category 3

Label Elements

Signal Word
Danger

Hazard Statements

- Highly flammable liquid and vapor
- Harmful if swallowed
- Harmful if inhaled
- Causes serious eye irritation
- Causes skin irritation
- May cause respiratory irritation
Precautionary Statements

Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Avoid breathing dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product

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 if you feel unwell

Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation occurs: Get medical advice/attention

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
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell

Fire
Explosion risk in case of fire
Fight fire with normal precautions from a reasonable distance
Evacuate area

Storage
Store in a well-ventilated place. Keep cool
Store in a closed container
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>cis-1,2-Dichloroethylene</td>
<td>156-59-2</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. Obtain 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. Obtain medical attention.

**Ingestion**
Do not induce vomiting. Obtain medical attention.

**Most important symptoms/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

**Suitable Extinguishing Media**
Water spray. Carbon dioxide (CO₂). Dry chemical. Use water spray to cool unopened containers. Chemical foam.

**Unsuitable Extinguishing Media**
No information available

**Flash Point**
6 °C / 42.8 °F

**Autoignition Temperature**
440 °C / 824 °F

**Explosion Limits**
- Upper: 12.80%
- Lower: 9.70%

**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**
Hydrogen chloride gas, 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.

### 6. Accidental release measures

**Personal Precautions**
Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Avoid contact with skin, eyes and clothing.

**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.

### 7. Handling and storage

**Handling**
Ensure adequate ventilation. Wear personal protective equipment. Use explosion-proof equipment. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges.

**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

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>cis-1,2-Dichloroethylene</td>
<td>TWA: 200 ppm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>cis-1,2-Dichloroethylene</td>
<td></td>
<td>TWA: 200 ppm</td>
<td></td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

Engineering Measures

Ensure adequate ventilation, especially in confined areas. 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.

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>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>aromatic</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>-80 °C / -112 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>60 °C / 140 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>6 °C / 42.8 °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>12.80%</td>
</tr>
<tr>
<td>Lower</td>
<td>9.70%</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>201 mmHg @ 25 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>3.34 (Air = 1.0)</td>
</tr>
<tr>
<td>Relative Density</td>
<td>1.280</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>440 °C / 824 °F</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>C2 H2 Cl2</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>96.94</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

Reactive Hazard

None known, based on information available

Stability

Stable under normal conditions.
Conditions to Avoid
Keep away from open flames, hot surfaces and sources of ignition. Exposure to air. Exposure to light. Incompatible products. Exposure to moist air or water.

Incompatible Materials
Bases

Hazardous Decomposition Products
Hydrogen chloride gas, 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

**Delayed and immediate effects as well as chronic effects from short and long-term exposure**

**Irritation**
Irritating to eyes, respiratory system and skin

**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>cis-1,2-Dichloroethylene</td>
<td>156-59-2</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**
Respiratory system

**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. See actual entry in RTECS for complete information.

### 12. Ecological information

**Ecotoxicity**
Do not empty into drains. Do not flush into surface water or sanitary sewer system.

<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>cis-1,2-Dichloroethylene</td>
<td>Not listed</td>
<td>Not listed</td>
<td>EC₅₀ = 721 mg/L 5 min EC₅₀ = 905 mg/L 30 min</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

**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: UN1150
Proper Shipping Name: 1,2-DICHLOROETHYLENE
Hazard Class: 3
Packing Group: II

TDG

UN-No: UN1150
Proper Shipping Name: 1,2-DICHLOROETHYLENE
Hazard Class: 3
Packing Group: II

IATA

UN-No: 1150
Proper Shipping Name: 1,2-DICHLOROETHYLENE
Hazard Class: 3
Packing Group: II

IMDG/IMO

UN-No: 1150
Proper Shipping Name: 1,2-DICHLOROETHYLENE
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>cis-1,2-Dichloroethylene</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>205-859-7</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.
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 Database 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 Hazardous Categorization

Acute Health Hazard: Yes
Chronic Health Hazard: No
Fire Hazard: Yes
cis-1,2-Dichloroethylene

Sudden Release of Pressure Hazard: No
Reactive Hazard: No

Clean Water Act: Not applicable
Clean Air Act: Not applicable
OSHA Occupational Safety and Health Administration: Not applicable

CERCLA

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>cis-1,2-Dichloroethylene</td>
<td>1000 lb</td>
<td></td>
</tr>
</tbody>
</table>

California Proposition 65: This product does not contain any Proposition 65 chemicals

State Right-to-Know

<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>cis-1,2-Dichloroethylene</td>
<td>X</td>
<td>-</td>
<td>X</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

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
B2  Flammable liquid
D1B  Toxic materials
D2B  Toxic materials

16. Other information

Prepared By: Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date: 22-Sep-2009
Revision Date: 10-Feb-2015
Print Date: 10-Feb-2015
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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
SAFETY DATA SHEET

COPPER

Section 1. Identification

GHS product identifier : COPPER
Chemical name : Mixture
CAS number : Mixture
Other means of identification : CC01053472
Product type : liquid

Relevant identified uses of the substance or mixture and uses advised against
Product use : Industrial applications. Plastics.
Supplier’s details : POLYONE CORPORATION
ColorMatrix Group Inc.
680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA
+1 216 622 0100

Emergency telephone number (with hours of operation) : CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).

Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 2

GHS label elements
Hazard pictograms

- !

Signal word: Warning
Hazard statements: Causes skin irritation.

Precautionary statements

General: Not applicable.
Prevention: Wear protective gloves. Wash hands thoroughly after handling.
Response: IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
Storage: Not applicable.
Disposal: Not applicable.
Supplemental label elements: None known.
Hazards not otherwise classified: None known.

Section 3. Composition/information on ingredients

Substance/mixture: Mixture
Chemical name: Mixture
Other means of identification: CC01053472

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous Compounds Distillates, petroleum, hydrotreated middle</td>
<td>10 - 30</td>
<td>Not available.</td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>5 - 10</td>
<td>13463-67-7</td>
</tr>
</tbody>
</table>

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.
Section 4. First aid measures

Description of necessary first aid measures

Eye contact
- Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation
- Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact
- Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion
- Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact  :  Causes serious eye irritation.
Inhalation  :  No known significant effects or critical hazards.
Skin contact  :  Causes skin irritation.
Ingestion  :  Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact  :  Adverse symptoms may include the following: pain or irritation.
Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media: In case of fire, use water spray (fog), foam, dry chemical or CO₂.
Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical
Hazardous thermal decomposition products: In a fire or if heated, a pressure increase will occur and the container may burst.
Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides

Special protective actions for fire-fighters: 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.

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.
For non-emergency personnel: 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. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel”.

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 and materials for containment and cleaning up

Small spill: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill: Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, watercourses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. 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.

Section 7. Handling and storage

Precautions for safe handling

Protective measures: Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. 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.
Advice on general occupational hygiene: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. 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. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>OSHA PEL 1989 (1989-03-01) PEL: Permissible Exposure Level 10 mg/m3 Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (1993-06-30) PEL: Permissible Exposure Level 15 mg/m3 Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>ACGIH TLV (1996-05-18) TLV-TWA: Threshold Limit Value - Time weighted average PEL: Permissible Exposure Level 10 mg/m3</td>
</tr>
</tbody>
</table>

Appropriate engineering controls: Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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.

Individual protection measures

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
Eye/face protection: 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, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection: 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. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection: 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.

Other skin protection: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection: 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.

Section 9. Physical and chemical properties

Appearance

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>liquid [liquid]</td>
</tr>
<tr>
<td>Color</td>
<td>BROWN</td>
</tr>
<tr>
<td>Odor</td>
<td>Faint odor.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not available.</td>
</tr>
<tr>
<td>pH</td>
<td>Not available.</td>
</tr>
<tr>
<td>Melting point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Boiling point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Burning time</td>
<td>Not available.</td>
</tr>
</tbody>
</table>
Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.
Chemical stability : Stable under recommended storage and handling conditions (see Section 7).
Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid : Keep away from extreme heat and oxidizing agents.
Incompatible materials : Keep away from strong acids.
Oxidizer.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
POLYONE CORPORATION

SAFETY DATA SHEET

COPPER

Version Number 1.1
Revision Date 05/18/2015
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Print Date 05/21/2015

<table>
<thead>
<tr>
<th>LC50 Inhalation</th>
<th>Rat - Male</th>
<th>LD50 Dermal</th>
<th>Rabbit</th>
<th>6.82 Mg/l</th>
<th>&gt; 5,000 mg/kg</th>
<th>4 h</th>
</tr>
</thead>
</table>

Conclusion/Summary : Mixture. Not fully tested.

Irritation/Corrosion

Conclusion/Summary

Skin : Mixture. Not fully tested.
Eyes : Mixture. Not fully tested.
Respiratory : Mixture. Not fully tested.

Sensitization

Conclusion/Summary

Skin : Mixture. Not fully tested.
Respiratory : Mixture. Not fully tested.

Mutagenicity

Conclusion/Summary : Mixture. Not fully tested.

Carcinogenicity

Conclusion/Summary : Mixture. Not fully tested.

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>OSHA</th>
<th>IARC</th>
<th>NTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td></td>
<td>2B</td>
<td></td>
</tr>
</tbody>
</table>

Reproductive toxicity

Conclusion/Summary : Mixture. Not fully tested.

Teratogenicity

Conclusion/Summary : Mixture. Not fully tested.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9/15</td>
</tr>
</tbody>
</table>
COPPER

Information on the likely routes of exposure

Potential acute health effects

Eye contact : Causes serious eye irritation.
Inhalation : No known significant effects or critical hazards.
Skin contact : Causes skin irritation.
Ingestion : Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness
Inhalation : No specific data.
Skin contact : Adverse symptoms may include the following:
irritation
redness
Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.
Potential delayed effects : Not available.

Potential chronic health effects

General : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
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.

Numerical measures of toxicity

Acute toxicity estimates

<table>
<thead>
<tr>
<th>Route</th>
<th>ATE value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation (dusts and mists)</td>
<td>7.81 mg/l</td>
</tr>
</tbody>
</table>

Section 12. Ecological information

Toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>Acute LC50 &gt; 1,000,000 µg/l</td>
<td>Fish - Mummichog</td>
<td>96 h</td>
</tr>
<tr>
<td></td>
<td>Marine water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 &gt; 1,000 mg/l Fresh</td>
<td>Fish - Fathead minnow</td>
<td>96 h</td>
</tr>
<tr>
<td></td>
<td>water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13 mg/l Fresh water</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Water flea</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 6.5 mg/l Fresh water</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Water flea</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 19.3 mg/l Fresh water</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Water flea</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 27.8 mg/l Fresh water</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Water flea</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 35.306 mg/l Fresh</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion/Summary: Not available.

Persistence and degradability

Conclusion/Summary: Not available.

Bioaccumulative potential

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogPow</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>352.00</td>
<td>low</td>
<td></td>
</tr>
</tbody>
</table>
Mobility in soil

Soil/water partition coefficient (KOC): Not available.
Other adverse effects: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Acute hazardous waste "P" List: Not listed
United States - RCRA Toxic hazardous waste "U" List: Not listed

Section 14. Transport information

U.S. DOT Classification: Not regulated for transportation.
ICAO/IATA: Not classified as dangerous good under transport regulations.
IMO/IMDG (maritime): Not classified as dangerous good under transport regulations.

Section 15. Regulatory information

U.S. Federal regulations: United States - TSCA 12(b) - Chemical export notification: None of the components are listed.
United States - TSCA 4(a) - Final Test Rules: Not listed
United States - TSCA 4(a) - ITC Priority list: Not listed
United States - TSCA 4(a) - Proposed test rules: Not listed
United States - TSCA 4(f) - Priority risk review: Not listed
United States - TSCA 5(a)2 - Final significant new use rules: Not listed
United States - TSCA 5(a)2 - Proposed significant new use rules: Not listed
United States - TSCA 5(e) - Substances consent order: Not listed
United States - TSCA 6 - Final risk management: Not listed
United States - TSCA 6 - Proposed risk management: Not listed
United States - TSCA 8(a) - Chemical risk rules: Not listed
United States - TSCA 8(a) - Dioxin/Furane precursor: Not listed
United States - TSCA 8(a) - Chemical Data Reporting (CDR): Not determined
United States - TSCA 8(a) - Preliminary assessment report (PAIR): Not listed
United States - TSCA 8(c) - Significant adverse reaction (SAR): Not listed
United States - TSCA 8(d) - Health and safety studies: Not listed
United States - EPA Clean water act (CWA) section 307 - Priority pollutants: Not listed
United States - EPA Clean water act (CWA) section 311 - Hazardous substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances: Not listed
United States - Department of commerce - Precursor chemical: Not listed

Clean Air Act Section 112(b) : Not listed
Hazardous Air Pollutants (HAPs) : Not listed
Clean Air Act Section 602 Class I Substances : Not listed
Clean Air Act Section 602 Class II Substances : Not listed
DEA List I Chemicals (Precursor Chemicals) : Not listed
DEA List II Chemicals (Essential Chemicals) : Not listed

US. EPA CERCLA Hazardous Substances (40 CFR 302) : not applicable

SARA 311/312
Classification : Immediate (acute) health hazard
## Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous Compounds</td>
<td>10 - 30</td>
<td>AH</td>
</tr>
<tr>
<td>Distillates, petroleum, hydrotreated middle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>5 - 10</td>
<td>CH</td>
</tr>
</tbody>
</table>

### SARA 313
Not applicable.

### State regulations

<table>
<thead>
<tr>
<th>State</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts</td>
<td>The following components are listed:</td>
</tr>
<tr>
<td></td>
<td>Mica</td>
</tr>
<tr>
<td></td>
<td>Iron oxide</td>
</tr>
<tr>
<td></td>
<td>Titanium dioxide</td>
</tr>
<tr>
<td>New York</td>
<td>None of the components are listed.</td>
</tr>
<tr>
<td>New Jersey</td>
<td>The following components are listed:</td>
</tr>
<tr>
<td></td>
<td>Mica</td>
</tr>
<tr>
<td></td>
<td>Iron oxide</td>
</tr>
<tr>
<td></td>
<td>Titanium dioxide</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>The following components are listed:</td>
</tr>
<tr>
<td></td>
<td>Iron oxide</td>
</tr>
<tr>
<td></td>
<td>Titanium dioxide</td>
</tr>
</tbody>
</table>

### California Prop. 65
WARNING: This product contains a chemical known to the State of California to cause cancer.

### United States inventory (TSCA 8b)
All components are listed or exempted.

### Canada inventory
All components are listed or exempted.

### International regulations

<table>
<thead>
<tr>
<th>International lists</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia inventory (AICS)</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Taiwan inventory (CSNN)</td>
<td>Not determined.</td>
</tr>
<tr>
<td>Malaysia Inventory (EHS Register)</td>
<td>Not determined.</td>
</tr>
<tr>
<td>EINECS</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Japan inventory</td>
<td>Not determined.</td>
</tr>
<tr>
<td>China inventory (IECSC)</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>Korea inventory</td>
<td>All components are listed or exempted.</td>
</tr>
<tr>
<td>New Zealand Inventory of Chemicals (NZIoC)</td>
<td>Not determined.</td>
</tr>
</tbody>
</table>
Philippines inventory (PICCS): All components are listed or exempted.

Chemical Weapons Convention
List Schedule I Chemicals : Not listed
Chemical Weapons Convention
List Schedule II Chemicals : Not listed
Chemical Weapons Convention
List Schedule III Chemicals : Not listed

Section 16. Other information

History
Date of printing : 05/21/2015
Date of issue/Date of revision : 05/18/2015
Date of previous issue : 10/30/2014
Version : 1.1
Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.
1. IDENTIFICATION

Catalog Number / Product Name: 31276 / Dibenzo(a,h)anthracene Standard
Company: Restek Corporation
Address: 110 Benner Circle
Beliefonte, Pa. 16823
Phone#: 814-353-1300
Fax#: 814-353-1309
Emergency#: 800-424-9300 (CHEMTREC)
703-527-3887 (Outside the US)
Email: www.restek.com
Revision Number: 7
Intended use: For Laboratory use only

2. HAZARD(S) IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
Carcinogenicity Category 2

GHS Signal Word:
Warning

GHS Hazard:
Suspected of causing cancer.

GHS Safety Precautions:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
IF exposed or concerned: Get medical advice/attention.

Storage:
Store locked up.

Disposal:
Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs:
No data available.

Repeated Exposure Target Organs:
No data available.

3. COMPOSITION / INFORMATION ON INGREDIENT

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>EINEC #</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>200-838-9</td>
<td>99.900000</td>
</tr>
<tr>
<td>dibenz (a,h) anthracene</td>
<td>53-70-3</td>
<td>200-181-8</td>
<td>0.100000</td>
</tr>
</tbody>
</table>

4. FIRST-AID MEASURES
Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately.

Eyes: Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire.

Fire and/or Explosion Hazards: No data.

Fire Fighting Methods and Protection: Use methods for the surrounding fire.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including: the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area.


8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>IDLH</th>
<th>ACGIH STEL</th>
<th>ACGIH TLV-TWA</th>
<th>OSHA Exposure Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>2300 ppm IDLH</td>
<td>No data available.</td>
<td>50 ppm TWA</td>
<td>25 ppm TWA; 125 ppm STEL (15 min. TWA)</td>
</tr>
<tr>
<td>dibenz (a,h) anthracene</td>
<td>53-70-3</td>
<td>No data available.</td>
<td>No data available.</td>
<td>No data available.</td>
<td>No data available.</td>
</tr>
</tbody>
</table>

Personal Protection:

Engineering Measures: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

Respiratory Protection: Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying.

31276, 31276-5XX, & 31376 / Dibenzo (a,h) anthracene Standard
Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Medical Conditions Aggravated By Exposure: Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color: Colorless
Odor: Strong
Physical State: No data available.
Peroxidation State: No data available.
Solubility: No data available.

10. STABILITY AND REACTIVITY

Stability: Stable under normal conditions.
Conditions to Avoid: No data available. Contamination High temperatures
Materials to Avoid / Chemical Incompatibility: Strong oxidizing agents Caustics (bases)
Hazardous Decomposition Products: Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation Absorption Ingestion Skin contact Eye contact
Target Organs Potentially Affected By Exposure: Skin, Cardiovascular System, Eyes, Liver
Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation: Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity: Harmful! Can cause systemic damage (see "Target Organs) Inhalation may cause severe central nervous system depression (including unconsciousness).
Skin Contact: Contact causes severe skin irritation and possible burns.
Skin Absorption: Harmful if absorbed through the skin. May cause severe irritation and systemic damage.
Eye Contact: Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible.
Ingestion Irritation: Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.
Ingestion Toxicity: Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects: Contains a probable or known human carcinogen.
Carcinogenicity: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Inhalation: Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache. Harmful! Can cause systemic
Skin Absorption:
Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage.

Component Toxicological Data:
NIOSH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>LD50/LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane, dichloro-</td>
<td>75-09-2</td>
<td>Inhalation LC50 Rat 53 mg/L 6 h</td>
</tr>
</tbody>
</table>

Component Carcinogenic Data:
OSHA:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to achieve the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; (OSHA - 29 CFR 1910 Specifically Regulate Dibenz[a,h]anthracene 53-70-3 Present</td>
</tr>
</tbody>
</table>

ACGIH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans</td>
</tr>
</tbody>
</table>

NIOSH:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>potential occupational carcinogen</td>
</tr>
</tbody>
</table>

NTP:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IARC:
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Group No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data</td>
<td></td>
<td>Group 1</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>Group 2A</td>
</tr>
<tr>
<td>Dibenz[a,h]anthracene</td>
<td>53-70-3</td>
<td>Group 2A</td>
</tr>
<tr>
<td>No data</td>
<td></td>
<td>Group 2B</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

Overview: Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.
Mobility: No data
Persistence: No data
Bioaccumulation: No data
Degradability: No data
Ecological Toxicity Data: No data available.

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.
Disposal Methods: Incinerate spent or discarded material a permitted hazardous waste facility.
Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:
<table>
<thead>
<tr>
<th>DOT Proper Shipping Name</th>
<th>UN Number</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>UN1593</td>
<td>6.1</td>
<td>III</td>
</tr>
</tbody>
</table>
International:
IATA Proper Shipping Name: Dichloromethane
UN Number: UN1593
Hazard Class: 6.1
Packing Group: III

Marine Pollutant: No

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>Marine Pollutant</th>
<th>Severe Marine Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>No data available.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. REGULATORY INFORMATION

United States:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>CERCLA</th>
<th>SARA 313</th>
<th>SARA EHS 313</th>
<th>TSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>dibenz (a,h) anthracene</td>
<td>53-70-3</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
</tbody>
</table>

The following chemicals are listed on CA Prop 65:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS #</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>Prop 65 Cancer</td>
</tr>
<tr>
<td>Dichloromethane (Methylene chloride)</td>
<td></td>
<td>Prop 65 Cancer</td>
</tr>
<tr>
<td>Dibenz[a,h]anthracene</td>
<td>53-70-3</td>
<td>Prop 65 Cancer</td>
</tr>
</tbody>
</table>

State Right To Know Listing:

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS#</th>
<th>New Jersey</th>
<th>Massachusetts</th>
<th>Pennsylvania</th>
<th>California</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichloromethane</td>
<td>75-09-2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>dibenz (a,h) anthracene</td>
<td>53-70-3</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Prior Version Date: 05/15/14
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References: No data available.
Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Dieldrin

Product Number: 33491
Brand: Sigma-Aldrich
Index-No.: 602-049-00-9

CAS-No.: 60-57-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Dermal (Category 1), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Oral (Category 1), H372
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 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H300 + H310: Fatal if swallowed or in contact with skin
H351: Suspected of causing cancer.
H372: Causes damage to organs through prolonged or repeated exposure if swallowed.
H410: Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201: Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.

Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.

Do not get in eyes, on skin, or on clothing.

Wash skin thoroughly after handling.

Do not eat, drink or smoke when using this product.

Avoid release to the environment.

Wear protective gloves/ protective clothing/ eye protection/ face protection.

IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.

IF ON SKIN: Gently wash with plenty of soap and water. Immediately call a POISON CENTER or doctor/ physician.

IF exposed or concerned: Get medical advice/ attention.

Take off contaminated clothing and wash before reuse.

Collect spillage.

Store locked up.

Dispose of contents/ container to an approved waste disposal plant.

---

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,7,8,8a-octahydro-6,7-epoxy-1,4:5,8-dimethanonaphthalene

Formula: $\text{C}_{12}\text{H}_8\text{Cl}_6\text{O}$

Molecular weight: 380.91 g/mol

CAS-No.: 60-57-1

EC-No.: 200-484-5

Index-No.: 602-049-00-9

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. Take victim immediately to hospital. Consult a physician.

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. 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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>60-57-1</td>
<td>TWA</td>
<td>0.100000 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Central Nervous System impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Liver damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reproductive effects</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
</tr>
</tbody>
</table>
### Danger of cutaneous absorption

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.250000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
</tr>
</tbody>
</table>

**Potential Occupational Carcinogen**

See Appendix A

**Potential for dermal absorption**

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.250000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
</tbody>
</table>

**Skin designation**

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.1 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
</tr>
</tbody>
</table>

- Central Nervous System impairment
- Liver damage
- Reproductive effects
- Confirmed animal carcinogen with unknown relevance to humans
- Danger of cutaneous absorption

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.25 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
</tr>
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</table>

**Potential Occupational Carcinogen**

See Appendix A

**Potential for dermal absorption**

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.25 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
</tbody>
</table>

**Skin designation**

<table>
<thead>
<tr>
<th>Description</th>
<th>TWA</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.25 mg/m³</td>
<td>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
<td></td>
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</table>

**Skin notation**

<table>
<thead>
<tr>
<th>Description</th>
<th>PEL</th>
<th>USA</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL</td>
<td>0.25 mg/m³</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</td>
<td></td>
</tr>
</tbody>
</table>

### 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.

**Full contact**

Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

**Splash contact**

Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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.

### 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
  - No data available
- **e)** Melting point/freezing point
  - Melting point/range: 143 - 144 °C (289 - 291 °F) - lit.
- **f)** Initial boiling point and boiling range
  - No data available
- **g)** Flash point
  - No data available
- **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
  - No data available
- **l)** Vapour density
  - No data available
- **m)** Relative density
  - No data available
- **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
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
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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

**Acute toxicity**
LD50 Oral - Rat - 38.3 mg/kg
Inhalation: No data available
Dermal: No data available

No data available

**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**
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available

No data available
Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Ingestion - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
No data available

Additional Information
RTECS: IO1750000
Discomfort, Headache, Nausea, Vomiting, Dizziness, Tremors, tonic convulsions, clonic spasms, Coma., respiratory failure. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Blood - Irregularities - Based on Human Evidence
Blood - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish mortality LC50 - Carassius auratus (goldfish) - 1.6 µg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates Immobilization EC50 - Daphnia magna (Water flea) - 79.5 µg/l - 48 h

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Dieldrin)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Dieldrin)
Marine pollutant: yes
IATA
UN number: 2811    Class: 6.1    Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s. (Dieldrin)
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>60-57-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>60-57-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>60-57-1</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dieldrin</td>
<td>60-57-1</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.       Acute toxicity
Aquatic Acute    Acute aquatic toxicity
Aquatic Chronic  Chronic aquatic toxicity
Carc.            Carcinogenicity
H300             Fatal if swallowed.
H300 + H310      Fatal if swallowed or in contact with skin
H310             Fatal in contact with skin.
H351             Suspected of causing cancer.
H372             Causes damage to organs through prolonged or repeated exposure if swallowed.

HMIS Rating
Health hazard:  4
Chronic Health Hazard: *
Flammability:  0
Physical Hazard 0

NFPA Rating
Health hazard:  4
Fire Hazard:  0
Reactivity Hazard: 0
Further information
Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5  Revision Date: 05/27/2016  Print Date: 07/04/2016
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name : Diesel Fuel No. 2
Product Number : UST147
Brand : Sigma-Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, Blood, H373
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373
For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements
Pictogram
Signal word : Warning
Hazard statement(s)
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
H336 May cause drowsiness or dizziness.
H351 Suspected of causing cancer.
H373 May cause damage to organs (Liver, Blood) through prolonged or repeated exposure if swallowed.
H373 May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled.
Precautionary statement(s)
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.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methylene chloride</strong></td>
<td>Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; STOT RE 2; H315, H319, H335, H336, H351, H373</td>
<td>&gt;= 90 - &lt;= 100 %</td>
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<tr>
<td>CAS-No.</td>
<td>75-09-2</td>
<td></td>
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<tr>
<td>EC-No.</td>
<td>200-838-9</td>
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</tr>
<tr>
<td>Index-No.</td>
<td>602-004-00-3</td>
<td></td>
</tr>
</tbody>
</table>

| **Fuels, diesel, no. 2** | Flam. Liq. 4; Carc. 2; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H227, H304, H336, H351, H411 | >= 0.1 - < 1 % |
| CAS-No.            | 68476-34-6                     |               |
| EC-No.             | 270-676-1                      |               |
| Index-No.          | 649-227-00-2                   |               |

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area. 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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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. Evacuate personnel to safe 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
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
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.
Store at Room Temperature.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>TWA</td>
<td>50.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Potential Occupational Carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Appendix A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Central Nervous System impairment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Carboxyhemoglobinemia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Substances for which there is a Biological Exposure Index or Indices (see BEI® section)</td>
</tr>
</tbody>
</table>
Confirmed animal carcinogen with unknown relevance to humans

**TWA** | 50 ppm | USA. ACGIH Threshold Limit Values (TLV)
---|---|---

Central Nervous System impairment
Carboxyhemoglobinemia
Substances for which there is a Biological Exposure Index or Indices (see BEI® section)
Confirmed animal carcinogen with unknown relevance to humans

Substance listed; for more information see OSHA document 1910.1052

Substance listed; for more information see OSHA document 1910.1052

See Table Z-2

**PEL** | 25.000000 ppm | OSHA Specifically Regulated Chemicals/Carcinogens
---|---|---

This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH₂Cl₂. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole
OSHA specifically regulated carcinogen

**PEL** | 25 ppm 87 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107)
---|---|---

see section 5202

**STEL** | 125.000000 ppm 435 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107)
---|---|---

see section 5202

**Fuels, diesel, no. 2** 68476-34-6

**TWA** | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV)
---|---|---

Dermatitis
Confirmed animal carcinogen with unknown relevance to humans
Danger of cutaneous absorption varies

**TWA** | 100.000000 mg/m3 | USA. ACGIH Threshold Limit Values (TLV)
---|---|---

Dermatitis
Confirmed animal carcinogen with unknown relevance to humans
Danger of cutaneous absorption varies

**TWA** | 100 mg/m3 | USA. ACGIH Threshold Limit Values (TLV)
---|---|---

Dermatitis
Confirmed animal carcinogen with unknown relevance to humans
Danger of cutaneous absorption varies
Biological occupational exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Parameters</th>
<th>Value</th>
<th>Biological specimen</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>Dichloromethane</td>
<td>0.3000 mg/l</td>
<td>Urine</td>
<td>ACGIH - Biological Exposure Indices (BEI)</td>
</tr>
</tbody>
</table>

Remarks: End of shift (As soon as possible after exposure ceases)

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 a full-face respirator with multi-purpose 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).

**Control of environmental exposure**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance Form: liquid
b) Odour No data available
c) Odour Threshold No data available
d) pH No data available
e) Melting point/freezing point No data available
f) Initial boiling point and boiling range No data available
g) Flash point No data available
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 No data available
l) Vapour density No data available
m) Relative density No data available
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

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
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available
No data available

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.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a
known or anticipated carcinogen by NTP.

OSHA: OSHA specifically regulated carcinogen (Methylene chloride)

**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: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

---

### 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**
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 **Other adverse effects**
No data available

---

### 13. DISPOSAL CONSIDERATIONS

13.1 **Waste treatment methods**

**Product**
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

---

### 14. TRANSPORT INFORMATION

**DOT (US)**
UN number: 1593  Class: 6.1  Packing group: III
Proper shipping name: Dichloromethane, solution
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

**IMDG**
UN number: 1593  Class: 6.1  Packing group: III  EMS-No: F-A, S-A
Proper shipping name: DICHLOROMETHANE, SOLUTION

IATA
UN number: 1593    Class: 6.1    Packing group: III
Proper shipping name: Dichloromethane, solution

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

| Methylene chloride | CAS-No. 75-09-2 | Revision Date 2007-07-01 |

Pennsylvania Right To Know Components

| Methylene chloride | CAS-No. 75-09-2 | Revision Date 2007-07-01 |

New Jersey Right To Know Components

| Methylene chloride | CAS-No. 75-09-2 | Revision Date 2007-07-01 |

California Prop. 65 Components

| Methylene chloride | CAS-No. 75-09-2 | Revision Date 2007-09-28 |

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute: Acute aquatic toxicity
Aquatic Chronic: Chronic aquatic toxicity
Asp. Tox.: Aspiration hazard
Carc.: Carcinogenicity
Eye Irrit.: Eye irritation
Flam. Liq.: Flammable liquids
H227: Combustible liquid.
H304: May be fatal if swallowed and enters airways.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H335: May cause respiratory irritation.
H336: May cause drowsiness or dizziness.
H351: Suspected of causing cancer.
H373: May cause damage to organs (H373) through prolonged or repeated exposure if swallowed.
H411: Toxic to aquatic life with long lasting effects.
Skin Irrit.: Skin irritation
STOT RE: Specific target organ toxicity - repeated exposure
STOT SE: Specific target organ toxicity - single exposure

HMIS Rating
Health hazard: 2
Chronic Health Hazard: *
Flammability: 0  
Physical Hazard: 1  

**NFPA Rating**
Health hazard: 2  
Fire Hazard: 0  
Reactivity Hazard: 0  

**Further information**
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**Preparation Information**
Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956  
Version: 5.7  Revision Date: 06/03/2016  Print Date: 07/04/2016
SAFETY DATA SHEET

1. Identification

Product Name
Ethylbenzene

Cat No.
AC433800000; AC433800010; AC433801000

Synonyms
Ethylbenzol; Phenylethane

Recommended Use
Laboratory chemicals.

Uses advised against
No Information available

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Entity / Business Name
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)

Flammable liquids
Category 2

Acute Inhalation Toxicity - Vapors
Category 4

Carcinogenicity
Category 2

Specific target organ toxicity (single exposure)
Category 3

Target Organs - Respiratory system, Central nervous system (CNS)

Specific target organ toxicity - (repeated exposure)
Category 2

Aspiration Toxicity
Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs through prolonged or repeated exposure
Precautionary Statements

Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
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
Keep cool

Response
IF exposed or concerned: Get medical attention/advice

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

Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting

Fire
In case of fire: Use CO2, dry chemical, or foam for extinction

Storage
Store locked up
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)
Harmful to aquatic life with long lasting effects

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. First-aid measures

General Advice
If symptoms persist, call a physician.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain 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. Obtain medical attention. Aspiration into lungs can produce severe lung damage.
Ingestion
Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms/effects
Breathing difficulties.. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting; May cause central nervous system depression

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

Unsuitable Extinguishing Media
Do not use a solid water stream as it may scatter and spread fire

Flash Point
15 °C / 59 °F
No information available

Autoignition Temperature
432 °C / 810 °F

Explosion Limits
Upper 6.8%
Lower 1.2%

Sensitivity to Mechanical Impact
No information available

Sensitivity to Static Discharge
Yes

Specific Hazards Arising from the Chemical
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. 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>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions
Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling
Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.
8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL (Vacated)</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>TWA: 20 ppm</td>
<td>TWA: 100 ppm</td>
<td>IDLH: 800 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) TWA: 100 ppm</td>
<td>TWA: 100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) TWA: 435 mg/m³</td>
<td>TWA: 435 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 125 ppm</td>
<td>TWA: 435 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 545 mg/m³</td>
<td>TWA: 435 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec (TWA)</th>
<th>Mexico OEL (TWA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>TWA: 100 ppm</td>
<td>TWA: 434 mg/m³</td>
</tr>
<tr>
<td></td>
<td>STEL: 125 ppm</td>
<td>STEL: 543 mg/m³</td>
</tr>
<tr>
<td></td>
<td>STEL: 545 mg/m³</td>
<td>STEL: 543 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>TWA: 20 ppm</td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. 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
Long sleeved clothing.

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>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>aromatic</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>-95 °C / -139 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>136 °C / 276.8 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>15 °C / 59 °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>6.8%</td>
</tr>
<tr>
<td>Lower</td>
<td>1.2%</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>Relative Density</td>
<td>0.860</td>
</tr>
<tr>
<td>Solubility</td>
<td>Slightly soluble in water</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
</tbody>
</table>
Autoignition Temperature 432 °C / 810 °F
Decomposition Temperature No information available
Viscosity No information available
Molecular Formula C8 H10
Molecular Weight 106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available
Stability Stable under normal conditions.
Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
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 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>Ethylbenzene</td>
<td>3500 mg/kg ( Rat )</td>
<td>15400 mg/kg ( Rabbit )</td>
<td>17.2 mg/L ( Rat ) 4 h</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 May cause eye, skin, and respiratory tract irritation
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>Ethylbenzene</td>
<td>100-41-4</td>
<td>Group 2B</td>
<td>Not listed</td>
<td>A3</td>
<td>X</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 2B - Possibly Carcinogenic to Humans
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
IARC: (International Agency for Research on Cancer)
Group 2A - Probably Carcinogenic to Humans
ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available
Reproductive Effects No information available.
Developmental Effects No information available.
Teratogenicity No information available.
STOT - single exposure Respiratory system Central nervous system (CNS)
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: May cause central nervous system depression

Endocrine Disruptor Information
No information available

Other Adverse Effects
See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity
Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

<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>Ethylbenzene</td>
<td>2.6 - 11.3 mg/L EC50 72 h 438 mg/L EC50 &gt; 96 h 4.6 mg/L EC50 = 72 h 1.7 - 7.6 mg/L EC50 96 h</td>
<td>9.6 mg/L LC50 96 h 9.1 - 15.6 mg/L LC50 96 h 32 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h 4.2 mg/L LC50 96 h 7.55 - 11 mg/L LC50 96 h</td>
<td>EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h</td>
<td>1.8 - 2.4 mg/L EC50 48 h</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Insoluble in water
Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation
No information available.

Mobility
Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>3.118</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
UN-No
UN1175
Proper Shipping Name
ETHYLBENZENE
Hazard Class
3
Packing Group
II

TDG
UN-No
UN1175
Proper Shipping Name
ETHYLBENZENE
Hazard Class
3
Packing Group
II

IATA
UN-No
UN1175
Proper Shipping Name
ETHYLBENZENE
Hazard Class
3
Packing Group
II

IMDG/IMO
UN-No
UN1175
Proper Shipping Name
ETHYLBENZENE
Hazard Class
3
Packing Group
II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed The product is classified and labeled
according to EC directives or corresponding national laws. The product is classified and labeled in accordance with Directive 1999/45/EC.

### 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>Ethylbenzene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>202-849-4</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.
- 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
- 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**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>&gt;95</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazardous Categorization**

- **Acute Health Hazard:** Yes
- **Chronic Health Hazard:** Yes
- **Fire Hazard:** Yes
- **Sudden Release of Pressure Hazard:** No
- **Reactive Hazard:** No

### Clean Water Act

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>X</td>
<td>1000 lb</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

### Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Deleterors</th>
<th>Class 2 Ozone Deleterors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OSHA** Occupational Safety and Health Administration

Not applicable

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>1000 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

**California Proposition 65**

This product contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>Carcinogen</td>
<td>54 µg/day</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>
Ethylbenzene  

State Right-to-Know

<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>Ethylbenzene</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</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
Serious risk, Grade 3

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
- B2 Flammable liquid
- D2A Very toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 06-Aug-2010
Revision Date 30-Oct-2014
Print Date 30-Oct-2014
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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Trichlorofluoromethane
Product Number: 254991
Brand: Aldrich
CAS-No.: 75-69-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Dermal (Category 4), H312

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning
Hazard statement(s)
H312 Harmful in contact with skin.
Precautionary statement(s)
P280 Wear protective gloves/ protective clothing.
P302 + P352 + P312 IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P363 Wash contaminated clothing before reuse.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms: Fluorotrichloromethane
CFC-11
Formula: $\text{CCl}_3\text{F} \text{CCl}_3\text{F}$
Molecular weight: 137.37 g/mol
CAS-No.: 75-69-4
EC-No.: 200-892-3

**Hazardous components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichlorofluoromethane</td>
<td>Acute Tox. 4; H312</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

**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**
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

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, Hydrogen fluoride

5.3 **Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 **Further information**
No data available

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. 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**
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 **Reference to other sections**
For disposal see section 13.
7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Recommended storage temperature 2 - 8 °C
Contents under pressure.
Storage class (TRGS 510): Non Combustible Liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichlorofluoromethane</td>
<td>75-69-4</td>
<td>C</td>
<td>1,000.000000 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks
Cardiac sensitization
Not classifiable as a human carcinogen

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>1,000.000000 ppm 5,600.000000 mg/m3</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>1,000.000000 ppm 5,600.000000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
</tbody>
</table>

The value in mg/m3 is approximate.

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.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 30 min
Material tested: Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

Data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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 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**

Do not let product enter drains.

---

### 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><strong>a) Appearance</strong></td>
<td>Form: liquid, clear</td>
</tr>
<tr>
<td></td>
<td>Colour: colourless</td>
</tr>
<tr>
<td><strong>b) Odour</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>c) Odour Threshold</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>d) pH</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>e) Melting point/freezing point</strong></td>
<td>-110.99 - -109.99 °C (-167.78 - -165.98 °F)</td>
</tr>
<tr>
<td><strong>f) Initial boiling point and boiling range</strong></td>
<td>23.7 °C (74.7 °F) - lit.</td>
</tr>
<tr>
<td><strong>g) Flash point</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>h) Evaporation rate</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>i) Flammability (solid, gas)</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>j) Upper/lower flammability or explosive limits</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>k) Vapour pressure</strong></td>
<td>885.7 hPa (664.3 mmHg) at 20.0 °C (68.0 °F)</td>
</tr>
<tr>
<td></td>
<td>2,701.2 hPa (2,026.1 mmHg) at 55.0 °C (131.0 °F)</td>
</tr>
<tr>
<td><strong>l) Vapour density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>m) Relative density</strong></td>
<td>1.494 g/cm3 at 25 °C (77 °F)</td>
</tr>
<tr>
<td><strong>n) Water solubility</strong></td>
<td>1 g/l</td>
</tr>
<tr>
<td><strong>o) Partition coefficient: n-octanol/water</strong></td>
<td>log Pow: 2.53</td>
</tr>
<tr>
<td><strong>p) Auto-ignition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>q) Decomposition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>r) Viscosity</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>s) Explosive properties</strong></td>
<td>No data available</td>
</tr>
</tbody>
</table>
t) Oxidizing properties

9.2 Other safety information

Surface tension 18.0 mN/m at 25.0 °C (77.0 °F)

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, Sodium/sodium oxides, Potassium, Magnesium, Aluminum, Zinc

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 15,000 mg/kg
LC50 Inhalation - Rat - 0.3 h - 130000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder
No data available

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.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

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: PB6125000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated., Nausea, Dizziness, Headache, Vomiting, Diarrhoea, Abdominal pain, Weakness, Unconsciousness
Liver -

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3082        Class: 9   Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Trichlorofluoromethane)
Reportable Quantity (RQ): 5000 lbs

Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trichlorofluoromethane</td>
<td>75-69-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
Trichlorofluoromethane

CAS-No. 75-69-4
Revision Date 2007-07-01

Pennsylvania Right To Know Components

Trichlorofluoromethane
CAS-No. 75-69-4
Revision Date 2007-07-01

New Jersey Right To Know Components

Trichlorofluoromethane
CAS-No. 75-69-4
Revision Date 2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox. Acute toxicity
H312 Harmful in contact with skin.

HMIS Rating
Health hazard: 1
Chronic Health Hazard: 0
Flammability: 0
Physical Hazard: 0

NFPA Rating
Health hazard: 1
Fire Hazard: 0
Reactivity Hazard: 0

Further information
Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.17 Revision Date: 03/03/2015 Print Date: 05/01/2016
SAFETY DATA SHEET
Halocarbon R-12 (Dichlorodifluoromethane)

Section 1. Identification

GHS product identifier : Halocarbon R-12 (Dichlorodifluoromethane)
Chemical name : dichlorodifluoromethane
Other means of identification : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12
Product use : Synthetic/Analytical chemistry.
Synonym : ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12
SDS # : 001018
Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253
Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture : GASES UNDER PRESSURE - Liquefied gas
HAZARDOUS TO THE OZONE LAYER - Category 1
GHS label elements
Hazard pictograms : 

Signal word : Warning
Hazard statements : Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.
Harms public health and the environment by destroying ozone in the upper atmosphere.

Precautionary statements
General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.
Prevention : Use and store only outdoors or in a well ventilated place.
Response : Not applicable.
Storage : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.
Disposal : Refer to manufacturer/supplier for information on recovery/recycling.

Date of issue/Date of revision : 5/21/2015. Date of previous issue : 5/21/2015. Version : 2 1/13
Section 2. Hazards identification

Hazards not otherwise classified: Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Substance/mixture</th>
<th>Chemical name</th>
<th>Other means of identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance</td>
<td>dichlorodifluoromethane</td>
<td>ASPEN R-12, Methane, dichlorodifluoro-; Refrigerant 12; Propellant 12; Halon 122; Genetron 12; Freon 12; Fluorocarbon 12; Difluorodichloromethane; DICHLORODIFLUOROMETHANE (FC 12); CFC-12</td>
</tr>
</tbody>
</table>

CAS number/other identifiers
- CAS number: 75-71-8
- Product code: 001018

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Section 4. First aid measures

Description of necessary first aid measures

**Eye contact**: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

**Inhalation**: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Skin contact**: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion**: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if adverse health effects persist or are severe. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**
- **Eye contact**: Liquid can cause burns similar to frostbite.
- **Inhalation**: Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Date of issue/Date of revision: 5/21/2015. Date of previous issue: 5/21/2015. Version: 2 2/13
Section 4. First aid measures

**Skin contact**
- Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Frostbite**
- Try to warm up the frozen tissues and seek medical attention.

**Ingestion**
- Ingestion of liquid can cause burns similar to frostbite.

**Over-exposure signs/symptoms**

**Eye contact**
- Adverse symptoms may include the following:
  - Frostbite

**Inhalation**
- No specific data.

**Skin contact**
- Adverse symptoms may include the following:
  - Frostbite

**Ingestion**
- Adverse symptoms may include the following:
  - Frostbite

**Indication of immediate medical attention and special treatment needed, if necessary**

**Notes to physician**
- In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

**Specific treatments**
- No specific treatment.

**Protection of first-aiders**
- No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

**Extinguishing media**

**Suitable extinguishing media**
- Use an extinguishing agent suitable for the surrounding fire.

**Unsuitable extinguishing media**
- None known.

**Specific hazards arising from the chemical**
- Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

**Hazardous thermal decomposition products**
- Decomposition products may include the following materials:
  - Carbon dioxide
  - Carbon monoxide
  - Halogenated compounds
  - Carbonyl halides

**Special protective actions for fire-fighters**
- 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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

**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. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.
Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: 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. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions: Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. 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). May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill: Immediately contact emergency personnel. Stop leak if without risk.

Large spill: Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures: Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Avoid release to the environment. Refer to special instructions/safety data sheet. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities: Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits
## Section 8. Exposure controls/personal protection

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane, dichlorodifluoro-</td>
<td>ACGIH TLV (United States, 3/2012). TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL (United States, 1/2013). TWA: 4950 mg/m³ 10 hours. TWA: 1000 ppm 10 hours.</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (United States, 6/2010). TWA: 4950 mg/m³ 8 hours. TWA: 1000 ppm 8 hours.</td>
</tr>
</tbody>
</table>

### Appropriate engineering controls
- Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

### 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.

### Individual protection measures

#### 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.

#### Eye/face protection
- 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, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

#### Skin protection

##### Hand protection
- 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. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

##### Body protection
- 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.

##### Other skin protection
- Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

##### Respiratory protection
- 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.
Section 9. Physical and chemical properties

Appearance

Physical state: Gas. [Liquefied gas]
Color: Colorless.
Molecular weight: 120.91 g/mole
Molecular formula: C-Cl2-F2
Boiling/condensation point: -29.8°C (-21.6°F)
Melting/freezing point: -158°C (-252.4°F)
Critical temperature: 111.85°C (233.3°F)

Odor: Characteristic.
Odor threshold: Not available.
pH: Not available.
Flash point: [Product does not sustain combustion.]
 Burning time: Not applicable.
 Burning rate: Not applicable.
 Evaporation rate: Not available.
 Flammability (solid, gas): Not available.
 Lower and upper explosive (flammable) limits: Not available.
 Vapor pressure: 84.9 (psia)
Vapor density: 4.2 (Air = 1)
Specific Volume (ft³/lb): 3.1746
Gas Density (lb/ft³): 0.315
Relative density: Not applicable.
Solubility: Not available.
Solubility in water: 0.3 g/l
Partition coefficient: n-octanol/water: 2.16
Auto-ignition temperature: Not available.
Decomposition temperature: Not available.
SADT: Not available.
Viscosity: Not applicable.

Section 10. Stability and reactivity

Reactivity: No specific test data related to reactivity available for this product or its ingredients.

Chemical stability: The product is stable.

Possibility of hazardous reactions: Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid: No specific data.

Hazardous decomposition products: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Section 10. Stability and reactivity

Hazardous polymerization: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity
Not available.

Irritation/Corrosion
Not available.

Sensitization
Not available.

Mutagenicity
Not available.

Carcinogenicity
Not available.

Reproductive toxicity
Not available.

Teratogenicity
Not available.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)
Not available.

Aspiration hazard
Not available.

Information on the likely routes of exposure

Potential acute health effects

Eye contact: Liquid can cause burns similar to frostbite.

Inhalation: Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Skin contact: Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

Ingestion: Ingestion of liquid can cause burns similar to frostbite.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact: Adverse symptoms may include the following: frostbite

Inhalation: No specific data.

Skin contact: Adverse symptoms may include the following: frostbite
Section 11. Toxicological information

**Ingestion**: Adverse symptoms may include the following: frostbite

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**
- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Long term exposure**
- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Potential chronic health effects**
Not available.

- **General**: No known significant effects or critical hazards.
- **Carcinogenicity**: No known significant effects or critical hazards.
- **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.

**Numerical measures of toxicity**

- **Acute toxicity estimates**
  Not available.

Section 12. Ecological information

**Toxicity**
Not available.

**Persistence and degradability**
Not available.

**Bioaccumulative potential**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP&lt;sub&gt;ow&lt;/sub&gt;</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methane, dichlorodifluoro-</td>
<td>2.16</td>
<td>6.17</td>
<td>low</td>
</tr>
</tbody>
</table>

**Mobility in soil**

- **Soil/water partition coefficient (K<sub>OC</sub>)**: Not available.

**Other adverse effects**: No known significant effects or critical hazards.
Section 13. Disposal considerations

Disposal methods: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

United States - RCRA Toxic hazardous waste "U" List

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS #</th>
<th>Status</th>
<th>Reference number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichlorodifluoromethane; Methane, dichlorodifluoro-</td>
<td>75-71-8</td>
<td>Listed</td>
<td>U075</td>
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</table>

Section 14. Transport information

<table>
<thead>
<tr>
<th>DOT</th>
<th>TDG</th>
<th>Mexico</th>
<th>IMDG</th>
<th>IATA</th>
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<tbody>
<tr>
<td>UN number</td>
<td>UN1028</td>
<td>UN1028</td>
<td>UN1028</td>
<td>UN1028</td>
</tr>
<tr>
<td>UN proper shipping name</td>
<td>DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12</td>
<td>DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12</td>
<td>DICHLORODIFLUOROMETHANE OR REFRIGERANT GAS R 12</td>
<td>DICHLORODIFLUOROMETHANE (REFRIGERANT GAS R 12)</td>
</tr>
<tr>
<td>Transport hazard class(es)</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Packing group</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Additional information</td>
<td>Reportable quantity: 5000 lbs / 2270 kg</td>
<td>Explosive Limit and Limited Quantity Index</td>
<td>-</td>
<td>Passenger and Cargo Aircraft Quantity limitation: 75 kg</td>
</tr>
<tr>
<td></td>
<td>Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.</td>
<td>0.125</td>
<td>-</td>
<td>Cargo Aircraft Only Quantity limitation: 150 kg</td>
</tr>
<tr>
<td></td>
<td>Limited quantity</td>
<td>Passenger Carrying Road or Rail Index</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging instruction</td>
<td>Passenger aircraft Quantity limitation: 75 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cargo aircraft</td>
<td>Quantity limitation: 150 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special provisions</td>
<td>T50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

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Section 14. Transport information

Special precautions for user: Transport within user’s premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not available.

Section 15. Regulatory information

U.S. Federal regulations:
- TSCA 8(a) CDR Exempt/Partial exemption: Not determined
- TSCA 12(b) annual export notification: dichlorodifluoromethane
- United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs):
- Not listed

Clean Air Act Section 602 Class I Substances:
- Listed

Clean Air Act Section 602 Class II Substances:
- Not listed

DEA List I Chemicals (Precursor Chemicals):
- Not listed

DEA List II Chemicals (Essential Chemicals):
- Not listed

SARA 302/304
Composition/information on ingredients
No products were found.

SARA 304 RQ:
- Not applicable.

SARA 311/312
Classification:
- Sudden release of pressure

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
</table>

SARA 313

<table>
<thead>
<tr>
<th>Product name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form R - Reporting requirements</td>
<td>dichlorodifluoromethane</td>
<td>75-71-8</td>
</tr>
<tr>
<td>Supplier notification</td>
<td>dichlorodifluoromethane</td>
<td>75-71-8</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts:
- This material is listed.

New York:
- This material is listed.

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Section 15. Regulatory information

- **New Jersey**: This material is listed.
- **Pennsylvania**: This material is listed.
- **Canada inventory**: This material is listed or exempted.
- **International regulations**
  - **International lists**
    - **Australia inventory (AICS)**: This material is listed or exempted.
    - **China inventory (IECSC)**: This material is listed or exempted.
    - **Japan inventory**: This material is listed or exempted.
    - **Korea inventory**: This material is listed or exempted.
    - **Malaysia Inventory (EHS Register)**: Not determined.
    - **New Zealand Inventory of Chemicals (NZIoC)**: This material is listed or exempted.
    - **Philippines inventory (PICCS)**: This material is listed or exempted.
    - **Taiwan inventory (CSNN)**: Not determined.
- **Chemical Weapons Convention List Schedule I Chemicals**: Not listed
- **Chemical Weapons Convention List Schedule II Chemicals**: Not listed
- **Chemical Weapons Convention List Schedule III Chemicals**: Not listed

**Canada**

**WHMIS (Canada)**: Class A: Compressed gas.
- **CEPA Toxic substances**: This material is 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.

Section 16. Other information

- **Canada Label requirements**: Class A: Compressed gas.

**Hazardous Material Information System (U.S.A.)**

<table>
<thead>
<tr>
<th>Health</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability</td>
<td>0</td>
</tr>
<tr>
<td>Physical hazards</td>
<td>2</td>
</tr>
</tbody>
</table>

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

**National Fire Protection Association (U.S.A.)**

<table>
<thead>
<tr>
<th>Flammability</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>2</td>
</tr>
<tr>
<td>Instability/Reactivity</td>
<td>1</td>
</tr>
<tr>
<td>Special</td>
<td></td>
</tr>
</tbody>
</table>

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Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

**History**

| Date of printing | : 5/21/2015. |
| Date of issue/Date of revision | : 5/21/2015. |
| Date of previous issue | : 5/21/2015. |
| Version | : 2 |

**Key to abbreviations**

- ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- UN = United Nations
- ACGIH – American Conference of Governmental Industrial Hygienists
- AIHA – American Industrial Hygiene Association
- CAS – Chemical Abstract Services
- CEPA – Canadian Environmental Protection Act
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
- CPR – Controlled Products Regulations
- DSL – Domestic Substances List
- GWP – Global Warming Potential
- IARC – International Agency for Research on Cancer
- ICAO – International Civil Aviation Organisation
- Inh – Inhalation
- LC – Lethal concentration
- LD – Lethal dosage
- NDSL – Non-Domestic Substances List
- NIOSH – National Institute for Occupational Safety and Health
- TDG – Canadian Transportation of Dangerous Goods Act and Regulations
- TLV – Threshold Limit Value
- TSCA – Toxic Substances Control Act
- WEEL – Workplace Environmental Exposure Level
- WHMIS – Canadian Workplace Hazardous Material Information System

**References**

- Not available.

**WARNING:** Contains (Dichlorodifluoromethane), a substance which harms the public health and environment by destroying ozone in the upper atmosphere.
Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Indeno[1,2,3-cd]pyrene
Product Number: 48499
Brand: Supelco
CAS-No.: 193-39-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning
Hazard statement(s)
H351 Suspected of causing cancer.
Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/attention.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none
3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula : C\textsubscript{22}H\textsubscript{12}
Molecular weight : 276.33 g/mol
EC-No. : 205-893-2

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>Carc. 2; H351</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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
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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.
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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
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
Keep container tightly closed in a dry and well-ventilated place.
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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
Components with workplace control parameters
Contains no substances with occupational exposure limit values.

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
Impervious 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 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.

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: No data available

e) Melting point/freezing point: 163.6 °C (326.5 °F)

f) Initial boiling point and boiling range: 536.0 °C (996.8 °F)

g) Flash point: No data available

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: No data available

l) Vapour density: No data available

m) Relative density: No data available

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

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
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available
Inhalation: No data available
Dermal: No data available

**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**
This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**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: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>193-39-5</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>193-39-5</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>193-39-5</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indeno[1,2,3-cd]pyrene</td>
<td>193-39-5</td>
<td>2007-09-28</td>
</tr>
</tbody>
</table>

WARNING! This product contains a chemical known to the State of California to cause cancer.
Indeno[1,2,3-cd]pyrene

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

<table>
<thead>
<tr>
<th>Carc.</th>
<th>Carcinogenicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H351</td>
<td>Suspected of causing cancer.</td>
</tr>
</tbody>
</table>

**HMIS Rating**

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazard</td>
<td>0</td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>*</td>
</tr>
<tr>
<td>Flammability</td>
<td>0</td>
</tr>
<tr>
<td>Physical Hazard</td>
<td>0</td>
</tr>
</tbody>
</table>

**NFPA Rating**

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health hazard</td>
<td>1</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>0</td>
</tr>
<tr>
<td>Reactivity Hazard</td>
<td>0</td>
</tr>
</tbody>
</table>

**Further information**

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**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5  Revision Date: 05/27/2016  Print Date: 07/13/2017
Safety Data Sheet
according to 29CFR1910/1200 and GHS Rev. 3

Effective date: 10.24.2014

Iron Filings, 40 mesh

SECTION 1: Identification of the substance/mixture and of the supplier

Product name: Iron Filings, 40 mesh

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25369

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:
AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:
Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:
Fisher Science Education  Emergency Telephone No.: 800-535-5053

SECTION 2: Hazards identification

Classification of the substance or mixture:

Not classified for physical or health hazards under GHS.

Signal word: Warning

Hazard statements:
Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Do not eat, drink or smoke when using this product

Combustible Dust Hazard: :
May form combustible dust concentrations in air (during processing).

Other Non-GHS Classification:

WHMIS
NFPA/HMIS

[Diagram showing Health, Flammability, Physical Hazard, Personal Protection ratings (0-4)]
SECTION 3: Composition/information on ingredients

Ingredients:

| CAS 7439-89-6 | Iron | 100 % |

Percentages are by weight

SECTION 4: First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position. Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen. Get medical assistance if cough or other symptoms appear.

After skin contact: Rinse/flush exposed skin gently using soap and water for 15-20 minutes. Seek medical advice if discomfort or irritation persists.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists. Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea, Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician. Physician should treat symptomatically.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Use spark-proof tools and explosion-proof equipment. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Use spark-proof tools and explosion-proof equipment. Ensure that air-handling systems are operational. Ensure adequate ventilation.

Environmental precautions:
Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

**Methods and material for containment and cleaning up:**

Keep in suitable closed containers for disposal. Wear protective eyeware, gloves, and clothing. Refer to Section 8. Always obey local regulations. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

**Reference to other sections:**

---

**SECTION 7: Handling and storage**

**Precautions for safe handling:**

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8. Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

**Conditions for safe storage, including any incompatibilities:**

Store away from incompatible materials. Protect from freezing and physical damage. Keep away from food and beverages. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store in cool, dry conditions in well-sealed containers. Store with like hazards.

---

**SECTION 8: Exposure controls/personal protection**

**Control Parameters:**

- OSHA PEL TWA (Total Dust) 15 mg/m3 (50 mppcf*)
- ACGIH TLV TWA (inhalable particles) 10 mg/m3

**Appropriate Engineering controls:**

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use under a fume hood.

**Respiratory protection:**

Not required under normal conditions of use. 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. When necessary use NIOSH approved breathing equipment.

**Protection of skin:**

Select glove material impermeable and resistant to the substance. Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves. Wear protective clothing.
Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping. Wash hands before breaks and at the end of work. Avoid contact with skin, eyes, and clothing. Before wearing wash contaminated clothing.

SECTION 9: Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance (physical state,color)</td>
<td>Solid</td>
</tr>
<tr>
<td>Explosion limit lower</td>
<td>Not determined</td>
</tr>
<tr>
<td>Explosion limit upper</td>
<td>Not determined</td>
</tr>
<tr>
<td>Odor</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>Not determined</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not determined</td>
</tr>
<tr>
<td>Vapor density</td>
<td>Not determined</td>
</tr>
<tr>
<td>pH-value</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Relative density</td>
<td>Not determined</td>
</tr>
<tr>
<td>Melting/Freezing point</td>
<td>Not determined</td>
</tr>
<tr>
<td>Solubilities</td>
<td></td>
</tr>
<tr>
<td>Boiling point/Boiling range</td>
<td>Not determined</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>Not determined</td>
</tr>
<tr>
<td>Flash point (closed cup)</td>
<td>Not determined</td>
</tr>
<tr>
<td>Auto/Self-ignition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not determined</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not determined</td>
</tr>
<tr>
<td>Flammability (solid,gaseous)</td>
<td>Not determined</td>
</tr>
<tr>
<td>Viscosity</td>
<td>a. Kinematic: Not determined b. Dynamic: Not determined</td>
</tr>
<tr>
<td>Density</td>
<td>Not determined</td>
</tr>
</tbody>
</table>

SECTION 10: Stability and reactivity

Reactivity: Nonreactive under normal conditions.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing
Conditions to avoid: Incompatible Materials.
Hazardous decomposition products:

SECTION 11: Toxicological information

Acute Toxicity: No additional information.
Chronic Toxicity: No additional information.
Corrosion Irritation: No additional information.
Sensitization: No additional information.
Single Target Organ (STOT): No additional information.
Numerical Measures: No additional information.
Carcinogenicity: No additional information.
Mutagenicity: No additional information.
Reproductive Toxicity: No additional information.

SECTION 12: Ecological information

Ecotoxicity Persistence and degradability:
Bioaccumulative potential:
Mobility in soil:
Other adverse effects:

SECTION 13: Disposal considerations

Waste disposal recommendations:
Contact a licensed professional waste disposal service to dispose of this material. Dispose of empty containers as unused product. Product or containers must not be disposed with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). 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. Ensure complete and accurate classification.

SECTION 14: Transport information

UN-Number
Not Regulated.

UN proper shipping name
Not Regulated.

Transport hazard class(es)
Packing group: Not Regulated

Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15: Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):
None of the ingredients is listed

SARA Section 313 (Specific toxic chemical listings):
None of the ingredients is listed

RCRA (hazardous waste code):
None of the ingredients is listed

TSCA (Toxic Substances Control Act):
All ingredients are listed

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):
None of the ingredients is listed
Proposition 65 (California):

Chemicals known to cause cancer:
None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:
None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:
None of the ingredients is listed

Chemicals known to cause developmental toxicity:
None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):
All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):
None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):
None of the ingredients is listed

SECTION 16: Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:
IMDG: International Maritime Code for Dangerous Goods
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
Iron Filings, 40 mesh

Effective date: 10.24.2014
Last updated: 03.23.2015
Section 1. Identification

GHS product identifier : Isobutylene
Chemical name : 2-methylpropene
Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)
Product use : Synthetic/Analytical chemistry.
Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)
SDS # : 001031
Supplier's details : Airgas USA, LLC and its affiliates
                   259 North Radnor-Chester Road
                   Suite 100
                   Radnor, PA 19087-5283
                   1-610-687-5253
24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture : FLAMMABLE GASES - Category 1
                                           GASES UNDER PRESSURE - Liquefied gas
GHS label elements
Hazard pictograms : 
Signal word : Danger
Hazard statements : Extremely flammable gas.
                  May form explosive mixtures with air.
                  Contains gas under pressure; may explode if heated.
                  May cause frostbite.
                  May displace oxygen and cause rapid suffocation.
Precautionary statements
General : Read and follow all Safety Data Sheets (SDS’S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.
Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.
Disposal : Not applicable.
Hazard not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.
Section 3. Composition/information on ingredients

Substance/mixture: Substance
Chemical name: 2-methylpropene
Other means of identification: 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers
CAS number: 115-11-7
Product code: 001031

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isobutylene</td>
<td>100</td>
<td>115-11-7</td>
</tr>
</tbody>
</table>

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact: Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact: Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion: As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact: No known significant effects or critical hazards.
Inhalation: No known significant effects or critical hazards.
Skin contact: No known significant effects or critical hazards.
Frostbite: Try to warm up the frozen tissues and seek medical attention.
Ingestion: As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact: No specific data.
Inhalation: No specific data.
Skin contact: No specific data.
Ingestion: No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments: No specific treatment.

Date of issue/Date of revision: 7/11/2016
Date of previous issue: No previous validation
Version: 0.01
Section 4. First aid measures

Protection of first-aiders: No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media: Use an extinguishing agent suitable for the surrounding fire.

 Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products: Decomposition products may include the following materials:
- carbon dioxide
- carbon monoxide

Special protective actions for fire-fighters: 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. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

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.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel ".

Environmental precautions: Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.
**Section 7. Handling and storage**

**Precautions for safe handling**

**Protective measures**

Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Advice on general occupational hygiene**

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities**

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

**Section 8. Exposure controls/personal protection**

**Control parameters**

**Occupational exposure limits**

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
</table>

**Appropriate engineering controls**

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. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**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.

**Individual protection measures**

**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.

**Eye/face protection**

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, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.
Section 8. Exposure controls/personal protection

**Hand protection**: 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. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection**: 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. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

**Other skin protection**: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection**: 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.

Section 9. Physical and chemical properties

**Appearance**

- **Physical state**: Gas. [Liquefied compressed gas.]
- **Color**: Colorless.
- **Molecular weight**: 56.12 g/mole
- **Molecular formula**: C4-H8
- **Boiling/condensation point**: -6.9°C (19.6°F)
- **Melting/freezing point**: -140.7°C (-221.3°F)
- **Critical temperature**: 144.75°C (292.6°F)
- **Odor**: Characteristic.
- **Odor threshold**: Not available.
- **pH**: Not available.
- **Flash point**: Closed cup: -76.1°C (-105°F)
- **Burning time**: Not applicable.
- **Burning rate**: Not applicable.
- **Evaporation rate**: Not available.
- **Flammability (solid, gas)**: Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.
- **Lower and upper explosive (flammable) limits**: Lower: 1.8%  
  Upper: 9.6%
- **Vapor pressure**: 24.3 (psig)
- **Vapor density**: 1.94  (Air = 1)
- **Specific Volume (ft³/lb)**: 6.6845
- **Gas Density (lb/ft³)**: 0.1496  (25°C / 77 to °F)
- **Relative density**: Not applicable.
- **Solubility**: Not available.
- **Solubility in water**: 0.263 g/l
- **Partition coefficient: n-octanol/water**: 2.34
- **Auto-ignition temperature**: 465°C (869°F)
- **Decomposition temperature**: Not available.
- **SADT**: Not available.
Section 9. Physical and chemical properties

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isobutylene</td>
<td>LC50 Inhalation Vapor</td>
<td>Rat</td>
<td>550000 mg/m³</td>
<td>4 hours</td>
</tr>
</tbody>
</table>

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.
Section 11. Toxicological information

**Information on the likely routes of exposure**

**Potential acute health effects**

- **Eye contact**: No known significant effects or critical hazards.
- **Inhalation**: No known significant effects or critical hazards.
- **Skin contact**: No known significant effects or critical hazards.
- **Ingestion**: As this product is a gas, refer to the inhalation section.

**Symptoms related to the physical, chemical and toxicological characteristics**

- **Eye contact**: No specific data.
- **Inhalation**: No specific data.
- **Skin contact**: No specific data.
- **Ingestion**: No specific data.

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Long term exposure**

- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Potential chronic health effects**

Not available.

**General**: No known significant effects or critical hazards.

**Carcinogenicity**: No known significant effects or critical hazards.

**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.

**Numerical measures of toxicity**

**Acute toxicity estimates**

Not available.

Section 12. Ecological information

**Toxicity**

Not available.

**Persistence and degradability**

Not available.

**Bioaccumulative potential**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP_{ow}</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isobutylene</td>
<td>2.34</td>
<td>-</td>
<td>low</td>
</tr>
</tbody>
</table>

**Date of issue/Date of revision**: 7/11/2016  **Date of previous issue**: No previous validation  **Version**: 0.01
Section 12. Ecological information

Mobility in soil

Soil/water partition coefficient ($K_{OC}$) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty AirGas-owned pressure vessels should be returned to AirGas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

<table>
<thead>
<tr>
<th>UN number</th>
<th>DOT</th>
<th>TDG</th>
<th>Mexico</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1055</td>
<td>UN1055</td>
<td>UN1055</td>
<td>UN1055</td>
<td>UN1055</td>
<td>UN1055</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport hazard class(es)</th>
<th>2.1</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Packing group</th>
<th>-</th>
</tr>
</thead>
</table>

|-------------|-----|-----|-----|-----|

<table>
<thead>
<tr>
<th>Additional information</th>
<th>Limited quantity Yes.</th>
<th>Packaging instruction</th>
<th>Passenger aircraft Quantity limitation: Forbidden.</th>
<th>Cargo aircraft Quantity limitation: 150 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special provisions</td>
<td>19, T50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).

**Explosive Limit and Limited Quantity Index**

0.125

**ERAP Index**

3000

**Passenger Carrying Ship Index**

Forbidden

**Passenger Carrying Road or Rail Index**

Forbidden

**Special provisions**

29

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

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Section 14. Transport information

Special precautions for user: Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not available.

Section 15. Regulatory information

U.S. Federal regulations:
- TSCA 8(a) CDR Exempt/Partial exemption: Not determined
- United States inventory (TSCA 8b): This material is listed or exempted.
- Clean Air Act (CAA) 112 regulated flammable substances: isobutylene
  - Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs): Not listed
  - Clean Air Act Section 602 Class I Substances: Not listed
  - Clean Air Act Section 602 Class II Substances: Not listed
  - DEA List I Chemicals (Precursor Chemicals): Not listed
  - DEA List II Chemicals (Essential Chemicals): Not listed

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs):
- Not listed

Clean Air Act Section 602 Class I Substances:
- Not listed

Clean Air Act Section 602 Class II Substances:
- Not listed

DEA List I Chemicals (Precursor Chemicals):
- Not listed

DEA List II Chemicals (Essential Chemicals):
- Not listed

SARA 302/304
- Composition/information on ingredients: No products were found.

SARA 304 RQ:
- Not applicable.

SARA 311/312
- Classification:
  - Fire hazard: Sudden release of pressure

SARA 311/312 Classification:
- Fire hazard
- Sudden release of pressure

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isobutylene</td>
<td>100</td>
<td>Yes.</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
</tr>
</tbody>
</table>

State regulations
- Massachusetts:
  - This material is listed.
- New York:
  - This material is not listed.
- New Jersey:
  - This material is listed.
- Pennsylvania:
  - This material is listed.

International regulations
- International lists
- National inventory

Australia:
- This material is listed or exempted.

Canada:
- This material is listed or exempted.

China:
- This material is listed or exempted.

Europe:
- This material is listed or exempted.

Japan:
- This material is listed or exempted.

Malaysia:
- Not determined.

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9/11
Isobutylene

Section 15. Regulatory information

<table>
<thead>
<tr>
<th>Country</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>This material is listed or exempted.</td>
</tr>
<tr>
<td>Philippines</td>
<td>This material is listed or exempted.</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>This material is listed or exempted.</td>
</tr>
<tr>
<td>Taiwan</td>
<td>This material is listed or exempted.</td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td></td>
</tr>
<tr>
<td>WhMIS (Canada)</td>
<td>Class A: Compressed gas.</td>
</tr>
<tr>
<td></td>
<td>Class B-1: Flammable gas.</td>
</tr>
<tr>
<td>CEPA Toxic substances</td>
<td>This material is not listed.</td>
</tr>
<tr>
<td>Canadian ARET</td>
<td>This material is not listed.</td>
</tr>
<tr>
<td>Canadian NPRI</td>
<td>This material is listed.</td>
</tr>
<tr>
<td>Alberta Designated Substances</td>
<td>This material is not listed.</td>
</tr>
<tr>
<td>Ontario Designated Substances</td>
<td>This material is not listed.</td>
</tr>
<tr>
<td>Quebec Designated Substances</td>
<td>This material is not listed.</td>
</tr>
</tbody>
</table>

Section 16. Other information

**Canada Label requirements**
- Class A: Compressed gas.
- Class B-1: Flammable gas.

**Hazardous Material Information System (U.S.A.)**

<table>
<thead>
<tr>
<th>Health</th>
<th>Flammability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910, 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

**National Fire Protection Association (U.S.A.)**

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

**Procedure used to derive the classification**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flam. Gas 1, H220</td>
<td>Expert judgment</td>
</tr>
</tbody>
</table>

**History**

<table>
<thead>
<tr>
<th>Date of printing</th>
<th>7/11/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of issue/Date of revision</td>
<td>7/11/2016</td>
</tr>
<tr>
<td>Date of previous issue</td>
<td>No previous validation</td>
</tr>
</tbody>
</table>
Section 16. Other information

Version : 0.01

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations

References : Not available.

Notice to reader:
To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
SAFETY DATA SHEET

1. Identification

Product Name Lead
Cat No. : L27-1RL
Synonyms Lead metal.
Recommended Use Laboratory chemicals.
Uses advised against No Information available

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>Acute oral toxicity</td>
</tr>
<tr>
<td>Acute Inhalation Toxicity - Dusts and Mists</td>
</tr>
<tr>
<td>Carcinogenicity</td>
</tr>
<tr>
<td>Reproductive Toxicity</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
</tr>
<tr>
<td>Target Organs - Central nervous system (CNS)</td>
</tr>
<tr>
<td>Specific target organ toxicity - (repeated exposure)</td>
</tr>
<tr>
<td>Target Organs - Kidney, Blood.</td>
</tr>
</tbody>
</table>

Label Elements

Signal Word
Danger

Hazard Statements
Harmful if swallowed
Harmful if inhaled
May cause drowsiness or dizziness
May cause cancer
May damage the unborn child. Suspected of damaging fertility
May cause damage to organs through prolonged or repeated exposure
Precautionary Statements

Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray

Response
IF exposed or concerned: Get medical attention/advice

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth

Storage
Store locked up
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)
Very toxic to aquatic life with long lasting effects

Other hazards
WARNING! This product contains a chemical known in the State of California to cause cancer. WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>&gt; 99</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.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes.

Inhalation
Move to fresh air.

Ingestion
Do not induce vomiting.

Most important symptoms/effects
No information available.

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media
No information available

Flash Point
No information available
Method - No information available
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
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
None known

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.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>0</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. Avoid release to the environment. Collect spillage.

Methods for Containment and Cleanup
No information available.

7. Handling and storage
Handling
Wear personal protective equipment. Ensure adequate ventilation.
Storage
Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>TWA: 0.05 mg/m³</td>
<td>TWA: 50 µg/m³</td>
<td>IDLH: 100 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TWA: 0.050 mg/m³</td>
</tr>
</tbody>
</table>

Legend
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

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.
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>Light blue</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>Not applicable</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>327.4 °C / 621.3 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>1740 °C / 3164 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</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>1.3 mmHg @ 970 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available</td>
</tr>
<tr>
<td>Relative Density</td>
<td>11.3</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble in water</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>Pb</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>207.19</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Hazard</td>
<td>None known, based on information available</td>
</tr>
<tr>
<td>Stability</td>
<td>Stable under normal conditions.</td>
</tr>
<tr>
<td>Conditions to Avoid</td>
<td>Incompatible products.</td>
</tr>
<tr>
<td>Incompatible Materials</td>
<td>Strong oxidizing agents</td>
</tr>
<tr>
<td>Hazardous Decomposition Products</td>
<td>None under normal use conditions</td>
</tr>
<tr>
<td>Hazardous Polymerization</td>
<td>Hazardous polymerization does not occur.</td>
</tr>
<tr>
<td>Hazardous Reactions</td>
<td>None under normal processing.</td>
</tr>
</tbody>
</table>

11. Toxicological information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity</td>
<td></td>
</tr>
<tr>
<td>Component Information</td>
<td></td>
</tr>
<tr>
<td>Toxicologically Synergistic Products</td>
<td>No information available</td>
</tr>
<tr>
<td>Delayed and immediate effects as well as chronic effects from short and long-term exposure</td>
<td></td>
</tr>
<tr>
<td>Irritation</td>
<td>No information available</td>
</tr>
<tr>
<td>Sensitization</td>
<td>No information available</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>The table below indicates whether each agency has listed any ingredient as a carcinogen.</td>
</tr>
<tr>
<td>Component</td>
<td>CAS-No</td>
</tr>
<tr>
<td>-----------</td>
<td>--------</td>
</tr>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
</tr>
</tbody>
</table>

**IARC: (International Agency for Research on Cancer)**
- Group 1 - Carcinogenic to Humans
- Group 2A - Probably Carcinogenic to Humans
- Group 2B - Possibly Carcinogenic to Humans

**NTP: (National Toxicity Program)**
- Known - Known Carcinogen
- Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

**ACGIH: (American Conference of Governmental Industrial Hygienists)**
- A1 - Known Human Carcinogen
- A2 - Suspected Human Carcinogen
- A3 - Animal Carcinogen

**Mexico - Occupational Exposure Limits - Carcinogens**
- A1 - Confirmed Human Carcinogen
- A2 - Suspected Human Carcinogen
- A3 - Confirmed Animal Carcinogen
- A4 - Not Classifiable as a Human Carcinogen
- A5 - Not Suspected as a Human Carcinogen

**Mutagenic Effects**
- No information available

**Reproductive Effects**
- No information available.

**Developmental Effects**
- No information available.

**Teratogenicity**
- No information available.

**STOT - single exposure**
- Central nervous system (CNS)

**STOT - repeated exposure**
- Kidney Blood

**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

#### (Bad file name)

**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>Lead</td>
<td>Not listed</td>
<td>1.32 mg/L LC50 96 h 1.17 mg/L LC50 96 h 0.44 mg/L LC50 96 h</td>
<td>Not listed</td>
<td>600 µg/L EC50 = 48 h</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th></th>
<th>DOT</th>
<th>TDG</th>
<th>IATA</th>
<th>IMDG/IMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not regulated</td>
<td>Not regulated</td>
<td>Not regulated</td>
<td>Not regulated</td>
<td></td>
</tr>
</tbody>
</table>

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>Lead</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-100-4</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.
- 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 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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
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</thead>
<tbody>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>&gt; 99</td>
<td>0.1</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Categorization

Acute Health Hazard Yes
Chronic Health Hazard Yes
Fire Hazard No
Sudden Release of Pressure Hazard No
Reactive Hazard No

Clean Water Act

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depletors</th>
<th>Class 2 Ozone Depletors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OSHA Occupational Safety and Health Administration
Not applicable

<table>
<thead>
<tr>
<th>Component</th>
<th>Specifically Regulated Chemicals</th>
<th>Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>30 µg/m³ Action Level 50 µg/m³ TWA</td>
<td></td>
</tr>
</tbody>
</table>
CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>10 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

California Proposition 65
This product contains the following Proposition 65 chemicals:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>7439-92-1</td>
<td>Carcinogen Developmental Female Reproductive Male Reproductive</td>
<td>15 µg/day</td>
<td>Developmental Carcinogen</td>
</tr>
</tbody>
</table>

State Right-to-Know

<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>Lead</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation
Reportable Quantity (RQ): Y
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

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
D2A Very toxic materials
D1B Toxic materials

16. Other information
Prepared By: Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date: 12-Sep-2014
Revision Date: 12-Dec-2014
Print Date: 12-Dec-2014
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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. Identification

Product Name: Magnesium
Cat No.: AC191080000; AC191080025; AC191080100; AC191085000
Synonyms: Magnesium metal (ribbons/turnings)
Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| Flammable solids | Category 1 |
| Self-heating substances and mixtures | Category 2 |
| Substances/mixtures which, in contact with water, emit flammable gases | Category 2 |

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
Self-heating in large quantities: may catch fire
In contact with water releases flammable gas
Precautionary Statements
Prevention
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool. Protect from sunlight
Keep away from any possible contact with water, because of violent reaction and possible flash fire
Handle under inert gas. Protect from moisture
Skin
Brush off loose particles from skin. Immerse in cool water/wrap with wet bandages
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Maintain air gap between stacks/pallets
Store away from other materials
Store in a dry place. Store in a closed container
Store bulk masses at temperatures not exceeding manufacturer recommendations
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
May form combustible dust concentrations in air

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium</td>
<td>7439-95-4</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. Obtain medical attention.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. 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.

Ingestion
Do not induce vomiting. Get medical attention.

Most important symptoms/effects
No information available.

Notes to Physician
Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media
Dry chemical. approved class D extinguishers. clay. sodium carbonate. Do not use a solid water stream as it may scatter and spread fire.

Unsuitable Extinguishing Media
No information available

Flash Point
500 °C / 932 °F

Autoignition Temperature
472.8 °C / 883 °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
Dust can form an explosive mixture in air. Water reactive. Produce flammable gases on contact with water. Flammable.

Hazardous Combustion Products
Magnesium oxides

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>0</td>
<td>4</td>
<td>2</td>
<td>W</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition.

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. Remove all sources of ignition. Ground and bond containers when transferring material. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling
Avoid contact with skin and eyes. Do not breathe dust. Use explosion-proof equipment. Use only non-sparking tools. Wash hands before breaks and immediately after handling the product. Ensure adequate ventilation. Wear personal protective equipment. Avoid dust formation.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed. Keep away from heat and sources of ignition. Never allow product to get in contact with water during storage. 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. 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.

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>Silver</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</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>651 °C / 1203.8 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>1107 °C / 2024.6 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>500 °C / 932 °F</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>negligible</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>No information available</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>472.8 °C / 883 °F</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>Mg</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>24.3</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Stability</td>
<td>Stable under normal conditions. Air sensitive. Water reactive.</td>
</tr>
<tr>
<td>Conditions to Avoid</td>
<td>Protect from water. Exposure to air. Incompatible products. Exposure to moist air or water.</td>
</tr>
<tr>
<td>Incompatible Materials</td>
<td>Acids, Strong oxidizing agents, Halogens, Acid chlorides</td>
</tr>
<tr>
<td>Hazardous Decomposition Products</td>
<td>Magnesium oxides</td>
</tr>
<tr>
<td>Hazardous Polymerization</td>
<td>Hazardous polymerization does not occur.</td>
</tr>
<tr>
<td>Hazardous Reactions</td>
<td>None under normal processing.</td>
</tr>
</tbody>
</table>

11. Toxicological information

<table>
<thead>
<tr>
<th>Component Information</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium</td>
<td>230 mg/kg ( Rat )</td>
<td>Not listed</td>
<td>Not listed</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: May cause irritation
- 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>Magnesium</td>
<td>7439-95-4</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>
12. Ecological information

Ecotoxicity
Do not empty into drains.

Persistence and Degradability
Insoluble in water

Bioaccumulation/Accumulation
No information available.

Mobility
Is not likely mobile in the environment due its low 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

<table>
<thead>
<tr>
<th>UN-No</th>
<th>1869</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>MAGNESIUM</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>4.1</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
</tr>
</tbody>
</table>

TDG

<table>
<thead>
<tr>
<th>UN-No</th>
<th>1869</th>
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<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>MAGNESIUM</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>4.1</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
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</table>

IATA

<table>
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<tr>
<th>UN-No</th>
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<tr>
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<tr>
<td>Hazard Class</td>
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<tr>
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</table>

IMDG/IMO

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<th>1869</th>
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</thead>
<tbody>
<tr>
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<td>MAGNESIUM</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>4.1</td>
</tr>
<tr>
<td>Packing Group</td>
<td>III</td>
</tr>
</tbody>
</table>

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed
**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>Magnesium</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>231-104-6</td>
<td>-</td>
<td>X</td>
<td>-</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.
- **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 Hazardous Categorization**
  - Acute Health Hazard: No
  - Chronic Health Hazard: No
  - Fire Hazard: Yes
  - Sudden Release of Pressure Hazard: No
  - Reactive Hazard: Yes
- **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

**State Right-to-Know**

<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>Magnesium</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</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
Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
B6  Reactive flammable material
B4  Flammable solid
F   Dangerously reactive material

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date  17-Jan-2011
Revision Date   03-Aug-2015
Print Date      03-Aug-2015
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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: Manganese
Product Number: 266167
Brand: Aldrich
CAS-No.: 7439-96-5

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute aquatic toxicity (Category 2), H401
For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements
Pictogram: none
Signal word: none
Hazard statement(s)
H401 Toxic to aquatic life.
Precautionary statement(s)
P273 Avoid release to the environment.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Formula: Mn
Molecular weight: 54.94 g/mol
CAS-No.: 7439-96-5
EC-No.: 231-105-1

Hazardous components
### Component Classification

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>Aquatic Acute 2; H401</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 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. Move out of dangerous area.

**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**
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.

### 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

Manganese/manganese oxides

**Advice for firefighters**
Wear self-contained breathing apparatus for firefighting if necessary.

#### 5.4 Further information

No data available.

### 6. ACCIDENTAL RELEASE MEASURES

#### 6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. 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.

### 7. HANDLING AND STORAGE

#### 7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
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
Keep container tightly closed in a dry and well-ventilated place.
Moisture sensitive. Handle and store under inert gas.
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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>TWA 0.200000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td>Remarks Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>5 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>5.000000 mg/m3</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
</tr>
<tr>
<td>TWA</td>
<td></td>
<td>1.000000 mg/m3</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
</tr>
<tr>
<td>ST</td>
<td></td>
<td>3.000000 mg/m3</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
</tr>
<tr>
<td>TWA</td>
<td></td>
<td>1.000000 mg/m3</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
</tr>
<tr>
<td>ST</td>
<td></td>
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<td>Ceiling limit is to be determined from breathing-zone air samples.</td>
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</tr>
<tr>
<td>TWA</td>
<td></td>
<td>0.200000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td>Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) varies</td>
</tr>
<tr>
<td>TWA</td>
<td></td>
<td>0.100000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td>Central Nervous System impairment 2015 Adoption varies</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015 Adoption Central Nervous System impairment varies</td>
<td>0.020000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Central Nervous System impairment varies</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Central Nervous System impairment varies</td>
<td>0.02</td>
<td></td>
<td></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**
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 levels of dusts are desired, use type N95 (US) or type P1 (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**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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: chips</td>
</tr>
<tr>
<td></td>
<td>Colour: grey, brown, silver</td>
</tr>
<tr>
<td>b) Odour</td>
<td>odourless</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>Melting point/range: 1,244 °C (2,271 °F) - lit.</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>1,962 °C (3,564 °F) - lit.</td>
</tr>
<tr>
<td>g) Flash point</td>
<td>Not applicable</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>
</tbody>
</table>
j) Upper/lower flammability or explosive limits No data available
k) Vapour pressure No data available
l) Vapour density No data available
m) Relative density 7.3 g/mL at 25 °C (77 °F)
n) Water solubility 0.0007 g/l at 20 °C (68 °F) - 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
No data available

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
Avoid moisture.

10.5 Incompatible materials
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Hydrogen peroxide, Oxidizing agents, Nitric acid, Sodium Hydroxide, Carbon dioxide (CO2), Nitryl Flouride, Steam

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - > 2,000 mg/kg
(OCED Test Guideline 420)
LC50 Inhalation - Rat - male and female - 4 h - > 5.14 mg/l
(OCED Test Guideline 403)
Dermal: No data available
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OCED Test Guideline 404)
Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitisation
- Mouse
Result: Does not cause skin sensitisation.
(OECD Test Guideline 429)

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.
ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

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: Not available

Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrolled laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish semi-static test NOEC - Oncorhynchus mykiss (rainbow trout) - 3.6 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates Immobilization NOEC - Daphnia magna (Water flea) - 1.6 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae Growth inhibition EC50 - Desmodesmus subspicatus (Scenedesmus subspicatus) - 4.5 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria Respiration inhibition EC50 - Sludge Treatment - 1,000 mg/l - 3 h (OECD Test Guideline 209)
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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese</td>
<td>7439-96-5</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

<table>
<thead>
<tr>
<th>Aquatic Acute</th>
<th>Acute aquatic toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H401</td>
<td>Toxic to aquatic life.</td>
</tr>
</tbody>
</table>

**HMIS Rating**

<table>
<thead>
<tr>
<th>Health hazard:</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Health Hazard:</td>
<td>*</td>
</tr>
<tr>
<td>Flammability:</td>
<td>0</td>
</tr>
<tr>
<td>Physical Hazard</td>
<td>0</td>
</tr>
</tbody>
</table>

**NFPA Rating**

<table>
<thead>
<tr>
<th>Health hazard:</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Hazard:</td>
<td>0</td>
</tr>
<tr>
<td>Reactivity Hazard:</td>
<td>0</td>
</tr>
</tbody>
</table>

**Further information**

Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

**Preparation Information**

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.6   Revision Date: 10/09/2015   Print Date: 05/01/2016
1. Identification

1.1. Product identifier
Product Identity
Mercury (Metallic)
Alternate Names
Quicksilver; Hydrargyrum; Liquid Silver

1.2. Relevant identified uses of the substance or mixture and uses advised against
Intended use
See Technical Data Sheet.
Application Method
See Technical Data Sheet.

1.3. Details of the supplier of the safety data sheet
Company Name
WM Mercury Waste Inc.
21211 Durand Avenue
Union Grove, WI 53182

Emergency
CHEMTREC (USA) (800) 424-9300
Customer Service: WM Mercury Waste Inc. (800) 741-3343

2. Hazard(s) identification

2.1. Classification of the substance or mixture
Acute Tox. 2;H330 Fatal if inhaled.
Repr. 1B;H360D May damage the unborn child.
STOT RE 1;H372 Causes damage to organs through prolonged or repeated exposure. Specific Target Organs: (Central Nervous System)
Aquatic Chronic 1;H410 Very toxic to aquatic life with long lasting effects.

2.2. Label elements
Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.

H330 Fatal if inhaled.
H360D May damage the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H410 Very toxic to aquatic life with long lasting effects.
[Prevention]:
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P260 Do not breathe mist / vapors / spray.
P264 Wash thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P284 Wear respiratory protection.

[Response]:
P304+340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308+313 IF exposed or concerned: Get medical advice / attention.
P310 Immediately call a POISON CENTER or doctor / physician.
P314 Get Medical advice / attention if you feel unwell.
P320 Specific treatment is urgent (see information on this label).
P391 Collect spillage.

[Storage]:
P403+233 Store in a well ventilated place. Keep container tightly closed.
P405 Store locked up.

[Disposal]:
P501 Dispose of contents / container in accordance with local / national regulations.

3. Composition/information on ingredients

This product contains the following substances that present a hazard within the meaning of the relevant State and Federal Hazardous Substances regulations.

<table>
<thead>
<tr>
<th>Ingredient/Chemical Designations</th>
<th>Weight %</th>
<th>GHS Classification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury [CAS Number: 0007439-97-6]</td>
<td>100</td>
<td>Repr. 1B;H360D Acute tox. 2;H330 STOT RE 1;H372 Aquatic Acute 1;H400 Aquatic Chronic 1;H410</td>
<td>[1][2]</td>
</tr>
</tbody>
</table>

In accordance with paragraph (i) of §1910.1200, the specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

[1] Substance classified with a health or environmental hazard.

*The full texts of the phrases are shown in Section 16.*
4. First aid measures

4.1. Description of first aid measures

General  In all cases of doubt, or when symptoms persist, seek medical attention. Never give anything by mouth to an unconscious person.

Inhalation  Remove to fresh air, keep patient warm and at rest. If breathing is irregular or stopped, give artificial respiration. If unconscious place in the recovery position and obtain immediate medical attention. Give nothing by mouth.

Eyes  Irrigate copiously with clean water for at least 15 minutes, holding the eyelids apart and seek medical attention.

Skin  Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser.

Ingestion  If swallowed, wash out mouth with water, obtain immediate medical attention. Keep at rest. Do NOT induce vomiting.

4.2. Most important symptoms and effects, both acute and delayed

Overview

Eye: Contact with eyes may cause severe irritation, and possible eye burns. Vapors may cause eye irritation.

Skin: May cause skin irritation. May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.

Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.

Inhalation: Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. May cause severe respiratory tract irritation.

Chronic: Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, and personality changes.

Notes to Physician: Treat symptomatically and supportively.

Antidote: The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. See section 2 for further details.

5. Fire-fighting measures

5.1. Extinguishing media

Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition: Mercury/mercury oxides.

Do not breathe mist / vapors / spray.
5.3. Advice for fire-fighters
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Combustion generates toxic fumes.

ERG Guide No. 172

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Put on appropriate personal protective equipment (see section 8).

6.2. Environmental precautions
Do not allow spills to enter drains or waterways. Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

6.3. Methods and material for containment and cleaning up
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).

7. Handling and storage

7.1. Precautions for safe handling
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

See section 2 for further details. - [Prevention]:

7.2. Conditions for safe storage, including any incompatibilities
Handle containers carefully to prevent damage and spillage.
Incompatible materials: Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.
Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Poison room locked.

See section 2 for further details. - [Storage]:

7.3. Specific end use(s)
No data available.
### 8. Exposure controls and personal protection

#### 8.1. Control parameters

**Exposure**

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>Ingredient</th>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0007439-97-6</td>
<td>Mercury</td>
<td>OSHA</td>
<td>TWA 0.1 mg/m³</td>
</tr>
</tbody>
</table>
| ACGIH    |            |        | Alkyl compounds TWA: 0.01 mg/m³ STEL 0.03 mg/m³ Skin  
|          | Aryl compounds TWA: 0.05 mg/m³ C 0.1 mg/m³ Skin  
|          | Elemental/Inorganic 0.025mg/m³ Skin                  |
| NIOSH    | No Established Limit                                    |
| Supplier | No Established Limit                                    |

**Carcinogen Data**

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>Ingredient</th>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0007439-97-6</td>
<td>Mercury</td>
<td>OSHA</td>
<td>Select Carcinogen: No</td>
</tr>
<tr>
<td>NTP</td>
<td>Known: No; Suspected: No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IARC</td>
<td>Group 1: No; Group 2a: No; Group 2b: No; Group 3: Yes; Group 4: No;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 8.2. Exposure controls

**Respiratory**

Follow the OSHA respirator regulations found in 29CFR §1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**Eyes**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin**

Wear appropriate protective clothing to prevent skin exposure. Wear appropriate gloves to prevent skin exposure.

**Engineering Controls**

Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn.

**Other Work Practices**

Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

See section 2 for further details. - [Prevention]:

### 9. Physical and chemical properties

- **Appearance**: Silver Liquid
- **Odor**: Odorless
- **Odor threshold**: Not Measured
- **pH**: Not Applicable
- **Melting point / freezing point**: -38.87 deg C
**Safety Data Sheet**  
**Mercury (Metallic)**

**SDS Revision Date:** 05/01/2015

**Initial boiling point and boiling range**  
356.5 deg C @ 760.00mmHg

**Flash Point**  
Not Measured

**Evaporation rate (Ether = 1)**  
Not Available

**Flammability (solid, gas)**  
Not Applicable

**Upper/lower flammability or explosive limits**

- **Lower Explosive Limit:** Not Measured
- **Upper Explosive Limit:** Not Measured

**Vapor pressure (Pa)**

- 0.002 mmHg @ 25C

**Vapor Density**

- 7 (Air=1)

**Specific Gravity**

- 13.5400g/cm3 (Water=1)

**Solubility in Water**

- Insoluble

**Partition coefficient n-octanol/water (Log Kow)**

- Not Measured

**Auto-ignition temperature**

- Not Measured

**Decomposition temperature**

- Not Available

**Viscosity (cSt)**

- 1.554 cP 20.00

**Molecular Formula**

- Hg

**Molecular Weight**

- 200.59

**9.2. Other information**

- No other relevant information.

---

### 10. Stability and reactivity

**10.1. Reactivity**

Hazardous Polymerization will not occur.

**10.2. Chemical stability**

Stable under normal circumstances.

**10.3. Possibility of hazardous reactions**

No data available.

**10.4. Conditions to avoid**

High temperatures, incompatible materials, metals.

**10.5. Incompatible materials**

- Acetylene, ammonia, boron phosphodiiodide, chlorine, chlorine dioxide, methyl azide, sodium carbide, halogens, strong oxidizers.

**10.6. Hazardous decomposition products**

- Mercury/mercury oxides.

---

### 11. Toxicological information

**Acute toxicity**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Oral LD50, mg/kg</th>
<th>Skin LD50, mg/kg</th>
<th>Inhalation Vapor LC50, mg/L/4hr</th>
<th>Inhalation Dust/Mist LC50, mg/L/4hr</th>
<th>Inhalation Gas LC50, ppm</th>
</tr>
</thead>
</table>

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Safety Data Sheet
Mercury (Metallic)

SDS Revision Date: 05/01/2015

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>96 hr LC50 fish, mg/l</th>
<th>48 hr EC50 crustacea, mg/l</th>
<th>ErC50 algae, mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury - (7439-97-6)</td>
<td>Not Available</td>
<td>0.0052, Daphnia magna</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

Note: When no route specific LD50 data is available for an acute toxin, the converted acute toxicity point estimate was used in the calculation of the product's ATE (Acute Toxicity Estimate).

12. Ecological information

12.1. Toxicity
Very toxic to aquatic life with long lasting effects.
No additional information provided for this product. See Section 3 for chemical specific data.

Aquatic Ecotoxicity

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>96 hr LC50 fish, mg/l</th>
<th>48 hr EC50 crustacea, mg/l</th>
<th>ErC50 algae, mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury - (7439-97-6)</td>
<td>Not Available</td>
<td>0.0052, Daphnia magna</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
There is no data available on the preparation itself.

12.3. Bioaccumulative potential
Not Measured

12.4. Mobility in soil
No data available.

12.5. Results of PBT and vPvB assessment
This product contains no PBT/vPvB chemicals.

12.6. Other adverse effects
No data available.

13. Disposal considerations

13.1. Waste treatment methods
Observe all federal, state and local regulations when disposing of this substance.

14. Transport information

<table>
<thead>
<tr>
<th>DOT (Domestic Surface Transportation)</th>
<th>IMO / IMDG (Ocean Transportation)</th>
<th>ICAO/IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.1. UN number</td>
<td>UN2809</td>
<td>UN2809</td>
</tr>
<tr>
<td>14.2. UN proper shipping name</td>
<td>UN2809, Mercury, 8, III</td>
<td>Mercury</td>
</tr>
<tr>
<td>14.3. Transport hazard class(es)</td>
<td>DOT Hazard Class: 8 (6.1)</td>
<td>IMDG: 8</td>
</tr>
<tr>
<td></td>
<td>IMDG: 8 Sub Class: 6.1</td>
<td>Sub Class: 6.1</td>
</tr>
<tr>
<td>14.4. Packing group</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>14.5. Environmental hazards</td>
<td>IMDG Marine Pollutant: Yes (Mercury)</td>
<td></td>
</tr>
<tr>
<td>14.6. Special precautions for user</td>
<td>No further information</td>
<td></td>
</tr>
</tbody>
</table>

15. Regulatory information

Regulatory Overview
The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented.

Toxic Substance Control Act (TSCA)
All components of this material are either listed or exempt from listing on the TSCA Inventory.

WHMIS Classification
D1A

US EPA Tier II Hazards
Fire: No
Sudden Release of Pressure: No
Reactive: No
Immediate (Acute): Yes
Delayed (Chronic): Yes

EPCRA 311/312 Chemicals and RQs (lbs): Mercury (1.00)

EPCRA 302 Extremely Hazardous:
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.
EPCRA 313 Toxic Chemicals:
Mercury

Proposition 65 - Carcinogens (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Developmental Toxins (>0.0%):
Mercury

Proposition 65 - Female Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

Proposition 65 - Male Repro Toxins (>0.0%):
To the best of our knowledge, there are no chemicals at levels which require reporting under this statute.

New Jersey RTK Substances (>1%):
Mercury

Pennsylvania RTK Substances (>1%):
Mercury

16. Other information

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

The full text of the phrases appearing in section 3 is:
H330 Fatal if inhaled.
H360D May damage the unborn child.
H372 Causes damage to organs through prolonged or repeated exposure.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

This is the first version in the GHS SDS format. Listings of changes from previous versions in other formats are not applicable.

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 WM Mercury Waste Inc. 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.

End of Document
Material Name: Hess 10W30 Motor Oil

Synonyms: Valvoline Product Code 52670413

*** Section 1 - Product and Company Identification ***

Manufacturer Information
Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961
Phone: 732-750-6000
Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

*** Section 2 - Hazards Identification ***

GHS Classification:
- Skin Corrosion/Irritation – Category 2
- Specific Target Organ Toxicity – Category 3 (narcosis)
- Carcinogenicity - Category 1B

GHS LABEL ELEMENTS
Symbol(s)

Signal Word
WARNING

Hazard Statements
- Causes skin irritation.
- May cause cancer.
- May cause drowsiness or dizziness.

Precautionary Statements

Prevention
- Wash hands and forearms thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Avoid breathing fume/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.

Response
If on skin: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
If exposed or concerned: Get medical advice/attention.
If inhaled: Remove person to fresh air and keep in a position comfortable for breathing. Call poison center or doctor if you feel unwell.
Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Storage
Store locked up.
Store in a well-ventilated place.
Keep container tightly closed.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

*** Section 3 - Composition / Information on Ingredients ***

<table>
<thead>
<tr>
<th>CAS #</th>
<th>Component</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>64742-65-0</td>
<td>Petroleum distillates, solvent dewaxed heavy paraffinic</td>
<td>83-93</td>
</tr>
</tbody>
</table>

Petroleum-based lubricating oil with detergent/dispersant engine oil package with zinc compounds.

*** Section 4 - First Aid Measures ***

First Aid: Eyes
If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is visual difficulty, seek medical attention.

First Aid: Skin
Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

First Aid: Ingestion
Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

First Aid: Inhalation
Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

First Aid: Notes to Physician
Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard. Patients who aspirate these oils should be followed for the development of long-term sequelae. Repeated aspiration of mineral oil can produce chronic inflammation of the lungs (i.e. lipoid pneumonia) that may progress to pulmonary fibrosis. Symptoms are often subtle and radiological changes appear worse than clinical abnormalities. Occasionally, persistent cough, irritation of the upper respiratory tract, shortness of breath with exertion, fever, and bloody sputum occur. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin.

*** Section 5 - Fire Fighting Measures ***

General Fire Hazards
See Section 9 for Flammability Properties.
Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively. No special fire hazards are known to be associated with this product. Dense smoke may be generated while burning.
Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Hazardous Combustion Products
May form: carbon dioxide and carbon monoxide, oxides of sulfur, nitrogen and phosphorous, various hydrocarbons.

Extinguishing Media
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media
None

Fire Fighting Equipment/Instructions
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

*** Section 6 - Accidental Release Measures ***

Recovery and Neutralization
Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up
Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

SMALL SPILL: Absorb liquid on vermiculite, floor absorbent or other absorbent material. Persons not wearing proper personal protective equipment should be excluded from area of spill.

LARGE SPILL: Prevent run-off to sewers, streams, or other bodies of water. If run-off occurs, notify authorities as required, that a spill has occurred. Persons not wearing proper personal protective equipment should be excluded from area of spill until clean-up has been completed.

Emergency Measures
Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment
Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).
Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

*** Section 7 - Handling and Storage ***

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Avoid contact with: acids, halogens, strong oxidizing agents.

*** Section 8 - Exposure Controls / Personal Protection ***

Component Exposure Limits

ACGIH, OSHA, and NIOSH have not developed exposure limits for any of this product's components.

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Personal Protective Equipment: Hands
Not normally required. However, wear resistant gloves such as nitrile rubber to prevent irritation which may result from prolonged or repeated skin contact with product.

Personal Protective Equipment: Eyes
Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body
To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear normal work clothing covering arms and legs.

Hygiene Measures
Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

*** Section 9 - Physical & Chemical Properties ***

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Dry, clear and bright</td>
</tr>
<tr>
<td>Odor</td>
<td>None</td>
</tr>
<tr>
<td>Physical State</td>
<td>Liquid</td>
</tr>
<tr>
<td>pH</td>
<td>ND</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>ND</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>ND</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>&gt;425 °F (218.3°C) @ 760.00 mmHg</td>
</tr>
<tr>
<td>Melting Point</td>
<td>ND</td>
</tr>
<tr>
<td>Solubility (H2O)</td>
<td>Negligible</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.881 @ 60°F (16°C)</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Slower than ethyl ether</td>
</tr>
<tr>
<td>VOC</td>
<td>ND</td>
</tr>
<tr>
<td>Viscosity</td>
<td>&lt;= 3300.0 cps @ -20°C; 10.0 - 11.0 cst @ 100°C</td>
</tr>
<tr>
<td>Octanol/H2O Coeff.</td>
<td>ND</td>
</tr>
<tr>
<td>Flash Point</td>
<td>430 °F (221.1 °C)</td>
</tr>
<tr>
<td>Flash Point Method</td>
<td>COC</td>
</tr>
<tr>
<td>Upper Flammability Limit (UFL):</td>
<td>ND</td>
</tr>
<tr>
<td>Lower Flammability Limit (LFL):</td>
<td>ND</td>
</tr>
<tr>
<td>Burning Rate</td>
<td>ND</td>
</tr>
<tr>
<td>Auto Ignition</td>
<td>ND</td>
</tr>
</tbody>
</table>

*** Section 10 - Chemical Stability & Reactivity Information ***

Chemical Stability
This is a stable material.

Hazardous Reaction Potential
Will not occur.

Conditions to Avoid
None

Incompatible Products
Avoid contact with: acids, halogens, strong oxidizing agents.

Hazardous Decomposition Products
May form: aldehydes, carbon dioxide and carbon monoxide, hydrogen sulfide, oxides of sulfur, nitrogen and phosphorus, toxic fumes, various hydrocarbons.
**Section 11 - Toxicological Information**

### Acute Toxicity

#### A: General Product Information
Harmful if large amounts are swallowed.

#### B: Component Analysis - LD50/LC50
- Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)
  - Inhalation LC50 Rat >4.7 mg/L 4 h; Oral LD50 Rat >5000 mg/kg; Dermal LD50 Rabbit >5000 mg/kg

### Potential Health Effects: Skin Corrosion Property/Stimulativeness
May cause mild skin irritation. Prolonged or repeated contact may dry the skin. Symptoms include redness, burning, drying and cracking of the skin, and skin burns. Additional symptoms of skin contact include: acne. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

### Potential Health Effects: Eye Critical Damage/ Stimulativeness
May cause mild eye irritation. Symptoms include stinging, tearing, and redness.

### Potential Health Effects: Ingestion
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful.

### Potential Health Effects: Inhalation
It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful. Symptoms usually occur at air concentrations higher than the recommended exposure limits.

### Respiratory Organs Sensitization/Skin Sensitization
This product is not reported to have any skin sensitization effects.

### Generative Cell Mutagenicity
This product is not reported to have any mutagenic effects.

### Carcinogenicity

#### A: General Product Information
May cause cancer.

Used motor oil has been shown to cause skin cancer in laboratory animal continually exposed by repeated applications.

#### B: Component Carcinogenicity
None of this product’s components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

### Reproductive Toxicity
This product is not reported to have any reproductive toxicity effects.

### Specified Target Organ General Toxicity: Single Exposure
This product is not reported to have any specific target organ general toxicity single exposure effects.

### Specified Target Organ General Toxicity: Repeated Exposure
This product is not reported to have any specific target organ general toxicity repeat exposure effects.

### Aspiration Respiratory Organs Hazard
Acute aspiration of large amounts of oil-laden material may produce a serious aspiration hazard.
*** Section 12 - Ecological Information ***

Ecotoxicity
A: General Product Information
   Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Petroleum distillates, solvent dewaxed heavy paraffinic (64742-65-0)

<table>
<thead>
<tr>
<th>Test &amp; Species</th>
<th>Conditions</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 Hr LC50 Oncorhynchus mykiss</td>
<td>&gt;5000 mg/L</td>
<td></td>
</tr>
<tr>
<td>48 Hr EC50 Daphnia magna</td>
<td>&gt;1000 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

Persistence/Degradability
No information available.

Bioaccumulation
No information available.

Mobility in Soil
No information available.

*** Section 13 - Disposal Considerations ***

Waste Disposal Instructions
See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging
Dispose of contents/container in accordance with local/regional/national/international regulations.

*** Section 14 - Transportation Information ***

DOT Information
Shipping Name: Not Regulated

*** Section 15 - Regulatory Information ***

Regulatory Information
Component Analysis
None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

SARA Section 311/312 – Hazard Classes

<table>
<thead>
<tr>
<th>Acute Health</th>
<th>Chronic Health</th>
<th>Fire</th>
<th>Sudden Release of Pressure</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

SARA SECTION 313 - SUPPLIER NOTIFICATION
ZINC C1-C14 ALKYLDITHIOPHOSPHATE (CAS No. 68649-42-3)

State Regulations
Safety Data Sheet

Material Name: Hess 10W30 Motor Oil

Component Analysis - State
None of this product’s components are listed on the state lists from CA, MA, MN, NJ, PA, or RI.

Component Analysis - WHMIS IDL
No components are listed in the WHMIS IDL.

Additional Regulatory Information

Component Analysis - Inventory

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS #</th>
<th>TSCA</th>
<th>CAN</th>
<th>EEC</th>
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</thead>
<tbody>
<tr>
<td>Petroleum distillates, solvent dewaxed heavy paraffinic</td>
<td>64742-65-0</td>
<td>Yes</td>
<td>DSL</td>
<td>EINECS</td>
</tr>
</tbody>
</table>

*** Section 16 - Other Information ***

NFPA® Hazard Rating

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Fire</td>
<td>1</td>
</tr>
<tr>
<td>Reactivity</td>
<td>0</td>
</tr>
</tbody>
</table>

HMIS® Hazard Rating

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1* Slight</td>
</tr>
<tr>
<td>Fire</td>
<td>1 Slight</td>
</tr>
<tr>
<td>Physical</td>
<td>Minimal</td>
</tr>
<tr>
<td></td>
<td>*Chronic</td>
</tr>
</tbody>
</table>

Key/Legend
EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References
None

Other Information
Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

Page 8 of 8  Revision Date 8/30/12
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: Methyl tert-butyl ether
Product Number: 48027
Brand: Supelco
Index-No.: 603-181-00-X
CAS-No.: 1634-04-4

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)
H225: Highly flammable liquid and vapour.
H315: Causes skin irritation.

Precautionary statement(s)
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.
P264: Wash skin thoroughly after handling.
P280: Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353  IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
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 for extinction.
P403 + P235  Store in a well-ventilated place. Keep cool.
P501  Dispose of contents/ container to an approved waste disposal plant.

2.3  Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1  Substances
Syonyms  : MTBE
          : tert-Butyl methyl ether
          : Methyl tert-butyl ether

Formula  : C₅H₁₂O
Molecular weight  : 88.15 g/mol
CAS-No.  : 1634-04-4
EC-No.  : 216-653-1
Index-No.  : 603-181-00-X
Registration number  : 01-2119452786-27-XXXX

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>tert-Butyl methyl ether</td>
<td>Flam. Liq. 2; Skin Irrit. 2; 2</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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

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
No data available

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.

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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. 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
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.
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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>tert-Butyl methyl ether</td>
<td>1634-04-4</td>
<td>TWA</td>
<td>50.000000 ppm</td>
<td>USA, ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td>Upper Respiratory Tract irritation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kidney damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PEL</td>
<td>40 ppm 144 mg/m3</td>
<td>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</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.

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 230 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)
data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, 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.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance Form: liquid
b) Odour No data available
c) Odour Threshold No data available
d) pH No data available
e) Melting point/freezing point Melting point/range: -108.6 °C (-163.5 °F)
f) Initial boiling point and boiling range 55 - 56 °C (131 - 133 °F) - lit.
g) Flash point -33.0 °C (-27.4 °F) - 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: 15.1 %(V)
Lower explosion limit: 1.6 %(V)
k) Vapour pressure 1.018.7 hPa (764.1 mmHg) at 55.0 °C (131.0 °F) 279.2 hPa (209.4 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density No data available
m) Relative density 0.74 g/cm3 at 25 °C (77 °F)
Water solubility
42 g/l at 20 °C (68 °F) - OECD Test Guideline 105

Partition coefficient: n-octanol/water
log Pow: 1.06

Auto-ignition temperature
374.0 °C (705.2 °F)

Decomposition temperature
No data available

Viscosity
0.464 mm²/s at 20 °C (68 °F) - 0.409 mm²/s at 40 °C (104 °F)

Explosive properties
No data available

Oxidizing properties
No data available

Other safety information
No data available

10. STABILITY AND REACTIVITY

Reactivity
No data available

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Incompatible materials
Oxidizing agents, Strong acids

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 4,000 mg/kg
LC50 Inhalation - Rat - 4 h - 23576 ppm
Dermal: No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation

Respiratory or skin sensitisation
Will not occur

Germ cell mutagenicity
No data available
Carcinogenicity

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: KN5250000

Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in Leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish
LC50 - Pimephales promelas (fathead minnow) - 672.00 mg/l - 96 h
LC50 - other fish - > 1,000.00 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 472 mg/l - 48 h

Toxicity to algae
EC50 - Pseudokirchneriella subcapitata (green algae) - 491 mg/l - 96 h

12.2 Persistence and degradability

Biodegradability
Result: 0 % - Not readily biodegradable.
(OECD Test Guideline 301D)

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
No data available

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. Contact a licensed professional waste disposal service to dispose of this material.
Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

**DOT (US)**
- UN number: 2398
- Class: 3
- Packing group: II
- Proper shipping name: Methyl tert-butyl ether
- Reportable Quantity (RQ): 1000 lbs
- Poison Inhalation Hazard: No

**IMDG**
- UN number: 2398
- Class: 3
- Packing group: II
- Proper shipping name: METHYL tert-BUTYL ETHER
- EMS-No: F-E, S-D

**IATA**
- UN number: 2398
- Class: 3
- Packing group: II
- Proper shipping name: Methyl tert-butyl ether

15. REGULATORY INFORMATION

**SARA 302 Components**
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1634-04-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazards**
Fire Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**
- tert-Butyl methyl ether

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1634-04-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**Pennsylvania Right To Know Components**
- tert-Butyl methyl ether

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1634-04-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

**New Jersey Right To Know Components**
- tert-Butyl methyl ether

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1634-04-4</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

**Full text of H-Statements referred to under sections 2 and 3.**

| Flam. Liq. | Flammable liquids |
| H225 | Highly flammable liquid and vapour. |
| H315 | Causes skin irritation. |
| Skin Irrit. | Skin irritation |

**HMIS Rating**
- Health hazard: 2
- Chronic Health Hazard: 3
- Flammability: 0

**NFPA Rating**
- Health hazard: 2
Fire Hazard: 3
Reactivity Hazard: 0

Further information
Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling
or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing
slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.5 Revision Date: 05/27/2016 Print Date: 07/13/2017
SAFETY DATA SHEET

1. Identification

Product Name: Naphthalene
Cat No.: N7-500
Synonyms: Tar camphor; Naphthalin; Coal tar camphor
Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

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>Flammable solids</td>
<td>Category 2</td>
</tr>
<tr>
<td>Acute oral toxicity</td>
<td>Category 4</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1B</td>
</tr>
<tr>
<td>Target Organs - Liver, Kidney.</td>
<td></td>
</tr>
</tbody>
</table>

Label Elements

<table>
<thead>
<tr>
<th>Signal Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable solid</td>
</tr>
<tr>
<td>Harmful if swallowed</td>
</tr>
<tr>
<td>May cause cancer</td>
</tr>
</tbody>
</table>

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required.
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
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)
Very toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

### 3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

### 4. First-aid measures

**General Advice**
If symptoms persist, call a physician.

**Eye Contact**
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain 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. Obtain medical attention.

**Ingestion**
Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

**Most important symptoms/effects**
Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

**Notes to Physician**
Treat symptomatically

### 5. Fire-fighting measures

**Suitable Extinguishing Media**
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.

**Unsuitable Extinguishing Media**
No information available

**Flash Point**
78 °C / 172.4 °F

**Method -**
No information available
Autoignition Temperature
Not applicable  526 °C / 978.8 °F

Explosion Limits
Upper  5.9 vol %
Lower  0.9 vol %

Sensitivity to Mechanical Impact  No information available
Sensitivity to Static Discharge  No information available

Specific Hazards Arising from the Chemical
Combustible material. Containers may explode when heated. Do not allow run-off from fire fighting to enter drains or water courses.

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>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions
Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up
Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal. Remove all sources of ignition.

7. Handling and storage

Handling
Wear personal protective equipment. Ensure adequate ventilation. Avoid ingestion and inhalation. Do not get in eyes, on skin, or on clothing. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TWA: 10 ppm</td>
<td>(Vacated) TWA: 10 ppm</td>
<td>IDLH: 250 ppm</td>
</tr>
<tr>
<td>Naphthalene</td>
<td></td>
<td>(Vacated) TWA: 50 mg/m³</td>
<td>TWA: 10 ppm</td>
</tr>
<tr>
<td></td>
<td>Skin</td>
<td>(Vacated) STEL: 15 ppm</td>
<td>TWA: 50 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Vacated) STEL: 75 mg/m³</td>
<td>STEL: 15 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 10 ppm</td>
<td>STEL: 75 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 50 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 15 ppm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>TWA: 10 ppm</td>
<td>TWA: 10 ppm</td>
<td>TWA: 10 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA: 52 mg/m³</td>
<td>TWA: 50 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STEL: 15 ppm</td>
<td>STEL: 15 ppm</td>
<td>STEL: 15 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 79 mg/m³</td>
<td>STEL: 75 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health
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>Characteristic</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>79 °C - 82 °C / 174.2 °F - 179.6 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>218 °C / 424.4 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>78 °C / 172.4 °F</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability or explosive limits</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>5.9 vol %</td>
</tr>
<tr>
<td>Lower</td>
<td>0.9 vol %</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.08 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.990</td>
</tr>
<tr>
<td>Solubility</td>
<td>slightly soluble</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>Not applicable 526 °C / 978.8 °F</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>540 °C</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C10H8</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>128.17</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Stability</td>
<td>Stable under normal conditions.</td>
</tr>
<tr>
<td>Incompatible Materials</td>
<td>Strong oxidizing agents</td>
</tr>
<tr>
<td>Hazardous Decomposition Products</td>
<td>Carbon monoxide (CO), Carbon dioxide (CO₂)</td>
</tr>
<tr>
<td>Hazardous Polymerization</td>
<td>Hazardous polymerization does not occur.</td>
</tr>
</tbody>
</table>
11. Toxicological information

Acute Toxicity

Product Information
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>Naphthalene</td>
<td>LD50 = 490 mg/kg (Rat)</td>
<td>LD50 &gt; 20 g/kg (Rabbit)</td>
<td>LC50 &gt; 340 mg/m³ (Rat) 1 h</td>
</tr>
<tr>
<td></td>
<td>LD50 = 1110 mg/kg (Rat)</td>
<td>LD50 = 1120 mg/kg (Rabbit)</td>
<td></td>
</tr>
</tbody>
</table>

Toxicologically Synergistic Products

None 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>Naphthalene</td>
<td>91-20-3</td>
<td>Group 2B</td>
<td>Reasonably Anticipated</td>
<td>A3</td>
<td>X</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen

Mutagenic Effects

Not mutagenic in AMES Test

Reproductive Effects

Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects

Developmental effects have occurred in experimental animals.

Teratogenicity

Teratogenic effects have occurred in experimental animals.

STOT - single exposure

None known

STOT - repeated exposure

Liver Kidney

Aspiration hazard

No information available

Symptoms / effects, both acute and delayed

Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information

No information available

Other Adverse Effects

Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.
### Component Persistence and Degradability

<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>Naphthalene</td>
<td>EC50: 0.4 mg/L, 72h (Skeletonema costatum)</td>
<td>LC50 96 h 1-6.5 mg/L (Pimephales promelas)</td>
<td>EC50 = 0.93 mg/L 30 min</td>
<td>EC50: 1.09 - 3.4 mg/L, 48h (Skeletonema costatum)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EC50 &gt; 20 mg/L 18 h</td>
<td>EC50: 1.96 mg/L, 48h (Pimephales promelas)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EC50: = 2.16 mg/L, 48h (Daphnia magna)</td>
</tr>
</tbody>
</table>

**Bioaccumulation/Accumulation**

Soluble in water. Persistence is unlikely based on information available. 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>Naphthalene</td>
<td>3.3</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.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>U165</td>
<td>-</td>
</tr>
</tbody>
</table>

### 14. Transport information

**DOT**

- **UN-No**: UN1334
- **Proper Shipping Name**: NAPHTHALENE, CRUDE
- **Hazard Class**: 4.1
- **Packing Group**: III

**TDG**

- **UN-No**: UN1334
- **Proper Shipping Name**: NAPHTHALENE, CRUDE
- **Hazard Class**: 4.1
- **Packing Group**: III

**IATA**

- **UN-No**: UN1334
- **Proper Shipping Name**: NAPHTHALENE, CRUDE
- **Hazard Class**: 4.1
- **Packing Group**: III

**IMDG/IMO**

- **UN-No**: UN1334
- **Proper Shipping Name**: NAPHTHALENE, CRUDE
- **Hazard Class**: 4.1
- **Packing Group**: III

### 15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

<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>Naphthalene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>202-049-5</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.
- 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)

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>&gt;95</td>
<td>0.1</td>
</tr>
</tbody>
</table>

#### SARA 311/312 Hazard Categories

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### CWA (Clean Water Act)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>X</td>
<td>100 lb</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

#### Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depleters</th>
<th>Class 2 Ozone Depleters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### OSHA Occupational Safety and Health Administration

Not applicable

#### CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

#### California Proposition 65

This product contains the following proposition 65 chemicals

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naphthalene</td>
<td>100 lb 1 lb</td>
<td></td>
</tr>
</tbody>
</table>

#### 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>Naphthalene</td>
<td></td>
<td></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
Moderate risk, Grade 2

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
- B3   Combustible liquid
- D1B  Toxic materials
- D2A  Very toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 27-Sep-2010
Revision Date 12-Oct-2015
Print Date 12-Oct-2015

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 on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of SDS
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: Nickel
Product Number: 268259
Brand: Aldrich
Index-No.: 028-002-00-7
CAS-No.: 7440-02-0

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements
Pictogram

Signal word Danger
Hazard statement(s)
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs through prolonged or repeated exposure if inhaled.
H412 Harmful to aquatic life with long lasting effects.
Precautionary statement(s)
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.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
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.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P333 + P313 If skin irritation or rash occurs: Get medical advice/ attention.
P363 Wash contaminated clothing before reuse.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Formula : Ni
Molecular weight : 58.69 g/mol
CAS-No. : 7440-02-0
EC-No. : 231-111-4
Index-No. : 028-002-00-7

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>Skin Sens. 1; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; H317, H351, H372, H412</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. Take victim immediately to hospital. Consult a physician.

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. 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.

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
Nickel/nickel oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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
Keep container tightly closed in a dry and well-ventilated place. Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>TWA</td>
<td>1.500000 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Remarks: Dermatitis, Pneumoconiosis, Not suspected as a human carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>1.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>0.015000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
</tbody>
</table>

Potential Occupational Carcinogen
See Appendix A
<table>
<thead>
<tr>
<th>TWA</th>
<th>1.000000 mg/m³</th>
<th>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.015000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential Occupational Carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Appendix A</td>
</tr>
<tr>
<td>TWA</td>
<td>1.5 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential Occupational Carcinogen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Appendix A</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.

**Full contact**
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

**Splash contact**
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance
   Form: Foil
   Colour: white, silver, metallic

b) Odour
   No data available

c) Odour Threshold
   No data available

d) pH
   No data available

e) Melting point/freezing point
   Melting point/range: 1,453 °C (2,647 °F) - lit.

f) Initial boiling point and boiling range
   2,732 °C (4,950 °F) - 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 hPa (1 mmHg) at 1,810 °C (3,290 °F)

l) Vapour density
   No data available

m) Relative density
   8.9 g/mL at 25 °C (77 °F)

n) Water solubility
   Insoluble

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

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**
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

10.6 **Hazardous decomposition products**
Other decomposition products - No data available
In the event of fire: see section 5

11. **TOXICOLOGICAL INFORMATION**

11.1 **Information on toxicological effects**

**Acute toxicity**
No data available

Inhalation: No data available
Dermal: No data available
No data available

**Skin corrosion/irritation**
No data available

**Serious eye damage/eye irritation**
No data available

**Respiratory or skin sensitisation**
May cause sensitisation by skin contact.

**Germ cell mutagenicity**
No data available

**Carcinogenicity**
Limited evidence of carcinogenicity in animal studies

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Nickel)
1 - Group 1: Carcinogenic to humans (Nickel)
2B - Group 2B: Possibly carcinogenic to humans (Nickel)
IARC: 2B - Group 2B: Possibly carcinogenic to humans (Nickel)
1 - Group 1: Carcinogenic to humans (Nickel)
2B - Group 2B: Possibly carcinogenic to humans (Nickel)
NTP: Reasonably anticipated to be a human carcinogen (Nickel)
Reasonably anticipated to be a human carcinogen (Nickel)
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**
No data available
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
Inhalation - Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available
Additional Information
RTECS: QR5950000
Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish  LC50 - Cyprinus carpio (Carp) - 1.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates  EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h

12.2 Persistence and degradability
Not applicable

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
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>7440-02-0</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components
Pennsylvania Right To Know Components

Nickel | CAS-No. | Revision Date
--- | --- | ---
7440-02-0 | 2007-07-01

New Jersey Right To Know Components

Nickel | CAS-No. | Revision Date
--- | --- | ---
7440-02-0 | 2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.

Nickel | CAS-No. | Revision Date
--- | --- | ---
7440-02-0 | 2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute | Acute aquatic toxicity
Aquatic Chronic | Chronic aquatic toxicity
Carc. | Carcinogenicity
H317 | May cause an allergic skin reaction.
H351 | Suspected of causing cancer.
H372 | Causes damage to organs through prolonged or repeated exposure if inhaled.
H402 | Harmful to aquatic life.
H412 | Harmful to aquatic life with long lasting effects.

HMIS Rating

Health hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical Hazard 0

NFPA Rating

Health hazard: 2
Fire Hazard: 0
Reactivity Hazard: 0

Further information

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 12/28/2015 Print Date: 05/01/2016
1. Identification

Product Name
Tetrachloroethylene

Cat No.: AC445690000; ACR445690010; AC445690025; AC445691000

Synonyms
Perchloroethylene

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>Condition</th>
<th>Category</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>
<tr>
<td>Skin Sensitization</td>
<td>Category 1</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 1B</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Target Organs - Central nervous system (CNS).</td>
<td></td>
</tr>
<tr>
<td>Specific target organ toxicity - (repeated exposure)</td>
<td>Category 2</td>
</tr>
<tr>
<td>Target Organs - Kidney, Liver, Blood.</td>
<td></td>
</tr>
</tbody>
</table>

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure
Precautionary Statements

Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Response
IF exposed or concerned: Get medical attention/advice

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention

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

Storage
Store locked up
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)
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>&gt;95</td>
</tr>
</tbody>
</table>

4. First-aid measures

General Advice
If symptoms persist, call a physician.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation
Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion
Clean mouth with water and drink afterwards plenty of water.
Most important symptoms/effects

None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing.

Notes to Physician

Treat symptomatically

<table>
<thead>
<tr>
<th>5. Fire-fighting measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suitable Extinguishing Media</td>
</tr>
<tr>
<td>Unsuitable Extinguishing Media</td>
</tr>
<tr>
<td>Flash Point</td>
</tr>
<tr>
<td>Method</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
</tr>
<tr>
<td>Explosion Limits</td>
</tr>
<tr>
<td>Upper</td>
</tr>
<tr>
<td>Lower</td>
</tr>
<tr>
<td>Sensitivity to Mechanical Impact</td>
</tr>
<tr>
<td>Sensitivity to Static Discharge</td>
</tr>
</tbody>
</table>

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products
Chlorine Hydrogen chloride gas 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.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Use personal protective equipment. Ensure adequate ventilation.

Environmental Precautions
Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling
Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.

Storage
Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

8. Exposure controls / personal protection

<table>
<thead>
<tr>
<th>Exposure Guidelines</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
<th>Mexico OEL (TWA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>TWA: 25 ppm STEL: 100 ppm</td>
<td>(Vacated) TWA: 25 ppm Ceiling: 200 ppm TWA: 100 ppm</td>
<td>IDLH: 150 ppm</td>
<td>TWA: 100 ppm TWA: 670 mg/m³ TWA: 200 ppm TWA: 1250 mg/m³ STEL: 200 ppm STEL: 1340 mg/m³</td>
</tr>
</tbody>
</table>

Page 3 / 8
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>Characteristic, sweet</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>-22 °C / -7.6 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>120 - 122 °C / 248 - 251.6 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>6.0 (Ether = 1.0)</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>18 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available</td>
</tr>
<tr>
<td>Density</td>
<td>1.619</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.625</td>
</tr>
<tr>
<td>Solubility</td>
<td>0.15 g/L water (20°C)</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>&gt; 150°C</td>
</tr>
<tr>
<td>Viscosity</td>
<td>0.89 mPa s at 20 °C</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C2 Cl4</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>165.83</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Hazard</td>
<td>None known, based on information available</td>
</tr>
<tr>
<td>Stability</td>
<td>Stable under normal conditions.</td>
</tr>
<tr>
<td>Conditions to Avoid</td>
<td>Incompatible products. Excess heat. Exposure to moist air or water.</td>
</tr>
</tbody>
</table>
Incompatible Materials: Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

Hazardous Decomposition Products: Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization: Hazardous polymerization does not occur.

Hazardous Reactions: None under normal processing.

**11. Toxicological information**

### Acute Toxicity

**Product Information**

**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>Tetrachloroethylene</td>
<td>LD50 = 2629 mg/kg (Rat)</td>
<td>LD50 &gt; 10000 mg/kg (Rat)</td>
<td>LC50 = 27.8 mg/L (Rat) 4 h</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.

<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>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>Group 2A</td>
<td>Reasonably Anticipated</td>
<td>A3</td>
<td>X</td>
<td>A3</td>
</tr>
</tbody>
</table>

**IARC: (International Agency for Research on Cancer)**

- Group 1 - Carcinogenic to Humans
- Group 2A - Probably Carcinogenic to Humans
- Group 2B - Possibly Carcinogenic to Humans

**NTP: (National Toxicity Program)**

- Known - Known Carcinogen
- Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

**ACGIH: (American Conference of Governmental Industrial Hygienists)**

- A1 - Known Human Carcinogen
- A2 - Suspected Human Carcinogen
- A3 - Animal Carcinogen

**ACGIH: (American Conference of Governmental Industrial Hygienists)**

**Mexico - Occupational Exposure Limits - Carcinogens**

- A1 - Confirmed Human Carcinogen
- A2 - Suspected Human Carcinogen
- A3 - Confirmed Animal Carcinogen
- A4 - Not Classifiable as a Human Carcinogen
- A5 - Not Suspected as a Human Carcinogen

**Mutagenic Effects**

No information available

**Reproductive Effects**

No information available.

**Developmental Effects**

No information available.

**Teratogenicity**

No information available.

**STOT - single exposure**

- Central nervous system (CNS)

**STOT - repeated exposure**

- Kidney Liver Blood

**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; Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest
pain, muscle pain or flushing

Endocrine Disruptor Information

<table>
<thead>
<tr>
<th>Component</th>
<th>EU - Endocrine Disrupters - Candidate List</th>
<th>EU - Endocrine Disruptors - Evaluated Substances</th>
<th>Japan - Endocrine Disruptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>Group II Chemical</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Other Adverse Effects
Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity
Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

<table>
<thead>
<tr>
<th>Component</th>
<th>EC50: &gt; 500 mg/L, 96h (Pseudokirchneriella subcapitata)</th>
<th>LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss)</th>
<th>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)</th>
<th>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)</th>
<th>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)</th>
<th>EC50 = 100 mg/L 24h</th>
<th>EC50 = 112 mg/L 24h</th>
<th>EC50 = 120.0 mg/L 30 min</th>
<th>EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability
Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation
No information available.

Mobility
Not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due its volatility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>2.88</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.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene - 127-18-4</td>
<td>U210</td>
<td>-</td>
</tr>
</tbody>
</table>

14. Transport information

DOT

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1897</td>
<td>TETRACHLOROETHYLENE</td>
<td>6.1</td>
<td>III</td>
</tr>
</tbody>
</table>

TDG

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1897</td>
<td>TETRACHLOROETHYLENE</td>
<td>6.1</td>
<td>III</td>
</tr>
</tbody>
</table>

IATA

<table>
<thead>
<tr>
<th>UN-No</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN1897</td>
<td>TETRACHLOROETHYLENE</td>
<td>6.1</td>
</tr>
</tbody>
</table>
15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

**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>Tetrachloroethylene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>204-825-9</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.
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**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>&gt;95</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazard Categories**

- Acute Health Hazard: Yes
- Chronic Health Hazard: Yes
- Fire Hazard: No
- Sudden Release of Pressure Hazard: No
- Reactive Hazard: No

**CWA (Clean Water Act)**

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Clean Air Act**

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depletors</th>
<th>Class 2 Ozone Depletors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OSHA**

Occupational Safety and Health Administration
Not applicable

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive ...
Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>100 lb 1 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

California Proposition 65
This product contains the following proposition 65 chemicals

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>Carcinogen</td>
<td>14 µg/day</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

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>Tetrachloroethylene</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation

- Reportable Quantity (RQ): Y
- DOT Marine Pollutant: Y
- 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-Dec-2009
Revision Date: 26-May-2017
Print Date: 26-May-2017
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

<table>
<thead>
<tr>
<th>CHS Inc.</th>
<th>Transportation Emergency (CHEMTREC)</th>
<th>1-800-424-9300</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.O. Box 64089</td>
<td>Technical Information</td>
<td>1-651-355-8443</td>
</tr>
<tr>
<td>Mail station 525</td>
<td>SDS Information</td>
<td>1-651-355-8445</td>
</tr>
<tr>
<td>St. Paul, MN 55164-0089</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product name</th>
<th>Regular, Midgrade &amp; Premium Unleaded Gasoline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common name</td>
<td>Unleaded Gasoline, Premium Unleaded Gasoline</td>
</tr>
<tr>
<td>Chemical name</td>
<td>Light Petroleum Distillate</td>
</tr>
<tr>
<td>Chemical family</td>
<td>Mixed Petroleum Hydrocarbon</td>
</tr>
</tbody>
</table>

**Relevant identified uses of the substance or mixture and uses advised against**

Not available.

## Section 2. Hazards identification

### OSHA/HCS status

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

### Classification of the substance or mixture

- FLAMMABLE LIQUIDS - Category 1
- SKIN CORROSION/IRRITATION - Category 2
- GERM CELL MUTAGENICITY - Category 1B
- CARCINOGENICITY - Category 1A
- TOXIC TO REPRODUCTION (Fertility) - Category 2
- TOXIC TO REPRODUCTION (Unborn child) - Category 2
- SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
- SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 1
- ASPIRATION HAZARD - Category 1
- AQUATIC HAZARD (ACUTE) - Category 3
- AQUATIC HAZARD (LONG-TERM) - Category 3

### GHS label elements

- **Hazard pictograms**
- [Flammable](image)
- [Toxic](image)
- [Danger](image)

- **Signal word**: Danger

- **Hazard statements**: Extremely flammable liquid and vapor.  
  Causes skin irritation.  
  May cause genetic defects.  
  May cause cancer.  
  Suspected of damaging fertility or the unborn child.  
  May be fatal if swallowed and enters airways.  
  May cause drowsiness and dizziness.  
  Causes damage to organs through prolonged or repeated exposure.  
  Harmful to aquatic life with long lasting effects.

### Precautionary statements

**General**: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

- **Hazardous Material Information System (U.S.A.)**
  - Health: 2
  - Flammability: 4
  - Physical hazards: 0

- **National Fire Protection Association (U.S.A.)**
  - Health: 2
  - Flammability: 4
  - Instability: 0
Section 3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>10 - 30</td>
<td>108-88-3</td>
</tr>
<tr>
<td>Xylene</td>
<td>10 - 30</td>
<td>1330-20-7</td>
</tr>
<tr>
<td>Tert-butyl methyl ether</td>
<td>10 - 30</td>
<td>1634-04-4</td>
</tr>
<tr>
<td>Benzene</td>
<td>1 - 5</td>
<td>71-43-2</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>1 - 5</td>
<td>95-63-6</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>1 - 5</td>
<td>100-41-4</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>1 - 5</td>
<td>110-54-3</td>
</tr>
<tr>
<td>Butyl ethyl ether</td>
<td>0.1 - 1</td>
<td>628-81-9</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0.1 - 1</td>
<td>91-20-3</td>
</tr>
</tbody>
</table>

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

**Eye contact**: If material comes in contact with the eyes, immediately wash the eyes with large amounts of water for 15 minutes, occasionally lifting the lower and upper lids. Get medical attention.

**Inhalation**: If person breathes in large amounts of material, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the person warm and at rest. Get medical attention as soon as possible.

**Skin contact**: If the material comes in contact with the skin, wash the contaminated skin with soap and water promptly. If the material penetrates through clothing, remove the clothing and wash the skin with soap and water promptly. If irritation persists after washing, get medical attention immediately.

**Ingestion**: If material has been swallowed, do not induce vomiting. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

**Potential acute health effects**

**Eye contact**: Causes serious eye irritation.

**Inhalation**: Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.

**Skin contact**: Causes skin irritation.

**Ingestion**: Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways. Irritating to mouth, throat and stomach.

**Over-exposure signs/symptoms**

**Eye contact**: Adverse symptoms may include the following: pain or irritation, watering, redness.

**Inhalation**: Adverse symptoms may include the following: respiratory tract irritation, coughing.

**Skin contact**: Adverse symptoms may include the following: irritation, redness.

**Ingestion**: No known significant effects or critical hazards.

Indication of immediate medical attention and special treatment needed, if necessary

**Notes to physician**: Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

**Specific treatments**: No specific treatment.

**Protection of first-aiders**: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)
Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media: Use dry chemical, CO₂, water spray (fog) or foam.
Unsuitable extinguishing media: Do not use water jet or water-based fire extinguishers.

Specific hazards arising from the chemical: Highly volatile material. Flowing gasoline can be ignited by self-generated static electricity; containers should be bonded and grounded. Vapors may travel along the ground to a source of ignition (pilot light, heater, electric motor) some distance away. Containers, drums (even empty) can explode when heat (welding, cutting, etc.) is applied.

Hazardous thermal decomposition products: Decomposition products may include the following materials:
- Carbon dioxide
- Carbon monoxide

Special protective actions for fire-fighters: Water may be ineffective on flames, but should be used to keep fire-exposed containers cool. Large fires, such as tank fires, should be fought with caution. If possible, pump the contents from the tank and keep adjoining structures cool and protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Do not flush down public sewers. The use of a self-contained breathing apparatus and protective clothing is recommended for fire fighters. Avoid inhalation of vapors.

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.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: Keep unnecessary and unprotected personnel from entering. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Methods and materials for containment and cleaning up

Spill: Contain with dikes or absorbent to prevent migration to sewers/streams. Take up small spill with dry chemical absorbent; large spills may require pump or vacuum prior to absorbent. May require excavation of severely contaminated soil.

Section 7. Handling and storage

Precautions for safe handling

Protective measures: Put on appropriate personal protective equipment (see Section 8). 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.

Advice on general occupational hygiene: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking.

Conditions for safe storage, including any incompatibilities: Do not store above the following temperature: 113°C (235.4°F). Odorous and toxic fumes may form from the decomposition of this product if stored at excessive temperatures for extended periods of time. Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Ingredient name | Exposure limits
--- | ---
Toluene | NIOSH REL (United States, 6/2009).
STEL: 560 mg/m³ 15 minutes.
STEL: 150 ppm 15 minutes.
TWA: 375 mg/m³ 10 hours.
TWA: 100 ppm 10 hours.
OSHA PEL Z2 (United States, 11/2006).
AMP: 500 ppm 10 minutes.
CEIL: 300 ppm
TWA: 200 ppm 8 hours.
OSHA PEL (United States, 6/2010).
TWA: 100 ppm 8 hours.
Xylene | ACGIH TLV (United States, 3/2012).
TWA: 20 ppm 8 hours.
ACGIH TLV (United States, 3/2012).
STEL: 651 mg/m³ 15 minutes.
STEL: 150 ppm 15 minutes.
TWA: 434 mg/m³ 8 hours.
TWA: 100 ppm 8 hours.
OSHA PEL (United States, 6/2010).
TWA: 100 ppm 8 hours.
Tert-butyl methyl ether

**ACGIH TLV (United States, 1/2005).**
TWA: 435 mg/m³ 8 hours.
TWA: 50 ppm 8 hours. Form: All forms.

**ACGIH TLV (United States, 2/2010).**
TWA: 50 ppm 8 hours.

**Benzene**

**ACGIH TLV (United States, 3/2012). Absorbed through skin.**
STEL: 8 mg/m³ 15 minutes.
STEL: 2.5 ppm 15 minutes.
TWA: 1.6 mg/m³ 8 hours.
TWA: 0.5 ppm 8 hours.

**NIOSH REL (United States, 6/2009).**
STEL: 1 ppm 15 minutes.
TWA: 0.1 ppm 10 hours.

**OSHA PEL (United States, 6/2010).**
STEL: 5 ppm 15 minutes.
TWA: 1 ppm 8 hours.

**OSHA PEL Z2 (United States, 11/2006).**
AMP: 50 ppm 10 minutes.
CEIL: 25 ppm
TWA: 10 ppm 8 hours.

**1,2,4-Trimethylbenzene**

**ACGIH TLV (United States, 3/2012).**
TWA: 123 mg/m³ 8 hours.
TWA: 25 ppm 8 hours.

**NIOSH REL (United States, 1/2013).**
TWA: 125 mg/m³ 10 hours.
TWA: 25 ppm 10 hours.

**OSHA PEL 1989 (United States, 3/1989).**
TWA: 25 ppm 8 hours.
TWA: 125 mg/m³ 8 hours.

**Ethylbenzene**

**ACGIH TLV (United States, 3/2012).**
TWA: 20 ppm 8 hours.

**NIOSH REL (United States, 6/2009).**
STEL: 545 mg/m³ 15 minutes.
STEL: 125 ppm 15 minutes.
TWA: 435 mg/m³ 8 hours.
TWA: 100 ppm 10 hours.

**OSHA PEL (United States, 6/2010).**
TWA: 435 mg/m³ 8 hours.
TWA: 100 ppm 8 hours.

**n-Hexane**

**ACGIH TLV (United States, 3/2012). Absorbed through skin.**
TWA: 50 ppm 8 hours.

**NIOSH REL (United States, 6/2009).**
TWA: 180 mg/m³ 10 hours.
TWA: 50 ppm 10 hours.

**OSHA PEL (United States, 6/2010).**
TWA: 1800 mg/m³ 8 hours.
TWA: 500 ppm 8 hours.

**Naphthalene**

**ACGIH TLV (United States, 3/2012). Absorbed through skin.**
STEL: 79 mg/m³ 15 minutes.
STEL: 15 ppm 15 minutes.
TWA: 52 mg/m³ 8 hours.
TWA: 10 ppm 8 hours.

**NIOSH REL (United States, 1/2013).**
STEL: 75 mg/m³ 15 minutes.
STEL: 15 ppm 15 minutes.
TWA: 50 mg/m³ 10 hours.
TWA: 10 ppm 10 hours.

**OSHA PEL (United States, 6/2010).**
TWA: 50 mg/m³ 8 hours.
TWA: 10 ppm 8 hours.

**Appropriate engineering controls** : Use only with adequate ventilation.

**Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

**Individual protection measures**

**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. Ensure that eyewash stations and safety showers are close to the workstation location.

**Eye/face protection** : Recommended: Splash goggles and a face shield, where splash hazard exists.

**Skin protection**

**Hand protection** : 4 - 8 hours (breakthrough time): Nitrile gloves.

**Body protection** : Recommended: Long sleeved coveralls.
Other skin protection: Recommended: Impervious boots.
Respiratory protection: If ventilation is inadequate, use a NIOSH-certified respirator with an organic vapor cartridge and P95 particulate filter.

Section 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>Color</td>
<td>Reddish golden brown.</td>
</tr>
<tr>
<td>Odor</td>
<td>Gasoline</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>10 ppm</td>
</tr>
<tr>
<td>pH</td>
<td>Not available</td>
</tr>
<tr>
<td>Melting point</td>
<td>Not available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>26.66°C (80°F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>Closed cup: -40°C (-40°F) [Pensky-Martens.]</td>
</tr>
<tr>
<td>Flammability</td>
<td>Not available</td>
</tr>
<tr>
<td>Lower and upper explosive (flammable) limits</td>
<td>Lower: 1.4%  Upper: 7.6%</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.72</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Slower</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble in the following materials: cold water and hot water.</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Negligible</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>257.22 to 454.44°C (495 to 850°F)</td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>Not available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>53.3 kPa (400 mm Hg) (68°F)</td>
</tr>
<tr>
<td>Vapor density</td>
<td>4 [Air = 1]</td>
</tr>
</tbody>
</table>

Section 10. Stability and reactivity

Reactivity: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability: The product is stable.
Possibility of hazardous reactions: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Incompatible materials: Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Hazardous decomposition products: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>LC50 Inhalation Vapor</td>
<td>Rat</td>
<td>49 g/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>636 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Xylene</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>5000 ppm</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>4300 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Tert-butyl methyl ether</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>23576 ppm</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LC50 Inhalation Vapor</td>
<td>Rat</td>
<td>41000 mg/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>&gt;4 g/kg</td>
<td>-</td>
</tr>
<tr>
<td>Benzene</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>930 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>LC50 Inhalation Vapor</td>
<td>Rat</td>
<td>18000 mg/m³</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>5 g/kg</td>
<td>-</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>&gt;5000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>3500 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>48000 ppm</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>15840 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Butyl ethyl ether</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>1870 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>&gt;20 g/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>490 mg/kg</td>
<td>-</td>
</tr>
</tbody>
</table>

Irritation/Corrosion
<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Score</th>
<th>Exposure</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>0.5 minutes 100 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 20 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>870 µg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Eyes - Severe irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 2 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Pig</td>
<td>-</td>
<td>24 hours 250 µL</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>435 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>500 mg</td>
<td>-</td>
</tr>
<tr>
<td>Xylene</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>87 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Eyes - Severe irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 5 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>8 hours 60 µL</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 500 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>100%</td>
<td>-</td>
</tr>
<tr>
<td>Benzene</td>
<td>Eyes - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>88 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Moderate irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 20 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Eyes - Severe irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 2 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rat</td>
<td>-</td>
<td>8 hours 60 µL</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 15 mg</td>
<td>-</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>Eyes - Severe irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>500 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 15 mg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>10 mg</td>
<td>-</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>Eyes - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>495 mg</td>
<td>-</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Skin - Mild irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>24 hours 0.05 mL</td>
<td>-</td>
</tr>
</tbody>
</table>

### Sensitization
- **Skin**: There is no data available.
- **Respiratory**: There is no data available.

### Mutagenicity
There is no data available.

### Carcinogenicity
There is no data available.

### Classification

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>OSHA</th>
<th>IARC</th>
<th>NTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Xylene</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Tert-butyl methyl ether</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Benzene</td>
<td>+</td>
<td>1</td>
<td>Known to be a human carcinogen.</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>-</td>
<td>2B</td>
<td>-</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>-</td>
<td>2B</td>
<td>Reasonably anticipated to be a human carcinogen.</td>
</tr>
</tbody>
</table>

### Reproductive toxicity
There is no data available.

### Teratogenicity
There is no data available.

### Specific target organ toxicity (single exposure)

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>Category 3</td>
<td>Not applicable.</td>
<td>Narcotic effects</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>Category 3</td>
<td>Not applicable.</td>
<td>Respiratory tract irritation; Narcotic effects</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>Category 3</td>
<td>Not applicable.</td>
<td>Narcotic effects</td>
</tr>
</tbody>
</table>

### Specific target organ toxicity (repeated exposure)

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Route of exposure</th>
<th>Target organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>Category 2</td>
<td>Not determined</td>
<td>Not determined</td>
</tr>
<tr>
<td>Benzene</td>
<td>Category 1</td>
<td>Not determined</td>
<td>Not determined</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>Category 2</td>
<td>Not determined</td>
<td>Not determined</td>
</tr>
</tbody>
</table>

### Aspiration hazard

<table>
<thead>
<tr>
<th>Name</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
<tr>
<td>Benzene</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>ASPIRATION HAZARD - Category 1</td>
</tr>
</tbody>
</table>
Information on the likely routes of exposure:
Dermal contact. Eye contact. Inhalation. Ingestion.

Section 12. Ecological information

Toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>Acute EC50 433 ppm Marine water</td>
<td>Algae - Skeletonema costatum</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 12500 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 11600 µg/l Fresh water</td>
<td>Crustaceans - Gammarius</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 6000 µg/l Fresh water</td>
<td>pseudolimnaeus - Adult</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 5500 µg/l Fresh water</td>
<td>Daphnia - Daphnia magna - Juvenile</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 500000 µg/l Fresh water</td>
<td>(Fledgling, Hatchling, Weanling)</td>
<td></td>
</tr>
<tr>
<td>Xylene</td>
<td>Acute LC50 8500 µg/l Marine water</td>
<td>Algae</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13400 µg/l Fresh water</td>
<td>Crustaceans - Palaemonetes pugio</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 10 mg/L</td>
<td>Fish - Pimephales promelas</td>
<td>96 hours</td>
</tr>
<tr>
<td>Tert-butyl methyl ether</td>
<td>Acute LC50 672000 µg/l Fresh water</td>
<td>Fish - Pimephales promelas</td>
<td>96 hours</td>
</tr>
<tr>
<td>Benzene</td>
<td>Acute EC50 29000 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 1360000 µg/l Fresh water</td>
<td>Algae - Scenedesmus abundans</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 9230 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 21000 µg/l Marine water</td>
<td>Daphnia - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 5.28 ul/L Fresh water</td>
<td>Crustaceans - Artemia salina - Nauplii</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 1.5 to 5.4 ul/L Marine water</td>
<td>Fish - Oncorynchus gorbuscha - Fry</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Fish - Morone saxatilis - Juvenile</td>
<td>(Fledgling, Hatchling, Weanling)</td>
<td>4 weeks</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>Acute LC50 4910 µg/l Marine water</td>
<td>Crustaceans - Elasmuspecticus - Adult</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 22.4 mg/L Fresh water</td>
<td>Fish - Tilapia zillii</td>
<td>96 hours</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>Acute EC50 4600 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 3600 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 2970 µg/l Fresh water</td>
<td>Daphnia - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 5200 µg/l Marine water</td>
<td>Crustaceans - Americamysis bahia</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 4200 µg/l Fresh water</td>
<td>Fish - Oncorynchus mykiss</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 1000 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>96 hours</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>Acute LC50 113000 µg/l Fresh water</td>
<td>Algae - Pseudokirchneriella subcapitata</td>
<td>96 hours</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Acute EC50 1600 µg/l Fresh water</td>
<td>Daphnia - Daphnia magna - Neonate</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 2350 µg/l Marine water</td>
<td>Crustaceans - Palaemonetes pugio</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 213 µg/l Fresh water</td>
<td>Fish - Melanotaenia fluvatilis - Larvae</td>
<td>96 hours</td>
</tr>
</tbody>
</table>

Persistence and degradability
There is no data available.

Bioaccumulative potential

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP&lt;sub&gt;ow&lt;/sub&gt;</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>2.73</td>
<td>90</td>
<td>low</td>
</tr>
<tr>
<td>Xylene</td>
<td>3.12</td>
<td>8.1 to 25.9</td>
<td>low</td>
</tr>
<tr>
<td>Tert-butyl methyl ether</td>
<td>1.04</td>
<td>1.5</td>
<td>low</td>
</tr>
<tr>
<td>Benzene</td>
<td>2.13</td>
<td>11</td>
<td>low</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>3.63</td>
<td>243</td>
<td>low</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>3.6</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>4</td>
<td>501.187</td>
<td>high</td>
</tr>
<tr>
<td>Butyl ethyl ether</td>
<td>2.03</td>
<td>-</td>
<td>low</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>3.4</td>
<td>36.5 to 168</td>
<td>low</td>
</tr>
</tbody>
</table>

Mobility in soil

Soil/water partition coefficient (K<sub>oc</sub>): There is no data available.

Other adverse effects: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods: Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.
Section 14. Transport information

DOT IDENTIFICATION NUMBER: UN1203
DOT proper shipping name: GASOLINE (Toluene, Xylene) RQ (Benzene, Xylene)
DOT Hazard Class(es): 3
PG: I
DOT EMER. RESPONSE GUIDE NO.: 128

Section 15. Regulatory information

U.S. Federal regulations:
- TSCA 8(a) PAIR: Naphthalene
- TSCA 8(a) CDR Exempt/Partial exemption: Not determined
- United States inventory (TSCA 8b): All components are listed or exempted.
- Clean Water Act (CWA) 307: Toluene; Benzene; Ethylbenzene; Naphthalene
- Clean Water Act (CWA) 311: Toluene; Xylene; Benzene; Ethylbenzene; Naphthalene

Clean Air Act Section 602 Class I Substances: Not listed
Clean Air Act Section 602 Class II Substances: Not listed
Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs): Listed

TSCA 8(a) PAIR: Naphthalene
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): All components are listed or exempted.
Clean Water Act (CWA) 307: Toluene; Benzene; Ethylbenzene; Naphthalene
Clean Water Act (CWA) 311: Toluene; Xylene; Benzene; Ethylbenzene; Naphthalene

SARA 302/304
Composition/information on ingredients
No products were found.

SARA 304 RQ: Not applicable.

SARA 311/312
Classification: Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>1 - 5</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>1 - 5</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>1 - 5</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>1 - 5</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
<tr>
<td>Butyl ethyl ether</td>
<td>0.1 - 1</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>0.1 - 1</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
<td>Yes.</td>
<td>Yes.</td>
</tr>
</tbody>
</table>

SARA 313: This product (does/not) contain toxic chemicals subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

Product name | CAS number | %
-------------|------------|-----
Toluene      | 108-88-3   | Up to 18.1
Xylene       | 1330-20-7  | Up to 15.3
Benzene      | 71-43-2    | Up to 5.3
1,2,4-Trimethylbenzene | 95-63-6 | Up to 4.8
Ethylbenzene | 100-41-4   | Up to 2.6
n-Hexane     | 110-54-3   | Up to 4
Naphthalene  | 91-20-3    | Up to 1

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts: The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether
New York: The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; Ethylbenzene; n-Hexane; Naphthalene
New Jersey: The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene
Pennsylvania: The following components are listed: Toluene; Xylene; Tert-butyl methyl ether; Benzene; 1,2,4-Trimethylbenzene; Ethylbenzene; n-Hexane; Butyl ethyl ether; Naphthalene
California Prop. 65

**WARNING:** This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

<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>Toluene</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
<td>7000 µg/day (ingestion)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13000 µg/day (inhalation)</td>
</tr>
<tr>
<td>Benzene</td>
<td>Yes.</td>
<td>Yes.</td>
<td>6.4 µg/day (ingestion)</td>
<td>24 µg/day (ingestion)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13 µg/day (inhalation)</td>
<td>49 µg/day (inhalation)</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>Yes.</td>
<td>No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>41 µg/day (ingestion)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>54 µg/day (inhalation)</td>
<td></td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Yes.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
</tbody>
</table>

**Section 16. Other information**

**Revision date:** 11/15/2013  
**Supersedes:** 01/23/2013  
**Revised Section(s):** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16.

**Prepared by:** KMK Regulatory Services Inc.

Notice to reader:
The information contained in this SDS relates only to the specific material identified. It does not cover use of that material in combination with any other material or in any particular process. In compliance with 29 C.F.R. 1910.1200(g), CHS has prepared this SDS in segments, with the intent that those segments be read together as a whole without textual omissions or alterations. CHS believes the information contained herein to be accurate, but makes no representation, guarantee, or warranty, express or implied, about the accuracy, reliability, or completeness of the information or about the fitness of contents herein for either general or particular purposes. Persons reviewing this SDS should make their own determination as to the material’s suitability and completeness for use in their particular applications.
RegenOx® – Part A (Oxidizer Complex)
Material Safety Data Sheet (MSDS)

Last Revised: June 24, 2010

Section 1 – Supplier Information and Material Identification

Supplier:

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenes.com

Chemical Description: A mixture of sodium percarbonate [2Na₂CO₃·3H₂O₂], sodium carbonate [Na₂CO₃], sodium silicate and silica gel.

Chemical Family: Inorganic Chemicals

Trade Name: RegenOx® – Part A (Oxidizer Complex)

Product Use: Used to remediate contaminated soil and groundwater (environmental applications)

Section 2 – Chemical Information/Other Designations

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>Chemical</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15630-89-4</td>
<td>Sodium Percarbonate</td>
<td>60 -100 %</td>
</tr>
<tr>
<td>5968-11-6</td>
<td>Sodium Carbonate Monohydrate</td>
<td>10 – 30 %</td>
</tr>
<tr>
<td>7699-11-6</td>
<td>Silicic Acid</td>
<td>&lt; 1 %</td>
</tr>
<tr>
<td>63231-67-4</td>
<td>Silica Gel</td>
<td>&lt; 1 %</td>
</tr>
</tbody>
</table>

Section 3 – Physical Data

Form: Powder

Color: White

Odor: Odorless

Melting Point: NA

Boiling Point: NA
Section 3 – Physical Data (cont)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability/Flash Point:</td>
<td>NA</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>NA</td>
</tr>
<tr>
<td>Bulk Density:</td>
<td>0.9 – 1.2 g/cm³</td>
</tr>
<tr>
<td>Solubility:</td>
<td>Min 14.5g/100g water @ 20 ºC</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>NA</td>
</tr>
<tr>
<td>pH (3% solution):</td>
<td>≈ 10.5</td>
</tr>
<tr>
<td>Decomposition Temperature:</td>
<td>Self-accelerating decomposition with oxygen release starts at 50 ºC.</td>
</tr>
</tbody>
</table>

Section 4 – Reactivity Data

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability:</td>
<td>Stable under normal conditions</td>
</tr>
<tr>
<td>Conditions to Avoid/Incompatibility:</td>
<td>Acids, bases, salts of heavy metals, reducing agents, and flammable substances</td>
</tr>
<tr>
<td>Hazardous Decomposition Products:</td>
<td>Oxygen. Contamination with many substances will cause decomposition. The rate of decomposition increases with increasing temperature and may be very vigorous with rapid generation of oxygen and steam.</td>
</tr>
</tbody>
</table>

Section 5 – Regulations

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCA Inventory Listed:</td>
<td>Yes</td>
</tr>
<tr>
<td>CERCLA Hazardous Substance (40 CFR Part 302)</td>
<td></td>
</tr>
<tr>
<td>Listed Substance:</td>
<td>No</td>
</tr>
<tr>
<td>Unlisted Substance:</td>
<td>Yes</td>
</tr>
<tr>
<td>SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know</td>
<td></td>
</tr>
<tr>
<td>Extremely Hazardous Substance:</td>
<td>No</td>
</tr>
<tr>
<td>WHMIS Classification:</td>
<td>C, D2B</td>
</tr>
<tr>
<td>Canadian Domestic Substance List:</td>
<td>Appears</td>
</tr>
</tbody>
</table>
Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage: Oxidizer. Store in a cool, well ventilated area away from all sources of ignition and out of the direct sunlight. Store in a dry location away from heat and in temperatures less than 40 °C.

Keep away from incompatible materials and keep lids tightly closed. Do not store in improperly labeled containers.

Protect from moisture. Do not store near combustible materials. Keep containers well sealed.

Store separately from reducing materials. Avoid contamination which may lead to decomposition.

Handling: Avoid contact with eyes, skin and clothing. Use with adequate ventilation.

Do not swallow. Avoid breathing vapors, mists or dust. Do not eat, drink or smoke in the work area.

Label containers and keep them tightly closed when not in use.

Wash hands thoroughly after handling.

Personal Protective Equipment (PPE)

Engineering Controls: General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Avoid creating dust or mists. Maintain adequate ventilation at all times. Do not use in confined areas. Keep levels below recommended exposure limits. To determine actual exposure limits, monitoring should be performed on a routine basis.

Respiratory Protection: For many conditions, no respiratory protection is necessary; however, in dusty or unknown conditions or when exposures exceed limit values a NIOSH approved respirator should be used.

Hand Protection: Wear chemical resistant gloves (neoprene, rubber, or PVC).
Section 6 – Protective Measures, Storage and Handling (cont)

<table>
<thead>
<tr>
<th>Eye Protection:</th>
<th>Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Protection:</td>
<td>Try to avoid skin contact with this product. Chemical resistant gloves (neoprene, PVC or rubber) and protective clothing should be worn during use.</td>
</tr>
<tr>
<td>Other:</td>
<td>Eye wash station.</td>
</tr>
<tr>
<td>Protection Against Fire &amp; Explosion:</td>
<td>Product is non-explosive. In case of fire, evacuate all non-essential personnel, wear protective clothing and a self-contained breathing apparatus, stay upwind of fire, and use water to spray cool fire-exposed containers.</td>
</tr>
</tbody>
</table>

Section 7 – Hazards Identification

Potential Health Effects

Inhalation: Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.

Eye Contact: Causes irritation, redness and pain.

Skin Contact: Causes slight irritation.

Ingestion: May be harmful if swallowed (vomiting and diarrhea).

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage: Eliminate all ignition sources. Evacuate unprotected personnel and never exceed any occupational exposure limit. Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Extinguishing Media: Water

First Aid

Eye Contact: Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.

Inhalation: Remove affected person to fresh air. Seek medical attention if the effects persist.

Ingestion: If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. Do Not induce vomiting.
Section 8 – Measures in Case of Accidents and Fire (cont)

Skin Contact: Wash affected areas with soap and a mild detergent and large amounts of water.

Section 9 – Accidental Release Measures

Precautions:

Cleanup Methods: Shovel or sweep spilt material into plastic bags or vented containers for disposal. Do not return spilled or contaminated material to the inventory.

Section 10 – Information on Toxicology

Toxicity Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 Oral (rat):</td>
<td>2,400 mg/kg</td>
</tr>
<tr>
<td>LD50 Dermal (rabbit):</td>
<td>Min 2,000 mg/kg</td>
</tr>
<tr>
<td>LD50 Inhalation (rat):</td>
<td>Min 4,580 mg/kg</td>
</tr>
</tbody>
</table>

Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information: NA

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment: Dispose of in an approved waste facility operated by an authorized contactor in compliance with local regulations.

Package (Pail) Treatment: The empty and clean containers are to be recycled or disposed of in conformity with local regulations.
### Section 13 – Shipping/Transport Information

<table>
<thead>
<tr>
<th>D.O.T. Shipping Name:</th>
<th>Oxidizing Solid, N.O.S. [A mixture of sodium percarbonate [2Na₂CO₃·3H₂O₂], sodium carbonate [Na₂CO₃], sodium silicate and silica gel.]</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN Number:</td>
<td>1479</td>
</tr>
<tr>
<td>Hazard Class:</td>
<td>5.1</td>
</tr>
<tr>
<td>Labels:</td>
<td>5.1 (Oxidizer)</td>
</tr>
<tr>
<td>Packaging Group:</td>
<td>III</td>
</tr>
</tbody>
</table>

### Section 14 – Other Information

<table>
<thead>
<tr>
<th>HMIS® Rating</th>
<th>Health – 1 (slight)</th>
<th>Reactivity – 1 (slight)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flammability – 0 (none)</td>
<td>Lab PPE – goggles, gloves, and lab coat</td>
</tr>
</tbody>
</table>

HMIS® is a registered trademark of the National Painting and Coating Association.

### Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.
RegenOx® – Part B (Activator Complex)
Material Safety Data Sheet (MSDS)

Last Revised: June 4, 2010

Section 1 – Supplier Information and Material Identification

Supplier:

![Regenesis Logo]

1011 Calle Sombra
San Clemente, CA 92673
Telephone: 949.366.8000
Fax: 949.366.8090
E-mail: info@regenesis.com

Chemical Description: A mixture of sodium silicate solution, silica gel and ferrous sulfate
Chemical Family: Inorganic Chemicals
Trade Name: RegenOx® – Part B (Activator Complex)
Product Use: Used for environmental remediation of contaminated soils and groundwater

Section 2 – Chemical Information/Other Designations

<table>
<thead>
<tr>
<th>CAS No.</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1344-09-8</td>
<td>Silicic Acid, Sodium Salt, Sodium Silicate</td>
</tr>
<tr>
<td>63231-67-4</td>
<td>Silica Gel</td>
</tr>
<tr>
<td>7720-78-7</td>
<td>Ferrous Sulfate</td>
</tr>
<tr>
<td>7732-18-5</td>
<td>Water</td>
</tr>
</tbody>
</table>

Section 3 – Physical Data

<table>
<thead>
<tr>
<th>Form:</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color:</td>
<td>Blue/Green</td>
</tr>
<tr>
<td>Odor:</td>
<td>Odorless</td>
</tr>
<tr>
<td>Melting Point:</td>
<td>NA</td>
</tr>
<tr>
<td>Boiling Point:</td>
<td>NA</td>
</tr>
<tr>
<td>Flammability/Flash Point:</td>
<td>NA</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>NA</td>
</tr>
</tbody>
</table>
Section 3 – Physical Data (cont)

Specific Gravity: 1.39 g/cm³
Solubility: Miscible
Viscosity: NA
pH (3% solution): 11

Hazardous Decomposition Products:
Oxides of carbon and silicon may be formed when heated to decomposition.

Section 4 – Reactivity Data

Stability: Stable under normal conditions.
Conditions to Avoid: None.
Incompatibility: Avoid hydrogen fluoride, fluorine, oxygen difluoride, chlorine trifluoride, strong acids, strong bases, oxidizers, aluminum, fiberglass, copper, brass, zinc, and galvanized containers.

Section 5 – Regulations

TSCA Inventory Listed: Yes
CERCLA Hazardous Substance (40 CFR Part 302)
Listed Substance: No
Unlisted Substance: Yes

SARA, Title III, Sections 302/303 (40 CFR Part 355) – Emergency Planning and Notification
Extremely Hazardous Substance: No

SARA, Title III, Sections 311/312 (40 CFR Part 370) – Hazardous Chemical Reporting: Community Right-To-Know
Hazard Category: Acute

SARA, Title III, Sections 313 (40 CFR Part 372) – Toxic Chemical Release Reporting: Community Right-To-Know
Extremely Hazardous Substance: No
Section 6 – Protective Measures, Storage and Handling

Technical Protective Measures

Storage: Keep in a tightly closed container (steel or plastic) and store in a cool, well ventilated area away from all incompatible materials (acids, reactive metals, and ammonium salts). Store in a dry location away from heat above 60 degrees C and colder than 10 degrees C. Do not store in aluminum, fiberglass, copper, brass, zinc or galvanized containers.

Handling: Avoid contact with eyes, skin and clothing. Avoid breathing spray mist. Use with adequate ventilation. Do not use product if it is brownish-yellow in color.

Personal Protective Equipment (PPE)

Engineering Controls: General room ventilation is required if used indoors. Local exhaust ventilation, process enclosures or other engineering controls may be needed to maintain airborne levels below recommended exposure limits. Safety shower and eyewash station should be within direct access.

Respiratory Protection: Use NIOSH-approved dust and mist respirator where spray mist exists. Respirators should be used in accordance with 29 CFR 1910.134.

Hand Protection: Wear chemical resistant gloves.

Eye Protection: Wear chemical safety goggles. A full face shield may be worn in lieu of safety goggles.

Skin Protection: Try to avoid skin contact with this product. Gloves and protective clothing should be worn during use.

Other:

Protection Against Fire & Explosion: Product is non-explosive and non-combustible.
Section 7 – Hazards Identification

Potential Health Effects

**Inhalation:** Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath, and irritations to mucous membranes, nose and throat.

**Eye Contact:** Causes irritation, redness and pain.

**Skin Contact:** Causes irritation. Symptoms include redness, itching and pain.

**Ingestion:** May cause irritation to mouth, esophagus, and stomach.

Section 8 – Measures in Case of Accidents and Fire

**After Spillage/Leakage (small):** Mop up and neutralize liquid, then discharge to sewer in accordance with local, state and federal regulations.

**After Spillage/Leakage (large):** Keep unnecessary personnel away; isolate hazard area and do not allow entrance into the affected area. Do not touch or walk through spilled material. Stop leak if possible without risking injury. Prevent runoff from entering into storm sewers and ditches that lead to natural waterways. Isolate the material if at all possible. Sand or earth may be used to contain the spill. If containment is not possible, neutralize the contaminated area and flush with large quantities of water.

**Extinguishing Media:** Material is compatible with all extinguishing media.

**Further Information:**

**First Aid**

**Eye Contact:** Flush eyes with running water for at least 15 minutes with eyelids held open. Seek a specialist.

**Inhalation:** Remove affected person to fresh air. Give artificial respiration if individual is not breathing. If breathing is difficult, give oxygen. Seek medical attention if the effects persist.

**Ingestion:** If the individual is conscious and not convulsing, give two-four cups of water to dilute the chemical and seek medical attention immediately. **DO NOT** induce vomiting.

**Skin Contact:** Wash affected areas with soap and a mild detergent and large amounts of water. Remove contaminated clothing and shoes.
Section 9 – Accidental Release Measures

Precautions:

PPE: Wear chemical goggles, body-covering protective clothing, chemical resistant gloves, and rubber boots (see Section 6).

Environmental Hazards: Sinks and mixes with water. High pH of this material may be harmful to aquatic life. Only water will evaporate from a spill of this material.

Cleanup Methods: Pick-up and place in an appropriate container for reclamation or disposal. US regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities.

Section 10 – Information on Toxicology

Toxicity Data

Sodium Silicate: When tested for primary eye irritation potential according to OECD Guidelines, Section 405, a similar sodium silicate solution produced corneal, iridal and conjunctival irritation. Some eye irritation was still present 14 days after treatment, although the average primary irritation score has declined from 29.7 after 1 day to 4.0 after 14 days. When tested for primary skin irritation potential, a similar sodium silicate solution produced irritation with a primary irritation index of 3 to abraded skin and 0 to intact skin. Human experience confirms that irritation occurs when sodium silicates get on clothes at the collar, cuffs, or other areas where abrasion may exist.

The acute oral toxicity of this product has not been tested.

Ferrous Sulfate: LD50 Oral (rat): 319 mg/kg not a suspected carcinogen.
Section 11 – Information on Ecology

Ecology Data

Ecotoxicological Information: Based on 100% solid sodium silicate, a 96 hour median tolerance for fish of 2,320 mg/l; a 96 hour median tolerance for water fleas of 247 mg/L; a 96 hour median tolerance for snail eggs of 632 mg/L; and a 96 hour median tolerance for Amphipoda of 160 mg/L.

Section 12 – Disposal Considerations

Waste Disposal Method

Waste Treatment: Neutralize and landfill solids in an approved waste facility operated by an authorized contactor in compliance with local regulations.

Package (Pail) Treatment: The empty and clean containers are to be recycled or disposed of in conformity with local regulations.

Section 13 – Shipping/Transport Information

D.O.T. This product is not regulated as a hazardous material so there are no restrictions.

Section 14 – Other Information

HMIS® Rating

Health – 2 (moderate) Reactivity – 0 (none)
Flammability – 0 (none) Lab PPE – goggles, gloves, and lab coat
Contact – 1 (slight)

HMIS® is a registered trademark of the National Painting and Coating Association.

Section 15 – Further Information

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.
# SAFETY DATA SHEET

## Section 1. Identification

<table>
<thead>
<tr>
<th>GHS product identifier</th>
<th>SILVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Mixture</td>
</tr>
<tr>
<td>CAS number</td>
<td>Mixture</td>
</tr>
<tr>
<td>Other means of identification</td>
<td>CC01054908</td>
</tr>
<tr>
<td>Product type</td>
<td>liquid</td>
</tr>
</tbody>
</table>

Relevant identified uses of the substance or mixture and uses advised against

**Product use**
- Industrial applications. Plastics.

**Supplier's details**
- **POLYONE CORPORATION**
  - ColorMatrix Group Inc.
  - 680 North Rocky River Drive, Berea, Ohio, 44017-1628, USA
  - +1 216 622 0100

**Emergency telephone number (with hours of operation)**
- CHEMTREC 1-800-424-9300 (24hrs for spill, leak, fire, exposure or accident).

## Section 2. Hazards identification

This mixture has not been evaluated as a whole for health effects. Information provided on health effects of this product is based on the individual components. However, some vapors or contaminants may be released upon heating and the end-user (fabricator) must take the necessary precautions (mechanical ventilation, respiratory protection, etc.) to protect employees from exposure. See sections 8 and 11 for special precautions. After handling, always wash hands thoroughly with soap and water.

**OSHA/HCS status**
- This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

**Classification of the substance or mixture**
- SKIN CORROSION/IRRITATION - Category 2

**GHS label elements**
Hazard pictograms:

Signal word: Warning
Hazard statements: Causes skin irritation.

Precautionary statements:
- General: Not applicable.
- Prevention: Wear protective gloves. Wash hands thoroughly after handling.
- Response: IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention.
- Storage: Not applicable.
- Disposal: Not applicable.
- Supplemental label elements: None known.
- Hazards not otherwise classified: None known.

Section 3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Substance/mixture</th>
<th>Mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical name</td>
<td>Mixture</td>
</tr>
<tr>
<td>Other means of identification</td>
<td>CC01054908</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>%</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous Compounds Distillates, petroleum, hydrotreated middle</td>
<td>10 - 30</td>
<td>Not available.</td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>10 - 30</td>
<td>13463-67-7</td>
</tr>
</tbody>
</table>

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.
Section 4. First aid measures

Description of necessary first aid measures

**Eye contact**
- Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

**Inhalation**
- Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

**Skin contact**
- Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

**Ingestion**
- Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

**Potential acute health effects**

**Eye contact**
- Causes serious eye irritation.

**Inhalation**
- No known significant effects or critical hazards.

**Skin contact**
- Causes skin irritation.

**Ingestion**
- Irritating to mouth, throat and stomach.

**Over-exposure signs/symptoms**

**Eye contact**
- Adverse symptoms may include the following: pain or irritation
Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : In case of fire, use water spray (fog), foam, dry chemical or CO₂.
Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical

Hazardous thermal decomposition products : In a fire or if heated, a pressure increase will occur and the container may burst.

Decomposition products may include the following materials:
- carbon dioxide
- carbon monoxide
- metal oxide/oxides

Special protective actions for fire-fighters : 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.

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.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments : No specific treatment.
Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)
For non-emergency personnel: 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. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

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 and materials for containment and cleaning up

Small spill: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large 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. Wash spillages into an effluent treatment plant or proceed as follows. 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.

Section 7. Handling and storage

Precautions for safe handling

Protective measures: Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. 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.
**Advice on general occupational hygiene**: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

**Conditions for safe storage, including any incompatibilities**: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. 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. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

---

### Section 8. Exposure controls/personal protection

#### Control parameters

**Occupational exposure limits**

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>OSHA PEL 1989 (1989-03-01) PEL: Permissible Exposure Level 10 mg/m³ Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (1993-06-30) PEL: Permissible Exposure Level 15 mg/m³ Form: Total dust</td>
</tr>
<tr>
<td></td>
<td>ACGIH TLV (1996-05-18) TLV-TWA: Threshold Limit Value - Time weighted average PEL:</td>
</tr>
<tr>
<td></td>
<td>Permissible Exposure Level 10 mg/m³</td>
</tr>
</tbody>
</table>

**Appropriate engineering controls**: Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

**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.

**Individual protection measures**

**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.

**Eye/face protection**

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, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

**Skin protection**

**Hand protection**

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. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

**Body protection**

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.

**Other skin protection**

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection**

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.

---

**Section 9. Physical and chemical properties**

**Appearance**

- Physical state: liquid [liquid]
- Color: SILVER
- Odor: Faint odor.
- Odor threshold: Not available.
- pH: Not available.
- Melting point: Not available.
- Boiling point: Not available.
- Flash point: Not available.
- Burning time: Not available.
Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : Stable under recommended storage and handling conditions (see Section 7).

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Keep away from extreme heat and oxidizing agents.

Incompatible materials : Keep away from strong acids.

Oxidizer.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

This mixture has not been evaluated as a whole for health effects. Exposure effects listed are based on existing health data for the individual components which comprise the mixture.

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Irritation/Corrosion

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Skin</th>
<th>Eyes</th>
<th>Respiratory</th>
</tr>
</thead>
</table>

Sensitization

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Skin</th>
<th>Respiratory</th>
</tr>
</thead>
</table>

Mutagenicity

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Skin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixture. Not fully tested.</td>
</tr>
</tbody>
</table>

Carcinogenicity

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixture. Not fully tested.</td>
</tr>
</tbody>
</table>

Reproductive toxicity

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Skin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixture. Not fully tested.</td>
</tr>
</tbody>
</table>

Teratogenicity

<table>
<thead>
<tr>
<th>Conclusion/Summary</th>
<th>Skin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixture. Not fully tested.</td>
</tr>
</tbody>
</table>

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td></td>
</tr>
</tbody>
</table>
Information on the likely routes of exposure

- **Eye contact**: Causes serious eye irritation.
- **Inhalation**: No known significant effects or critical hazards.
- **Skin contact**: Causes skin irritation.
- **Ingestion**: Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

- **Eye contact**: Adverse symptoms may include the following:
  - pain or irritation
  - watering
  - redness
- **Inhalation**: No specific data.
- **Skin contact**: Adverse symptoms may include the following:
  - irritation
  - redness
- **Ingestion**: No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

**Short term exposure**

- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Long term exposure**

- **Potential immediate effects**: Not available.
- **Potential delayed effects**: Not available.

**Potential chronic health effects**

- **General**: No known significant effects or critical hazards.
- **Carcinogenicity**: No known significant effects or critical hazards.
- **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.

Numerical measures of toxicity

**Acute toxicity estimates**

<table>
<thead>
<tr>
<th>Route</th>
<th>ATE value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhalation (dusts and mists)</td>
<td>8.073 mg/l</td>
</tr>
</tbody>
</table>

**Section 12. Ecological information**

**Toxicity**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>Acute LC50 &gt; 1,000,000 µg/l</td>
<td>Fish - Mummichog</td>
<td>96 h</td>
</tr>
<tr>
<td></td>
<td>Marine water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 &gt; 1,000 mg/l</td>
<td>Fish - Fathead minnow</td>
<td>96 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 13 mg/l</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Water flea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute LC50 6.5 mg/l</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Water flea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 19.3 mg/l</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Water flea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 27.8 mg/l</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Water flea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acute EC50 35.306 mg/l</td>
<td>Aquatic invertebrates.</td>
<td>48 h</td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Water flea</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion/Summary: Not available.

**Persistence and degradability**

Conclusion/Summary: Not available.

**Bioaccumulative potential**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogPow</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium dioxide</td>
<td>352.00</td>
<td>low</td>
<td>low</td>
</tr>
</tbody>
</table>
Mobility in soil

Soil/water partition coefficient (KOC) : Not available.
Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Acute hazardous waste "P" List: Not listed
United States - RCRA Toxic hazardous waste "U" List: Not listed

Section 14. Transport information

U.S. DOT Classification : Not regulated for transportation.
ICAO/IATA : Not classified as dangerous good under transport regulations.
IMO/IMDG (maritime) : Not classified as dangerous good under transport regulations.

Section 15. Regulatory information

U.S. Federal regulations : United States - TSCA 12(b) - Chemical export notification: None of the components are listed.
United States - TSCA 4(a) - Final Test Rules: Not listed
United States - TSCA 4(a) - ITC Priority list: Not listed
United States - TSCA 4(a) - Proposed test rules: Not listed
United States - TSCA 4(f) - Priority risk review: Not listed
United States - TSCA 5(a)2 - Final significant new use rules: Not listed
United States - TSCA 5(a)2 - Proposed significant new use rules: Not listed
United States - TSCA 5(e) - Substances consent order: Not listed
United States - TSCA 6 - Final risk management: Not listed
United States - TSCA 6 - Proposed risk management: Not listed
United States - TSCA 8(a) - Chemical risk rules: Not listed
United States - TSCA 8(a) - Dioxin/Furane precursor: Not listed
United States - TSCA 8(a) - Chemical Data Reporting (CDR): Not determined
United States - TSCA 8(a) - Preliminary assessment report (PAIR): Not listed
United States - TSCA 8(c) - Significant adverse reaction (SAR): Not listed
United States - TSCA 8(d) - Health and safety studies: Not listed
United States - EPA Clean water act (CWA) section 307 - Priority pollutants: Listed Chromium (III) oxide

United States - EPA Clean water act (CWA) section 311 - Hazardous substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Flammable substances: Not listed
United States - EPA Clean air act (CAA) section 112 - Accidental release prevention - Toxic substances: Not listed
United States - Department of commerce - Precursor chemical: Not listed

Clean Air Act Section 112(b) : Not listed
Hazardous Air Pollutants (HAPs) : Not listed
Clean Air Act Section 602 Class I Substances : Not listed
Clean Air Act Section 602 Class II Substances : Not listed
DEA List I Chemicals (Precursor Chemicals) : Not listed
DEA List II Chemicals (Essential Chemicals) : Not listed

US. EPA CERCLA Hazardous Substances (40 CFR 302)

SARA 311/312

not applicable
Classification: Immediate (acute) health hazard

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous Compounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distillates, petroleum,</td>
<td>10-30</td>
<td>AH</td>
</tr>
<tr>
<td>hydrotreated middle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>10-30</td>
<td>CH</td>
</tr>
</tbody>
</table>

SARA 313

<table>
<thead>
<tr>
<th>Form R - Reporting requirements</th>
<th>Product name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier notification</td>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>1-5</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts: The following components are listed:
- Mica
- Titanium dioxide
- Aluminum

New York: None of the components are listed.

New Jersey: The following components are listed:
- Mica
- Titanium dioxide
- Aluminum

Pennsylvania: The following components are listed:
- Titanium dioxide
- Aluminum

California Prop. 65
WARNING: This product contains a chemical known to the State of California to cause cancer.

United States inventory (TSCA 8b): All components are listed or exempted.

Canada inventory: All components are listed or exempted.

International regulations
International lists

- **Australia inventory (AICS):** Not determined.
- **Taiwan inventory (CSNN):** Not determined.
- **Malaysia Inventory (EHS Register):** Not determined.
- **EINECS:** All components are listed or exempted.
- **Japan inventory:** Not determined.
- **China inventory (IECSC):** All components are listed or exempted.
- **Korea inventory:** All components are listed or exempted.
- **New Zealand Inventory of Chemicals (NZIoC):** Not determined.
- **Philippines inventory (PICCS):** All components are listed or exempted.

**Chemical Weapons Convention**

- **List Schedule I Chemicals:** Not listed
- **List Schedule II Chemicals:** Not listed
- **List Schedule III Chemicals:** Not listed

### Section 16. Other information

#### History

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of printing</td>
<td>06/04/2015</td>
</tr>
<tr>
<td>Date of issue/Date of revision</td>
<td>06/03/2015</td>
</tr>
<tr>
<td>Date of previous issue</td>
<td>11/20/2014</td>
</tr>
<tr>
<td>Version</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**Key to abbreviations**

- **ATE** = Acute Toxicity Estimate
- **BCF** = Bioconcentration Factor
- **GHS** = Globally Harmonized System of Classification and Labelling of Chemicals
- **IATA** = International Air Transport Association
- **IBC** = Intermediate Bulk Container
- **IMDG** = International Maritime Dangerous Goods
- **LogPow** = logarithm of the octanol/water partition coefficient
- **MARPOL 73/78** = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. (*Marpol* = marine pollution)
- **UN** = United Nations

**References**

Not available.

**Notice to reader**

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution.
Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Particularly this information may not be valid for such material used in conjunction with any other materials or in any process, unless specified in the text.
SAFETY DATA SHEET

1. Identification

Product identifier: Trichloroethylene

Other means of identification
Product No.: 9464, 8600, 9458, 9454

Recommended use and restriction on use
Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer
Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034
Telephone: Customer Service: 855-282-6867
Fax:  
Contact Person: Environmental Health & Safety
e-mail: info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Health Hazards
Skin Corrosion/Irritation Category 2
Serious Eye Damage/Eye Irritation Category 2A
Germ Cell Mutagenicity Category 2
Carcinogenicity Category 1B
Specific Target Organ Toxicity - Single Exposure Category 3

Environmental Hazards
Chronic hazards to the aquatic environment Category 3

Label Elements
Hazard Symbol:

Signal Word: Danger
Hazard Statement: May cause cancer. Suspected of causing genetic defects. Causes serious eye irritation. Causes skin irritation. Harmful to aquatic life with long lasting effects.

Precautionary Statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid release to the environment.

Response: 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. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. Call a POISON CENTER or doctor/physician if you feel unwell. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Substances

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>Content in percent (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE</td>
<td></td>
<td>79-01-6</td>
<td>99 - 100%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Rinse mouth. Get medical attention if symptoms occur. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Get medical attention if symptoms persist. If breathing stops, provide artificial respiration.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention if irritation persists after washing. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention if irritation persists after washing.

Most important symptoms/effects, acute and delayed

Symptoms: Irritating to eyes, respiratory system and skin.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical: Contact with metals may evolve flammable hydrogen gas. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.
7. Handling and storage

Precautions for safe handling: Use personal protective equipment as required. Do not breathe mist or vapor. Do not taste or swallow. Do not eat, drink or smoke when using the product. Use only with adequate ventilation. Wash hands thoroughly after handling. See Section 8 of the MSDS for Personal Protective Equipment. Avoid contact with eyes. Avoid contact with skin. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Wash contaminated clothing before reuse.

Conditions for safe storage, including any incompatibilities: Store locked up. Keep in a cool, well-ventilated place. Store in a dry place.

8. Exposure controls/personal protection

Control Parameters

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Type</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE</td>
<td>TWA</td>
<td>10 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>25 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>50 ppm  270 mg/m³</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>200 ppm 1,080 mg/m³</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>100 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td>Ceiling</td>
<td></td>
<td>200 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td>MAX. CONC</td>
<td></td>
<td>300 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td>AN ESL</td>
<td></td>
<td>54 µg/m³</td>
<td>US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)</td>
</tr>
</tbody>
</table>

Biological Limit Values

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Exposure Limit Values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE (Trichloroacetic acid: Sampling time: End of shift at end of work week.)</td>
<td>15 mg/l (Urine)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
<tr>
<td>TRICHLOROETHYLENE (Trichloroethanol, without hydrolysis: Sampling time: End of shift at end of work week.)</td>
<td>0.5 mg/l (Blood)</td>
<td>ACGIH BEL (03 2013)</td>
</tr>
</tbody>
</table>

Appropriate Engineering Controls

No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. 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. An eye wash and safety shower must be available in the immediate work area.
Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection
Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing.

Respiratory Protection: In case of inadequate ventilation use suitable respirator.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not eat, drink or smoke when using the product. Wash contaminated clothing before reuse.

9. Physical and chemical properties

Appearance

Physical state: Liquid
Form: Liquid
Color: Colorless
Odor: Ether-like odor
Odor threshold: No data available.
pH: No data available.
Melting point/freezing point: -84.7 °C
Initial boiling point and boiling range: 87.2 °C
Flash Point: Not applicable
Evaporation rate: No data available.
Flammability (solid, gas): No data available.

Upper/lower limit on flammability or explosive limits

Flammability limit - upper (%): 10.5 % (V)
90% (V)
Flammability limit - lower (%): 8 % (V)
12.5% (V)
Explosive limit - upper (%): No data available.
Explosive limit - lower (%): No data available.

Vapor pressure: 9.2 kPa (25 °C)
Vapor density: 4.53 AIR=1
Relative density: 1.47 (20 °C)

Solubility

Solubility in water: 1 g/l (20 °C)
Solubility (other): acetone: Soluble
ethanol: Soluble

Partition coefficient (n-octanol/water): 2.61
Auto-ignition temperature: 420 °C
Decomposition temperature: No data available.
Viscosity: No data available.

Other information
Molecular weight: 131.39 g/mol (C2HCl3)

10. Stability and reactivity

Reactivity: No dangerous reaction known under conditions of normal use.
Chemical Stability: Material is stable under normal conditions.

Possibility of Hazardous Reactions: Hazardous polymerization does not occur.


Hazardous Decomposition Products: By heating and fire, toxic vapors/gases may be formed. Oxides of Carbon. Phosgene.

11. Toxicological information

Information on likely routes of exposure

Ingestion: May be harmful if swallowed.
Inhalation: May be harmful if inhaled.
Skin Contact: Causes skin irritation.
Eye contact: Causes serious eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral Product: LD 50 (Rat): 4,920 mg/kg
Dermal Product: No data available.
Inhalation Product: LC 50 (Rat, 4 h): 12000 ppm

Repeated Dose Toxicity Product: No data available.

Skin Corrosion/Irritation Product: Causes skin irritation.

Serious Eye Damage/Eye Irritation Product: Causes serious eye irritation.

Respiratory or Skin Sensitization Product: Not a skin sensitizer.

Carcinogenicity Product: May cause cancer.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

TRICHLOROETHYLENE Overall evaluation: 1. Carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens:

TRICHLOROETHYLENE Reasonably Anticipated to be a Human Carcinogen.
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: Suspected of causing genetic defects.

In vivo
Product: Suspected of causing genetic defects.

Reproductive Toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: May cause respiratory irritation. May cause drowsiness or dizziness.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: Not classified

Other Effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
TRICHLOROETHYLENE
LC 50 (Fathead minnow (Pimephales promelas), 96 h): 31.4 - 71.8 mg/l Mortality
LC 50 (Bluegill (Lepomis macrochirus), 96 h): 39 - 54 mg/l Mortality
EC 50 (Fathead minnow (Pimephales promelas), 96 h): 18.4 - 28.5 mg/l Intoxication

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
TRICHLOROETHYLENE
LC 50 (Water flea (Daphnia magna), 48 h): 12 - 26 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and Degradability

Biodegradation
Product: There are no data on the degradability of this product.
BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: Log Kow: 2.61

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: Harmful to aquatic life with long lasting effects.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT
UN Number: UN 1710
UN Proper Shipping Name: Trichloroethylene
Transport Hazard Class(es)
Class(es): 6.1
Label(s): 6.1
Packing Group: III
Marine Pollutant: No

IMDG
UN Number: UN 1710
UN Proper Shipping Name: TRICHLOROETHYLENE
Transport Hazard Class(es)
Class(es): 6.1
Label(s): 6.1
EmS No.: F-A, S-A
Packing Group: III
Marine Pollutant: No

IATA
UN Number: UN 1710
Proper Shipping Name: Trichloroethylene
Transport Hazard Class(es):
Class(es): 6.1
Label(s): 6.1
Marine Pollutant: No
Packing Group: III

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

- Acute (Immediate)
- Chronic (Delayed)
- Fire
- Reactive
- Pressure Generating

SARA 302 Extremely Hazardous Substance
None present or none present in regulated quantities.

SARA 304 Emergency Release Notification

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE</td>
<td>100 lbs.</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazardous Chemical

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Threshold Planning Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE</td>
<td>500 lbs</td>
</tr>
</tbody>
</table>

SARA 313 (TRI Reporting)

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Reporting threshold for other users</th>
<th>Reporting threshold for manufacturing and processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRICHLOROETHYLENE</td>
<td>10000 lbs</td>
<td>25000 lbs</td>
</tr>
</tbody>
</table>

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)
TRICHLOROETHYLENE Reportable quantity: 100 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65
TRICHLOROETHYLENE Carcinogenic.
TRICHLOROETHYLENE Male reproductive toxin.
TRICHLOROETHYLENE Developmental toxin.

US. New Jersey Worker and Community Right-to-Know Act
TRICHLOROETHYLENE Listed

US. Massachusetts RTK - Substance List
TRICHLOROETHYLENE Listed

US. Pennsylvania RTK - Hazardous Substances
TRICHLOROETHYLENE Listed

US. Rhode Island RTK
TRICHLOROETHYLENE Listed
Inventory Status:

- Australia AICS: On or in compliance with the inventory
- Canada DSL Inventory List: On or in compliance with the inventory
- EINECS, ELINCS or NLP: On or in compliance with the inventory
- Japan (ENCS) List: On or in compliance with the inventory
- China Inv. Existing Chemical Substances: Not in compliance with the inventory.
- Korea Existing Chemicals Inv. (KECI): On or in compliance with the inventory
- Canada NDSL Inventory: Not in compliance with the inventory.
- Philippines PICCS: On or in compliance with the inventory
- US TSCA Inventory: On or in compliance with the inventory
- New Zealand Inventory of Chemicals: On or in compliance with the inventory
- Japan ISHL Listing: On or in compliance with the inventory
- Japan Pharmacopoeia Listing: Not in compliance with the inventory.

16. Other information, including date of preparation or last revision

NFPA Hazard ID

Flammability
Health
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue Date: 01-08-2015
Revision Date: No data available.
Version #: 1.1
Further Information: No data available.
Disclaimer:

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SAFETY DATA SHEET

1. Identification

Product Name: Tetrachloroethylene
Cat No.: AC167890000; AC167890010; AC167890025; AC167890100; AC167891000; AC167895000
Synonyms: Perchloroethylene
Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

2. Hazard(s) identification

Classification:
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation: Category 2
Serious Eye Damage/Eye Irritation: Category 2
Skin Sensitization: Category 1
Carcinogenicity: Category 1B
Specific target organ toxicity (single exposure): Category 3
Target Organs - Respiratory system, Central nervous system (CNS).
Specific target organ toxicity - (repeated exposure): Category 2
Target Organs - Kidney, Liver, Blood.

Label Elements:
Signal Word: Danger

Hazard Statements:
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure
Precautionary Statements

Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Response
IF exposed or concerned: Get medical attention/advice

Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention

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

Storage
Store locked up
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)
Toxic to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</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. Obtain 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. 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. Obtain medical attention.

Ingestion
Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects
Breathing difficulties. May cause allergic skin reaction. Inhalation of high vapor
concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing.

Notes to Physician
Treat symptomatically

### 5. Fire-fighting measures

**Suitable Extinguishing Media**
Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

**Unsuitable Extinguishing Media**
No information available

- **Flash Point**
  No information available

- **Method -**
  No information available

- **Autoignition Temperature**
  No information available

- **Explosion Limits**
  No data available

- **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**
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

**Hazardous Combustion Products**
Chlorine Hydrogen chloride gas 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.

### 6. Accidental release measures

**Personal Precautions**
Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

**Environmental Precautions**
Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.

**Methods for Containment and Clean Up**
Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

### 7. Handling and storage

**Handling**
Use only under a chemical fume hood. Wear personal protective equipment. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing.

**Storage**
Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

### 8. Exposure controls / personal protection

**Exposure Guidelines**

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
</table>
| Tetrachloroethylene | TWA: 25 ppm  
STEL: 100 ppm | (Vacated) TWA: 25 ppm  
(Ceiling: 200 ppm  
TWA: 100 ppm) | IDLH: 150 ppm |
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Component</th>
<th>Quebec</th>
<th>Mexico OEL (TWA)</th>
<th>Ontario TWAEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>TWA: 25 ppm</td>
<td>TWA: 100 ppm</td>
<td>TWA: 25 ppm</td>
</tr>
<tr>
<td></td>
<td>STEL: 100 ppm</td>
<td>TWA: 670 mg/m³</td>
<td>STEL: 100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 200 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 1250 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 200 ppm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 1340 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health

**Engineering Measures**

Use only under a chemical fume hood. 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>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic, sweet</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>-22 °C / -7.6 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>120 - 122 °C / 248 - 251.6 °F @ 760 mmHg</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>6.0 (Ether = 1.0)</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>18 mbar @ 20 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No information available</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.625</td>
</tr>
<tr>
<td>Solubility</td>
<td>0.15 g/L water (20°C)</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>&gt; 150°C</td>
</tr>
<tr>
<td>Viscosity</td>
<td>0.89 mPa s at 20 °C</td>
</tr>
<tr>
<td>Molecular Formula</td>
<td>C2 Cl4</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>165.83</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

**Reactive Hazard**

None known, based on information available
Stability
Stable under normal conditions.

Conditions to Avoid
Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials
Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines

Hazardous Decomposition Products
Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
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>Tetrachloroethylene</td>
<td>LD50 = 2629 mg/kg (Rat)</td>
<td>LD50 &gt; 10000 mg/kg (Rat)</td>
<td>LC50 = 27.8 mg/L (Rat) 4 h</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
May cause sensitization by skin contact

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>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>Group 2A</td>
<td>Reasonably Anticipated</td>
<td>A3</td>
<td>X</td>
<td>A3</td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen

Mutagenic Effects
No information available

Reproductive Effects
No information available.

Developmental Effects
No information available.

Teratogenicity
No information available.

STOT - single exposure
Respiratory system Central nervous system (CNS)

STOT - repeated exposure
Kidney Liver Blood

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: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest
Endocrine Disruptor Information

<table>
<thead>
<tr>
<th>Component</th>
<th>EU - Endocrine Disrupters Candidate List</th>
<th>EU - Endocrine Disruptors - Evaluated Substances</th>
<th>Japan - Endocrine Disruptor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>Group II Chemical</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Other Adverse Effects

Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

<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>Tetrachloroethylene</td>
<td>EC50: &gt; 500 mg/L, 96h (Pseudokirchneriella subcapitata)</td>
<td>LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhyncus mykiss)</td>
<td>EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min</td>
<td>EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence and Degradability

Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation

No information available.

Mobility

Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>2.88</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.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene - 127-18-4</td>
<td>U210</td>
<td>-</td>
</tr>
</tbody>
</table>

14. Transport information

DOT

UN-No   UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No   UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA

UN-No   UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III
International Inventories

<table>
<thead>
<tr>
<th>Component</th>
<th>TCA</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>Tetrachloroethylene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>204-825-9</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.
- 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.
- UX - 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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>&gt;95</td>
<td>0.1</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazard Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Health Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Chronic Health Hazard</td>
<td>Yes</td>
</tr>
<tr>
<td>Fire Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Sudden Release of Pressure Hazard</td>
<td>No</td>
</tr>
<tr>
<td>Reactive Hazard</td>
<td>No</td>
</tr>
</tbody>
</table>

CWA (Clean Water Act)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Clean Air Act

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depleters</th>
<th>Class 2 Ozone Depleters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>100 lb 1 lb</td>
<td></td>
</tr>
</tbody>
</table>
California Proposition 65

This product contains the following proposition 65 chemicals

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrachloroethylene</td>
<td>127-18-4</td>
<td>Carcinogen</td>
<td>14 µg/day</td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

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>Tetrachloroethylene</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant: Y
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

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
D1B Toxic materials
D2A Very toxic materials

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date
10-Dec-2009

Revision Date
06-Nov-2015

Print Date
06-Nov-2015

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
SAFETY DATA SHEET

1. Identification

Product identifier: TOLUENE

Other means of identification
Product No.: 9457, 4483, V560, 8604, 9476, 9466, 9460, 9456, 9364, 9351, 9336, 8608

Recommended use and restriction on use
Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer
Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
          Center Valley, PA 18034
Telephone: Customer Service: 855-282-6867
Fax: 
Contact Person: Environmental Health & Safety
              e-mail: info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151
Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard classification

Physical hazards
  Flammable liquids: Category 2

Health hazards
  Acute toxicity (Oral): Category 4
  Acute toxicity (Inhalation - vapor): Category 4
  Skin corrosion/irritation: Category 2
  Serious eye damage/eye irritation: Category 2A
  Toxic to reproduction: Category 2
  Specific target organ toxicity - single exposure: Category 3
  Specific target organ toxicity - repeated exposure: Category 2
  Aspiration hazard: Category 1

Environmental hazards
  Acute hazards to the aquatic environment: Category 2

Label elements
  Hazard symbol:
Signal word: Danger

Hazard statement: Highly flammable liquid and vapor. Harmful if swallowed or if inhaled. Causes skin irritation. Causes serious eye irritation. Suspected of damaging fertility or the unborn child. May cause respiratory irritation. May cause drowsiness or dizziness. May be fatal if swallowed and enters airways. May cause damage to organs through prolonged or repeated exposure. Toxic to aquatic life.

Precautionary statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. 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. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment.

Response: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. IF exposed or concerned: Get medical advice/attention. 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. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse. 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. IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.


Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion.

3. Composition/information on ingredients
Substances

<table>
<thead>
<tr>
<th>Chemical identity</th>
<th>Common name and synonyms</th>
<th>CAS number</th>
<th>Content in percent (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE</td>
<td></td>
<td>108-88-3</td>
<td>99 - 100%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Get medical attention immediately.

Skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

Most important symptoms/effects, acute and delayed

Symptoms: Harmful if swallowed. May be fatal if swallowed. Harmful if inhaled. Irritating to eyes, respiratory system and skin.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General fire hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray, foam, dry powder or carbon dioxide.

Unsuitable extinguishing media: Avoid water in straight hose stream; will scatter and spread fire.

Specific hazards arising from the chemical: Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk.
| Special protective equipment for fire-fighters: | Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. |

### 6. Accidental release measures

| Personal precautions, protective equipment and emergency procedures: | ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. See Section 8 of the MSDS for Personal Protective Equipment. |

| Methods and material for containment and cleaning up: | Eliminate all ignition sources if safe to do so. Take precautionary measures against static discharges. Stop leak if possible without any risk. Use only non-sparking tools. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal. |

| Notification Procedures: | Prevent entry into waterways, sewer, basements or confined areas. Inform authorities if large amounts are involved. |

| Environmental precautions: | Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. |

### 7. Handling and storage

| Precautions for safe handling: | DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Wear protective gloves/protection/eye protection/face protection. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Wash hands thoroughly after handling. |

| Conditions for safe storage, including any incompatibilities: | Keep away from food, drink and animal feeding stuffs. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids. |
8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

<table>
<thead>
<tr>
<th>Chemical identity</th>
<th>Type</th>
<th>Exposure Limit values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE</td>
<td>TWA</td>
<td>20 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>150 ppm 560 mg/m³</td>
<td>US. NIOSH: Pocket Guide to Chemical Hazards (2010)</td>
</tr>
<tr>
<td></td>
<td>REL</td>
<td>100 ppm 375 mg/m³</td>
<td>US. NIOSH: Pocket Guide to Chemical Hazards (2010)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>100 ppm 375 mg/m³</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>150 ppm 560 mg/m³</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>200 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>Ceiling</td>
<td>300 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>MAX. CONC</td>
<td>500 ppm</td>
<td>US. OSHA Table Z-2 (29 CFR 1910.1000) (02 2006)</td>
</tr>
</tbody>
</table>

Biological limit values

<table>
<thead>
<tr>
<th>Chemical identity</th>
<th>Exposure Limit values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOLUENE (o-Cresol, with hydrolysis: Sampling time: End of shift.)</td>
<td>0.3 mg/g (Creatinine in urine)</td>
<td>ACGIH BEL (2011)</td>
</tr>
<tr>
<td>TOLUENE (toluene: Sampling time: Prior to last shift of work week.)</td>
<td>0.02 mg/l (Blood)</td>
<td>ACGIH BEL (2011)</td>
</tr>
<tr>
<td>TOLUENE (toluene: Sampling time: End of shift.)</td>
<td>0.03 mg/l (Urine)</td>
<td>ACGIH BEL (2011)</td>
</tr>
</tbody>
</table>

Appropriate engineering controls

No data available.

Individual protection measures, such as personal protective equipment

**General information:** Good general ventilation (typically 10 air changes per hour) should be used. 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. An eye wash and safety shower must be available in the immediate work area. Use explosion-proof ventilation equipment.

**Eye/face protection:** Wear safety glasses with side shields (or goggles) and a face shield.

**Skin protection**

- **Hand protection:** Chemical resistant gloves
- **Other:** Wear suitable protective clothing.

**Respiratory protection:** In case of inadequate ventilation use suitable respirator.

**Hygiene measures:** Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties
Appearance

Physical state: Liquid
Form: Liquid
Color: Colorless
Odor: Sweet aromatic odor
Odor threshold: No data available.
\(pH\): No data available.
Melting point/freezing point: \(-94.9 ^\circ C\)
Initial boiling point and boiling range: 110 \(^\circ C\)
Flash Point: 4 \(^\circ C\) (Closed Cup)
Evaporation rate: 2.24 (butyl acetate=1)
Flammability (solid, gas): No data available.
Upper/lower limit on flammability or explosive limits
- Flammability limit - upper (%): 7.1 \%(V)
- Flammability limit - lower (%): 1.1 \%(V)
- Explosive limit - upper (%): No data available.
- Explosive limit - lower (%): No data available.
Vapor pressure: 3.8 kPa (25 \(^\circ C\))
Vapor density: 3.1 Air=1
Relative density: 0.86 (20 \(^\circ C\))
Solubility(ies)
- Solubility in water: 0.7 g/l (23.3 \(^\circ C\))
- Solubility (other): No data available.
Partition coefficient (n-octanol/water): 2.73
Auto-ignition temperature: 480 \(^\circ C\)
Decomposition temperature: No data available.
Viscosity: No data available.
Molecular weight: 92.14 g/mol (C7H8)

10. Stability and reactivity

Reactivity: No dangerous reaction known under conditions of normal use.
Chemical stability: Material is stable under normal conditions.
Possibility of hazardous reactions: Hazardous polymerization does not occur.
Conditions to avoid: Heat, sparks, flames.
Incompatible materials: Strong oxidizing agents. Chlorine.
Hazardous decomposition products: Thermal decomposition may release oxides of carbon.

11. Toxicological information

Information on likely routes of exposure
Ingestion: Harmful if swallowed.
Inhalation: Harmful if inhaled. May cause irritation to the mucous membranes and upper respiratory tract.
Skin contact: Causes skin irritation.

Eye contact: Causes serious eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: LD 50 (Rat): 636 mg/kg

Dermal
Product: LD 50 (Rabbit): 12,124 mg/kg

Inhalation
Product: LC 50 (Mouse, 24 h): 400 mg/l
LC 50 (Rat, 4 h): 8,000 mg/l

Repeated dose toxicity
Product: No data available.

Skin corrosion/irritation
Product: Causes skin irritation.

Serious eye damage/eye irritation
Product: Causes serious eye irritation.

Respiratory or skin sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

No carcinogenic components identified

Germ cell mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: May damage fertility or the unborn child.

Specific target organ toxicity - single exposure
Product: Narcotic effect. Respiratory tract irritation.

Specific target organ toxicity - repeated exposure
Product: Peripheral nervous system Central nervous system. Kidneys. auditory organs

Aspiration hazard
Product: May be fatal if swallowed and enters airways.
Other effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
TOLUENE
LC 50 (Fathead minnow (Pimephales promelas), 96 h): 12.6 mg/l Mortality
LC 50 (Coho salmon, silver salmon (Oncorhynchus kisutch), 96 h): 5.5 mg/l Mortality

Aquatic invertebrates
Product: No data available.

Specified substance(s):
TOLUENE
EC 50 (Brine shrimp (Artemia sp.), 24 h): 22.1 - 54.1 mg/l Intoxication
EC 50 (Water flea (Daphnia magna), 48 h): 5.46 - 9.83 mg/l Intoxication

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD ratio
Product: No data available.

Bioaccumulative potential
Bioconcentration factor (BCF)
Product: Bioaccumulation is unlikely to be significant because of the low water solubility of this product.

Partition coefficient n-octanol / water (log Kow)
Product: Log Kow: 2.73

Mobility in soil:
The product is insoluble in water and will spread on the water surface.

Other adverse effects:
Toxic to aquatic organisms.

13. Disposal considerations

Disposal instructions:
Discharge, treatment, or disposal may be subject to national, state, or local laws. Residual vapors may explode on ignition; do not cut, drill, grind, or weld on or near this container.

Contaminated packaging:
Since emptied containers retain product residue, follow label warnings even after container is emptied.
14. Transport information

DOT
- UN number: UN 1294
- UN proper shipping name: Toluene
- Transport hazard class(es):
  - Class(es): 3
  - Label(s): 3
- Packing group: II
- Marine Pollutant: No

IMDG
- UN number: UN 1294
- UN proper shipping name: TOLUENE
- Transport hazard class(es):
  - Class(es): 3
  - Label(s): 3
  - EmS No.: F-E, S-D
- Packing group: II
- Marine Pollutant: No

IATA
- UN number: UN 1294
- Proper Shipping Name: Toluene
- Transport hazard class(es):
  - Class(es): 3
  - Label(s): 3
- Marine Pollutant: No
- Packing group: II

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
- US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
  - None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):
- TOLUENE
  - Reportable quantity: 1000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories
- X Acute (Immediate)
- X Chronic (Delayed)
- X Fire
- Reactive
- Pressure Generating

SARA 302 Extremely hazardous substance
- None present or none present in regulated quantities.

SARA 304 Emergency release notification
- Chemical identity: TOLUENE
- RQ: 1000 lbs.
**SARA 311/312 Hazardous chemical**

**Chemical identity** | **Threshold Planning Quantity**
---|---
TOLUENE | 500 lbs

**SARA 313 (TRI reporting)**

| Chemical identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
---|---|---|
TOLUENE | 10000 lbs | 25000 lbs.

**Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)**

TOLUENE

Reportable quantity: 1000 lbs.

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):**

None present or none present in regulated quantities.

**US state regulations**

**US. California Proposition 65**

TOLUENE

Developmental toxin.

TOLUENE

Female reproductive toxin.

**US. New Jersey Worker and Community Right-to-Know Act**

TOLUENE

Listed

**US. Massachusetts RTK - Substance List**

TOLUENE

Listed

**US. Pennsylvania RTK - Hazardous Substances**

TOLUENE

Listed

**US. Rhode Island RTK**

TOLUENE

Listed

**Inventory Status:**

- **Australia AICS:** On or in compliance with the inventory
- **Canada DSL Inventory List:** On or in compliance with the inventory
- **EU EINECS List:** On or in compliance with the inventory
- **EU ELINCS List:** Not in compliance with the inventory.
- **Japan (ENCS) List:** On or in compliance with the inventory
- **EU No Longer Polymers List:** Not in compliance with the inventory.
- **China Inv. Existing Chemical Substances:** On or in compliance with the inventory
- **Korea Existing Chemicals Inv. (KECI):** On or in compliance with the inventory
- **Canada NDSL Inventory:** Not in compliance with the inventory.
- **Philippines PICCS:** On or in compliance with the inventory
- **US TSCA Inventory:** On or in compliance with the inventory
- **New Zealand Inventory of Chemicals:** On or in compliance with the inventory
- **Switzerland Consolidated Inventory:** Not in compliance with the inventory.
- **Japan ISHL Listing:** On or in compliance with the inventory
- **Japan Pharmacopoeia Listing:** Not in compliance with the inventory

**16. Other information, including date of preparation or last revision**

**NFPA Hazard ID**

![NFPA Hazard ID]

- **Flammability:** 2
- **Health:** 3
- **Reactivity:** 0
Reactivity

Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date: 06-12-2014
Revision date: No data available.
Version #: 1.0
Further information: No data available.

Disclaimer:

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## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

<table>
<thead>
<tr>
<th><strong>Product name</strong></th>
<th>Gasoline, Unleaded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Synonyms</strong></td>
<td>Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809</td>
</tr>
<tr>
<td><strong>SDS Number</strong></td>
<td>888100008809</td>
</tr>
<tr>
<td><strong>Version</strong></td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Product Use Description</strong></td>
<td>Fuel</td>
</tr>
<tr>
<td><strong>Company</strong></td>
<td>For: Tesoro Refining &amp; Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259</td>
</tr>
<tr>
<td><strong>Tesoro Call Center</strong></td>
<td>(877) 783-7676</td>
</tr>
<tr>
<td><strong>Chemtrec</strong></td>
<td>(Emergency Contact): (800) 424-9300</td>
</tr>
</tbody>
</table>

## SECTION 2. HAZARDS IDENTIFICATION

<table>
<thead>
<tr>
<th><strong>Classifications</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable Liquid – Category 1 or 2 depending on formulation.</td>
</tr>
<tr>
<td>Aspiration Hazard – Category 1</td>
</tr>
<tr>
<td>Carcinogenicity – Category 2</td>
</tr>
<tr>
<td>Specific Target Organ Toxicity (Repeated Exposure) – Category 2</td>
</tr>
<tr>
<td>Specific Target Organ Toxicity (Single Exposure) – Category 3</td>
</tr>
<tr>
<td>Skin Irritation – Category 2</td>
</tr>
<tr>
<td>Eye Irritation – Category 2B</td>
</tr>
<tr>
<td>Chronic Aquatic Toxicity – Category 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pictograms</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image-url" alt="Pictograms" /></td>
</tr>
</tbody>
</table>

| **Signal Word** | Danger |

**Hazard Statements**

- Extremely flammable liquid and vapor.
- May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
- Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
- May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
- May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
- Repeated or prolonged skin contact can cause irritation and dermatitis.
Harmful to aquatic life.

Precautionary statements

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, welding and hot surfaces. No smoking. Keep container tightly closed. Ground and/or bond container and receiving equipment. Use explosion-proof electrical equipment. Use only non-sparking tools (if tools are used in flammable atmosphere). Take precautionary measures against static discharge. Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid). Wash hands or liquid-contacted skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe vapors. Use only outdoors or in a well-ventilated area.

Response: In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish. If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin or eye irritation persists, get medical attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.

Storage: Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed. Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

Disposal: Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline, natural; Low boiling point naphtha</td>
<td>8006-61-9</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>Xylene</td>
<td>1330-20-7</td>
<td>10 - 30%</td>
</tr>
<tr>
<td>Ethanol; ethyl alcohol</td>
<td>64-17-5</td>
<td>0-8.2%</td>
</tr>
<tr>
<td>Trimethylbenzene</td>
<td>25551-13-7</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Isopentane; 2-methylbutane</td>
<td>78-78-4</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>Less than 1.3%</td>
</tr>
<tr>
<td>Pentane</td>
<td>109-66-0</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>1 - 5%</td>
</tr>
<tr>
<td>Butane</td>
<td>106-97-8</td>
<td>1 - 20%</td>
</tr>
<tr>
<td>Heptane [and isomers]</td>
<td>142-82-5</td>
<td>0.5 - 0.75%</td>
</tr>
<tr>
<td>N-hexane</td>
<td>110-54-3</td>
<td>0.5 - 0.75%</td>
</tr>
</tbody>
</table>

**SECTION 4. FIRST AID MEASURES**

**Inhalation**: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

**Skin contact**: In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.

**Eye contact**: Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.

**Ingestion**: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

**Notes to physician**: Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

**SECTION 5. FIRE-FIGHTING MEASURES**

**Suitable extinguishing media**: SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

**Specific hazards during fire fighting**: Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

**Special protective equipment for fire-fighters**: Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
Further information: Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental precautions: Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains, inform respective authorities.

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

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling: Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initiated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

1. Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
2. Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
3. Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initiated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities: Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".
Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

### SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

#### Exposure Guidelines

<table>
<thead>
<tr>
<th>List</th>
<th>Components</th>
<th>CAS-No.</th>
<th>Type:</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>Benzene</td>
<td>71-43-2</td>
<td>TWA</td>
<td>1 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>71-43-2</td>
<td>STEL</td>
<td>5 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>71-43-2</td>
<td>OSHA_ACT</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>OSHA Z1</td>
<td>Xylene</td>
<td>1330-20-7</td>
<td>PEL</td>
<td>100 ppm</td>
</tr>
<tr>
<td></td>
<td>Ethanol; Ethyl alcohol</td>
<td>64-17-5</td>
<td>PEL</td>
<td>1,000 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>1,900 mg/m3</td>
</tr>
<tr>
<td></td>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>PEL</td>
<td>10 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>50 mg/m3</td>
</tr>
<tr>
<td></td>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>PEL</td>
<td>300 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>1,050 mg/m3</td>
</tr>
<tr>
<td></td>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>PEL</td>
<td>100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>435 mg/m3</td>
</tr>
<tr>
<td></td>
<td>Heptane [and isomers]</td>
<td>142-82-5</td>
<td>PEL</td>
<td>500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>2,000 mg/m3</td>
</tr>
<tr>
<td></td>
<td>N-hexane</td>
<td>110-54-3</td>
<td>PEL</td>
<td>500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>1,800 mg/m3</td>
</tr>
<tr>
<td>ACGIH</td>
<td>Toluene</td>
<td>108-88-3</td>
<td>TWA</td>
<td>50 ppm</td>
</tr>
<tr>
<td></td>
<td>Xylene</td>
<td>1330-20-7</td>
<td>TWA</td>
<td>100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>150 ppm</td>
</tr>
<tr>
<td></td>
<td>Ethanol; Ethyl alcohol</td>
<td>64-17-5</td>
<td>TWA</td>
<td>1,000 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>25 ppm</td>
</tr>
<tr>
<td></td>
<td>Trimethylbenzene</td>
<td>25551-13-7</td>
<td>TWA</td>
<td>600 ppm</td>
</tr>
<tr>
<td></td>
<td>Isopentane; 2-Methylbutane</td>
<td>78-78-4</td>
<td>TWA</td>
<td>600 ppm</td>
</tr>
<tr>
<td></td>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>TWA</td>
<td>10 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>15 ppm</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
<td>71-43-2</td>
<td>TWA</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>2.5 ppm</td>
</tr>
<tr>
<td></td>
<td>Pentane</td>
<td>109-66-0</td>
<td>TWA</td>
<td>600 ppm</td>
</tr>
<tr>
<td></td>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>TWA</td>
<td>100 ppm</td>
</tr>
<tr>
<td></td>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>TWA</td>
<td>100 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>125 ppm</td>
</tr>
<tr>
<td></td>
<td>Heptane [and isomers]</td>
<td>142-82-5</td>
<td>TWA</td>
<td>400 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1330-20-7</td>
<td>STEL</td>
<td>500 ppm</td>
</tr>
</tbody>
</table>
**Engineering measures**: Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

**Eye protection**: Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.

**Hand protection**: Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

**Skin and body protection**: If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex® is recommended in areas where material is stored or handled.

**Respiratory protection**: A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

**Work / Hygiene practices**: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear to straw colored liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Characteristic hydrocarbon-like</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>0.5 - 1.1 ppm</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>About -101°C (-150°F)</td>
</tr>
<tr>
<td>Initial boiling point &amp; range</td>
<td>Boiling point varies: 30 – 200°C (85 – 392°F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>&lt; -21°C (-5.8°F)</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Higher initially and declining as lighter components evaporate</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Flammable vapor released by liquid</td>
</tr>
</tbody>
</table>
Upper explosive limit: 7.6 % (V)
Lower explosive limit: 1.3 % (V)
Vapor pressure: 345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1): Approximately 3 to 4
Relative density (water = 1): 0.8 g/mL
Solubility (in water): Negligible
Partition coefficient (n-octanol/water): 2 – 7 as log Pow
Auto-ignition temperature: Approximately 250°C (480°F)
Decomposition temperature: Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity: 0.64 to 0.88 mm²/s range reported for gasoline

Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature): Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY
Reactivity: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability: Stable under normal conditions.
Possibility of hazardous reactions: Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.
Conditions to avoid: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION
Skin contact: Irritating to skin. Can be partially absorbed through skin.
Eye contact: Irritating to eyes.
Ingestion: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.
Inhalation and further information

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries. Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Component:

Gasoline, natural; Low boiling point naphtha 8006-61-9

Acute oral toxicity: LD50 rat
Dose: 18.8 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 20.7 mg/l
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.
Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes.
Result: Moderate eye irritation

Toluene 108-88-3

Acute oral toxicity: LD50 rat
Dose: 636 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: 12,124 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 49 mg/l
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.
Result: Mild skin irritation

Prolonged skin contact may defat the skin and produce dermatitis.

Eye irritation: Classification: Irritating to eyes.
Result: Mild eye irritation

Xylene 1330-20-7

Acute oral toxicity: LD50 rat
Dose: 2,840 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: ca. 4,500 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 6,350 mg/l
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin.
Result: Mild skin irritation
<table>
<thead>
<tr>
<th>Substance</th>
<th>CAS Number</th>
<th>Acute oral toxicity: LD50 rat</th>
<th>Dose</th>
<th>Acute dermal toxicity: LD50 rabbit</th>
<th>Dose</th>
<th>Acute inhalation toxicity: LC50 rat</th>
<th>Dose</th>
<th>Exposure time</th>
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<tr>
<td>Ethanol; Ethyl alcohol</td>
<td>64-17-5</td>
<td>Acute oral toxicity: Dose: 6,200 mg/kg</td>
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<td>Acute dermal toxicity: Dose: 19,999 mg/kg</td>
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<td>Acute inhalation toxicity: Dose: 8,001 mg/l</td>
<td>Exposure time: 4 h</td>
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<td>Acute dermal toxicity: Dose: 19,999 mg/kg</td>
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<td>Acute inhalation toxicity: Dose: 8,001 mg/l</td>
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<td>Naphthalene</td>
<td>91-20-3</td>
<td>Acute oral toxicity: Dose: 2,001 mg/kg</td>
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<td>Acute dermal toxicity: Dose: 2,501 mg/kg</td>
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<td>Acute inhalation toxicity: Dose: 101 mg/l</td>
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<td>Acute dermal toxicity: Dose: 2,501 mg/kg</td>
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<td>Acute inhalation toxicity: Dose: 101 mg/l</td>
<td>Exposure time: 4 h</td>
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<td>Benzene</td>
<td>71-43-2</td>
<td>Acute oral toxicity: Dose: 930 mg/kg</td>
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<td>Acute inhalation toxicity: LC50 rat</td>
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<td>Pentane</td>
<td>109-66-0</td>
<td>Acute oral toxicity: Dose: 2,001 mg/kg</td>
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<td>Acute inhalation toxicity: LC50 rat</td>
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<td>Acute inhalation toxicity: LC50 rat</td>
<td>Dose: 364 mg/l</td>
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<td>Cyclohexane</td>
<td>110-82-7</td>
<td>Acute dermal toxicity: Dose: 2,001 mg/kg</td>
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<td>Acute inhalation toxicity: LC50 rat</td>
<td>Dose: 14 mg/l</td>
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</tbody>
</table>
Skin irritation: Classification: Irritating to skin. Result: Skin irritation

Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Ethylbenzene 100-41-4

Acute oral toxicity: LD50 rat
Dose: 3,500 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: 15,500 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 18 mg/l
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation

Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.

Heptane [and isomers] 142-82-5

Acute oral toxicity: LD50 rat
Dose: 15,001 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 103 g/m3
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin. Result: Skin irritation
Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product.

Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

N-hexane 110-54-3

Acute oral toxicity: LD50 rat
Dose: 25,000 mg/kg

Acute dermal toxicity: LD50 rabbit
Dose: 2,001 mg/kg

Acute inhalation toxicity: LC50 rat
Dose: 171.6 mg/l
Exposure time: 4 h

Skin irritation: Classification: Irritating to skin. Result: Skin irritation

Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Teratogenicity: N11.00418960

Carcinogenicity

NTP
Naphthalene (CAS-No.: 91-20-3)
Benzene (CAS-No.: 71-43-2)

IARC
Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9)
Naphthalene (CAS-No.: 91-20-3)
Benzene (CAS-No.: 71-43-2)
Ethylbenzene (CAS-No.: 100-41-4)

OSHA
Benzene (CAS-No.: 71-43-2)

CA Prop 65
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Toluene (CAS-No.: 108-88-3)
SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information: Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

**Toluene**
- Toxicity to fish:
  - LC50
  - Species: Carassius auratus (goldfish)
  - Dose: 13 mg/l
  - Exposure time: 96 h

  Acute and prolonged toxicity for aquatic invertebrates:
  - EC50
  - Species: Daphnia magna (Water flea)
  - Dose: 11.5 mg/l
  - Exposure time: 48 h

  Toxicity to algae:
  - IC50
  - Species: Selenastrum capricornutum (green algae)
  - Dose: 12 mg/l
  - Exposure time: 72 h

**Ethanol; Ethyl alcohol**
- Toxicity to fish:
  - LC50
  - Species: Leuciscus idus (Golden orfe)
  - Dose: 8,140 mg/l
  - Exposure time: 48 h

  Acute and prolonged toxicity for aquatic invertebrates:
  - EC50
  - Species: Daphnia magna (Water flea)
  - Dose: 9,268 - 14,221 mg/l
  - Exposure time: 48 h

**Isopentane; 2-Methylbutane**
- Toxicity to fish:
  - LC50
  - Species: Oncorhynchus mykiss (rainbow trout)
  - Dose: 3.1 mg/l
  - Exposure time: 96 h

  Acute and prolonged toxicity for aquatic invertebrates:
  - EC50
  - Species: Daphnia magna (Water flea)
  - Dose: 2.3 mg/l
  - Exposure time: 96 h

**Naphthalene**
- Toxicity to algae:
  - EC50
  - Species: Dose: 33 mg/l
  - Exposure time: 24 h

**Pentane**
- Acute and prolonged toxicity for aquatic invertebrates:
  - EC50
  - Species: Daphnia magna (Water flea)
  - Dose: 9.74 mg/l
  - Exposure time: 48 h

**Cyclohexane**
- Acute and prolonged toxicity for aquatic invertebrates:
  - EC50
  - Species: Daphnia magna (Water flea)
  - Dose: 3.78 mg/l
  - Exposure time: 48 h
Heptane [and isomers]  142-82-5  Toxicity to fish:
LC50
Species: Carassius auratus (goldfish)
Dose: 4 mg/l
Exposure time: 24 h

Acute and prolonged toxicity for aquatic invertebrates:
EC50
Species: Daphnia magna (Water flea)
Dose: 1.5 mg/l
Exposure time: 48 h

N-hexane  110-54-3  Toxicity to fish:
LC50
Species: Pimephales promelas (fathead minnow)
Dose: 2.5 mg/l
Exposure time: 96 h

Acute and prolonged toxicity for aquatic invertebrates:
EC50
Species: Daphnia magna (Water flea)
Dose: 2.1 mg/l
Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal:
Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR
Proper shipping name : Petrol
UN-No. : 1203
Class : 3
Packing group : II

TDG
Proper shipping name : Gasoline
UN-No. : UN1203
Class : 3
Packing group : II

IATA Cargo Transport
UN UN-No. : UN1203
Description of the goods : Gasoline
Class : 3
Packaging group : II
ICAO-Labels : 3
Packing instruction (cargo aircraft) : 364
Packing instruction (cargo aircraft) : Y341

IATA Passenger Transport
UN UN-No. : UN1203
Description of the goods : Gasoline
Class : 3
Packaging group : II
ICAO-Labels : 3
Packing instruction (passenger aircraft) : 353
Packing instruction (passenger aircraft) : Y341

IMDG-Code
UN-No. : UN 1203
Description of the goods : Gasoline
Class : 3
Packaging group : II
IMDG-Labels : 3
EmS Number : F-E S-E
Marine pollutant : No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
Highly toxic by ingestion
Moderate skin irritant
Severe eye irritant
Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)
The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which
exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude
oil refining process and any indigenous components of such from the CERCLA Section 103 reporting
requirements. However, other federal reporting requirements, including SARA Section 304, as well as
the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to
cause birth defects or other reproductive harm.
Toluene 108-88-3
Benzene 71-43-2

SECTION 16. OTHER INFORMATION

Further information
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 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.
6, 8, 10, 12, 14, 16, 64, 68, 91, 112, 306, 1092, 1106, 1500, 1570, 1571, 1651, 1652, 1654, 1700, 1701, 1702, 1710, 1711, 1714, 1726, 1729, 1730, 1732, 1733, 1826, 1848, 1880, 1950
SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identification

Product Description: Xylene
Cat No.: 6601, 6615, 6655, 9900-5, 9900-55, 6601E
Synonyms: Dimethylbenzene; Methyltoluene
Molecular Formula: C8H10

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use: Laboratory chemicals.
Uses advised against: No Information available

1.3. Details of the supplier of the safety data sheet

Company: Richard Allan Scientific
A Subsidiary of Thermo Fisher Scientific
4481 Campus Drive
Kalamazoo, MI 49008
Tel: (800) 522-7270

E-mail address: begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards
Flammable liquids: Category 3

Health hazards
Aspiration Toxicity: Category 1
Acute dermal toxicity: Category 4
Acute Inhalation Toxicity - Vapors: Category 4
Skin Corrosion/irritation: Category 2
Specific target organ toxicity - (repeated exposure): Category 2

Environmental hazards
Based on available data, the classification criteria are not met

Classification according to EU Directives 67/548/EEC or 1999/45/EC
Symbol(s): Xn - Harmful
R-phrase(s): R10 - Flammable
R38 - Irritating to skin
R20/21 - Harmful by inhalation and in contact with skin

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### 2.2. Label elements

**Signal Word**

Danger

**Hazard Statements**

- H226 - Flammable liquid and vapor
- H312 - Harmful in contact with skin
- H332 - Harmful if inhaled
- H315 - Causes skin irritation
- H304 - May be fatal if swallowed and enters airways
- H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements**

- P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- P280 - Wear protective gloves/ protective clothing
- P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
- P312 - Call a POISON CENTER or doctor/ physician if you feel unwell
- P304 + P310 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
- P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician
- P331 - Do NOT induce vomiting
- P362 - Take off contaminated clothing and wash before reuse
- P260 - Do not breathe dust/fume/gas/mist/vapors/spray

### 2.3. Other hazards

No information available

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>EC-No.</th>
<th>Weight %</th>
<th>CLP Classification - Regulation (EC) No 1272/2008</th>
<th>DSD Classification - 67/548/EEC</th>
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<tr>
<td>Ethylbenzene</td>
<td>100-41-4</td>
<td>EEC No. 202-849-4</td>
<td>10 - 15</td>
<td>Flam. Liq. 2 (H225) Acute Tox. 4 (H332) Asp. Tox. 1 (H304) STOT RE 2 (H373) Aquatic Chronic 3 (H412)</td>
<td>F; R11 Xn; R20-48/20 R65</td>
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<td>Xylenes (o-, m-, p-isomers)</td>
<td>1330-20-7</td>
<td>EEC No. 215-535-7</td>
<td>85</td>
<td>Acute Tox. 4 (H312) Acute Tox. 4 (H332) Skin Irrit. 2 (H315) Flam. Liq. 3 (H226)</td>
<td>R10 Xn; R20/21 Xi; R38</td>
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<td>Toluene</td>
<td>108-88-3</td>
<td>EEC No. 203-625-9</td>
<td>0 - 0.5</td>
<td>Skin Irrit. 2 (H315) Repr. 2 (H361d) STOT SE 3 (H336) STOT RE 2 (H373) Asp. Tox. 1 (H304) Flam. Liq. 2 (H225)</td>
<td>F; R11 Xi; R38 Xn; R48/20-65 Repr.Cat.3; R63 R67</td>
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<td>Benzene</td>
<td>71-43-2</td>
<td>EEC No. 200-753-7</td>
<td>0 - 0.01</td>
<td>Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) Muta. 1B (H340) Carc. 1A (H350) STOT RE 1 (H372)</td>
<td>F; R11 Xi; R36/38 Carc.Cat.1; R45 Muta.Cat.2; R46 T; R48/23/24/25</td>
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</table>
SAFETY DATA SHEET

Xylene

Revision Date 21-Feb-2014

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice
If symptoms persist, call a physician. Show this safety data sheet to the doctor in attendance.

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. If symptoms persist, call a physician.

Skin Contact
Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required. Call a physician immediately. SPEEDY ACTION IS CRITICAL, GET MEDICAL AID IMMEDIATELY. If symptoms persist, call a physician. If skin irritation persists, call a physician. Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

Ingestion
Do not induce vomiting. Call a physician or Poison Control Center immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required. Immediate medical attention is not required. Move to fresh air in case of accidental inhalation of vapors. If symptoms persist, call a physician.

Protection of First-aiders
Use personal protective equipment.

4.2. Most important symptoms and effects, both acute and delayed

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician
Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
CO₂, dry chemical, dry sand, alcohol-resistant foam. Cool closed containers exposed to fire with water spray.

Extinguishing media which must not be used for safety reasons
No information available.

5.2. Special hazards arising from the substance or mixture

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.
SAFETY DATA SHEET

Hazardous Combustion Products
Carbon monoxide (CO), Carbon dioxide (CO₂), Hydrocarbons, Aldehydes.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges. Do not get in eyes, on skin, or on clothing. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

6.2. Environmental precautions

Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system. Prevent further leakage or spillage if safe to do so. Prevent product from entering drains.

6.3. Methods and material for containment and cleaning up

Remove all sources of ignition. Soak up with inert absorbent material. Take precautionary measures against static discharges. Keep in suitable, closed containers for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Use only under a chemical fume hood. Wear personal protective equipment. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Do not ingest. Pay attention to flashback. No information available. Do not take internally.

7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area. Keep containers tightly closed in a cool, well-ventilated place. Keep in properly labeled containers.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits

<table>
<thead>
<tr>
<th>Component</th>
<th>European Union</th>
<th>The United Kingdom</th>
<th>France</th>
<th>Belgium</th>
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<tr>
<td>Ethylbenzene</td>
<td>TWA: 100 ppm 8 hr TWA: 442 mg/m³ 8 hr STEL: 200 ppm 15 min STEL: 884 mg/m³ 15 min Possibility of significant uptake through the skin</td>
<td>STEL: 125 ppm 15 min STEL: 552 mg/m³ 15 min TWA: 100 ppm 8 hr TWA: 441 mg/m³ 8 hr Skin</td>
<td>TWA / VME: 20 ppm (8 hours) restrictive limit TWA / VME: 88.4 mg/m³ (8 hours) restrictive limit TWA / VME: 1000 mg/m³ (8 hours) STEL / VLCT: 100 ppm, restrictive limit STEL / VLCT: 442</td>
<td>TWA: 100 ppm 8 uren STEL: 125 ppm 15 minuten STEL: 551 mg/m³ 15 minuten Huid</td>
<td>STEL / VLA-EC: 200 ppm (15 minutos). STEL / VLA-EC: 884 mg/m³ (15 minutos). TWA / VLA-ED: 100 ppm (8 horas) TWA / VLA-ED: 441 mg/m³ (8 horas) Piel</td>
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<td>Portugal</td>
<td>The Netherlands</td>
<td>Finland</td>
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<tr>
<td>Xylenes (o-, m-, p-isomers)</td>
<td>TWA: 50 ppm 8 ore. pure TWA: 221 mg/m³ 8 ore. pure STEL: 100 ppm 15 minuti. Breve termine pure STEL: 442 mg/m³ 15 minuti. Breve termine pure Pelle</td>
<td>TWA: 100 ppm (8 Stunden). AGW - exposure factor 2 TWA: 440 mg/m³ (8 Stunden). AGW - exposure factor 2 TWA: 100 ppm (8 Stunden). AGW</td>
<td>TWA: 100 ppm 15 minuti. Breve termine STEL: 442 mg/m³ 15 minuti. Breve termine</td>
<td>STEL: 442 mg/m³ 15 minuti. Breve termine</td>
<td>TWA: 50 ppm 8 tunteina STEL: 220 mg/m³ 8 tunteina STEL: 440 mg/m³ 8 tunteina Iho</td>
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## SAFETY DATA SHEET

### Xylene

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<td></td>
<td>MAK-KZW: 200 ppm 15 Minuten</td>
<td>MAK-KZW: 880 mg/m³ 15 Minuten</td>
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<td>MAK-TMW: 100 ppm 8 Stunden</td>
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<td></td>
<td>TWA: 50 ppm 8 Stunden</td>
<td>TWA: 192 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p-isomers)</td>
<td>Haut</td>
<td>Haut</td>
<td>Haut/Peau</td>
<td>Haut/Peau</td>
<td>Haut/Peau</td>
</tr>
<tr>
<td></td>
<td>MAK-KZW: 100 ppm 15 Minuten</td>
<td>MAK-KZW: 442 mg/m³ 15 Minuten</td>
<td>MAK-TMW: 50 ppm 8 Stunden</td>
<td>MAK-TMW: 221 mg/m³ 8 Stunden</td>
<td>MAK-TMW: 221 mg/m³ 8 Stunden</td>
</tr>
<tr>
<td></td>
<td>TWA: 50 ppm 8 Stunden</td>
<td>TWA: 109 mg/m³ 8 Stunden</td>
<td>TWA: 109 mg/m³ 8 Stunden</td>
<td>TWA: 109 mg/m³ 8 Stunden</td>
<td>TWA: 109 mg/m³ 8 Stunden</td>
</tr>
<tr>
<td>Toluene</td>
<td>Haut</td>
<td>Haut</td>
<td>Haut/Peau</td>
<td>Haut/Peau</td>
<td>Haut/Peau</td>
</tr>
<tr>
<td></td>
<td>MAK-KZW: 100 ppm 15 Minuten</td>
<td>MAK-KZW: 380 mg/m³ 15 Minuten</td>
<td>MAK-TMW: 50 ppm 8 Stunden</td>
<td>MAK-TMW: 190 mg/m³ 8 Stunden</td>
<td>MAK-TMW: 190 mg/m³ 8 Stunden</td>
</tr>
<tr>
<td></td>
<td>TWA: 25 ppm 8 Stunden</td>
<td>TWA: 104 mg/m³ 8 Stunden</td>
<td>TWA: 104 mg/m³ 8 Stunden</td>
<td>TWA: 104 mg/m³ 8 Stunden</td>
<td>TWA: 104 mg/m³ 8 Stunden</td>
</tr>
<tr>
<td>Benzene</td>
<td>TRK-KZW: 4 ppm 15 Minuten</td>
<td>TRK-KZW: 12.8 mg/m³ 15 Minuten</td>
<td>TRK-TMW: 1 ppm 8 Stunden</td>
<td>TRK-TMW: 3.2 mg/m³ 8 Stunden</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA: 0.5 ppm 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
<td>TWA: 1.6 mg/m³ 8 Stunden</td>
</tr>
</tbody>
</table>

### Component Notation

- **Ethylbenzene**: Haut (skin), Adha (mucous membranes), Lunge (respiratory system), Organ (blood), Organ (nervous system), Organ (muscular system), Organ (eye), Organ (skin), Organ (heart).
- **Xylenes (o-, m-, p-isomers)**: Haut (skin), Adha (mucous membranes), Lunge (respiratory system), Organ (blood), Organ (nervous system), Organ (muscular system), Organ (eye), Organ (skin), Organ (heart).

### Safety Data

<table>
<thead>
<tr>
<th>Component</th>
<th>Bulgaria</th>
<th>Croatia</th>
<th>Ireland</th>
<th>Cyprus</th>
<th>Czech Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>TWA: 435 mg/m³</td>
<td>TWA: 545 mg/m³</td>
<td>kože 100 ppm 8 satima</td>
<td>TWA: 100 ppm 8 hr.</td>
<td>TWA: 200 ppm 8 hodinach</td>
</tr>
<tr>
<td></td>
<td>STEL: 545 mg/m³</td>
<td>TWA-GVI: 442 mg/m³ 8 satima</td>
<td>Skin-potential for cutaneous absorption</td>
<td>TWA-GVI: 442 mg/m³ 15 min Skin</td>
<td>Potential for cutaneous absorption Ceiling: 500 mg/m³</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p-)</td>
<td>TWA: 50 ppm</td>
<td>TWA: 50 ppm 8 hr.</td>
<td>kože</td>
<td>Skin-potential for</td>
<td>TWA: 200 mg/m³ 8 hodinach</td>
</tr>
</tbody>
</table>

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100000000103121
### SAFETY DATA SHEET

**Xylene**

<table>
<thead>
<tr>
<th>Component</th>
<th>Estonia</th>
<th>Gibraltar</th>
<th>Greece</th>
<th>Hungary</th>
<th>Iceland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>Nahk TWA: 100 ppm 8 tundides, TWA: 442 mg/m³ 8 tundides, STEL: 200 ppm 15 minutama, STEL: 884 mg/m³ 15 minutama, Ceiling: 0.01 ppm 5 min TWA-GV: 50 ppm 8 satima. TWA-GV: 221 mg/m³ 8 satima. STEL-KGV: 100 ppm 15 minutama. STEL-KGV: 442 mg/m³ 15 minutama.</td>
<td>Skin notation TWA: 100 ppm 8 hr TWA: 442 mg/m³ 8 hr STEL: 200 ppm 15 min STEL: 884 mg/m³ 15 min</td>
<td>Skin notation TWA: 100 ppm 8 hr TWA: 221 mg/m³ 8 hr STEL: 442 mg/m³ 15 min</td>
<td>TWA: 884 mg/m³ 15 perchekben. CK TWA: 442 mg/m³ 8 órában. ČK lehetséges boron keresztüli felszívódás TWA: 100 ppm 15 min STEL: 545 mg/m³ TWA: 100 ppm TWA: 435 mg/m³</td>
<td>TWA: 200 ppm 50 ppm 8 klukkustundum. TWA: 200 mg/m³ 8 klukkustundum. Skin notation Ceiling: 100 ppm Ceiling: 400 mg/m³</td>
</tr>
</tbody>
</table>

| Xylenes (o-, m-, p-isomers) | Nahk TWA: 50 ppm 8 tundides, TWA: 221 mg/m³ 8 tundides, STEL: 100 ppm 15 minutama, STEL: 442 mg/m³ 15 minutama. | Skin notation TWA: 50 ppm 8 hr pure TWA: 221 mg/m³ 8 hr pure STEL: 100 ppm 15 min pure STEL: 442 mg/m³ 15 min pure | Skin - potential for cutaneous absorption TWA: 150 ppm STEL: 650 mg/m³ STEL: 100 ppm TWA: 435 mg/m³ | TWA: 442 mg/m³ 15 perchekben. CK TWA: 221 mg/m³ 8 órában. ČK lehetséges boron keresztüli felszívódás TWA: 100 ppm STEL: 545 mg/m³ TWA: 435 mg/m³ | TWA: 100 ppm 25 ppm 8 klukkustundum. TWA: 109 mg/m³ 8 klukkustundum. Skin notation Ceiling: 50 ppm Ceiling: 218 mg/m³ |

| Toluene | Nahk TWA: 50 ppm 8 tundides, TWA: 192 mg/m³ 8 tundides, STEL: 100 ppm 15 minutama, STEL: 384 mg/m³ 15 minutama. | Skin notation TWA: 50 ppm 8 hr pure TWA: 192 mg/m³ 8 hr pure STEL: 100 ppm 15 min STEL: 384 mg/m³ 15 min | Skin - potential for cutaneous absorption TWA: 100 ppm STEL: 100 ppm TWA: 442 mg/m³ | TWA: 380 mg/m³ 15 perchekben. CK TWA: 190 mg/m³ 8 órában. ČK lehetséges boron keresztüli felszívódás TWA: 100 ppm STEL: 384 mg/m³ TWA: 50 ppm TWA: 192 mg/m³ | TWA: 50 ppm 25 ppm 8 klukkustundum. TWA: 94 mg/m³ 8 klukkustundum. Skin notation Ceiling: 50 ppm Ceiling: 186 mg/m³ |

| Benzene | Nahk TWA: 0.5 ppm 8 tundides, TWA: 1.5 mg/m³ 8 tundides, STEL: 3 ppm 15 minutama, STEL: 9 mg/m³ 15 minutama. | Skin - potential for cutaneous absorption TWA: 1.0 ppm TWA: 3.19 mg/m³ | | lehetséges boron keresztüli felszívódás Ceiling: 3 mg/m³ MK TWA: 100 ppm IPRD Oda TWA: 442 mg/m³ IPRD STEL: 200 ppm STEL: 884 mg/m³ | TWA: 0.5 ppm 8 klukkustundum. TWA: 1.6 mg/m³ 8 klukkustundum. Skin notation Ceiling: 1 ppm Ceiling: 3.2 mg/m³ |

<table>
<thead>
<tr>
<th>Component</th>
<th>Latvia</th>
<th>Lithuania</th>
<th>Luxembourg</th>
<th>Malta</th>
<th>Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>skin - potential for cutaneous exposure STEL: 200 ppm STEL: 884 mg/m³ TWA: 100 ppm</td>
<td>TWA: 100 ppm IPRD TWA: 442 mg/m³ IPRD Oda STEL: 200 ppm STEL: 884 mg/m³</td>
<td>possibility of significant uptake through the skin TWA: 100 ppm 8 Stunden TWA: 442 mg/m³ 8</td>
<td>possibility of significant uptake through the skin TWA: 100 ppm TWA: 442 mg/m³ STEL: 200 ppm 15 minute</td>
<td>Skin notation TWA: 100 ppm 8 ore TWA: 442 mg/m³ 8 ore STEL: 200 ppm 15 minute</td>
</tr>
</tbody>
</table>
## SAFETY DATA SHEET

### Xylene

<table>
<thead>
<tr>
<th>Component</th>
<th>Russia</th>
<th>Slovak Republic</th>
<th>Slovenia</th>
<th>Sweden</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>TWA: 50 mg/m³</td>
<td>Ceiling: 884 mg/m³</td>
<td>TWA: 100 ppm 8 urah Koža</td>
<td>STV: 100 ppm 15 minute</td>
<td>Deri</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p-isomers)</td>
<td>TWA: 50 mg/m³</td>
<td>Ceiling: 442 mg/m³</td>
<td>TWA: 50 ppm 8 urah Koža</td>
<td>STV: 450 mg/m³ 15 minute</td>
<td>Deri</td>
</tr>
<tr>
<td>Toluene</td>
<td>TWA: 50 mg/m³</td>
<td>Ceiling: 384 mg/m³</td>
<td>TWA: 50 ppm 8 urah Koža</td>
<td>STV: 442 mg/m³ 15 minute</td>
<td>Deri</td>
</tr>
<tr>
<td>Benzene</td>
<td>TWA: 5 mg/m³</td>
<td>1.0 ppm 8 hodinách</td>
<td>TWA: 1.0 ppm 8 urah Koža</td>
<td>STV: 3 ppm 15 minute</td>
<td>Deri</td>
</tr>
</tbody>
</table>

### Skin notation

- Russia: 3
- Slovak Republic: 3
- Slovenia: 3
- Sweden: 3
- Turkey: 3

### Biological limit values

<table>
<thead>
<tr>
<th>Component</th>
<th>European Union</th>
<th>United Kingdom</th>
<th>France</th>
<th>Spain</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>Mandelic acid: 1500</td>
<td></td>
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<td></td>
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</table>

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### Xylene

<table>
<thead>
<tr>
<th>Component</th>
<th>mg/g creatinine urine end of shift at end of workweek</th>
<th>Phenylglyoxylic acid: 700 mg/g Creatinine urine end of workweek</th>
<th>Phenylglyoxylic acid: 300 mg/g urine (end of shift)</th>
<th>Xylene: 1.5 mg/L whole blood (end of shift all isomers)</th>
<th>Methylhippuric(tolu-cal) acid: 2000 mg/L urine (end of shift all isomers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xylenes (o-, m-, p-isomers)</td>
<td>Methylhippuric acid: 650 mmol/mmol creatinine urine Post shift</td>
<td>Methylhippuric acid: 1500 mg/g creatinine urine end of shift</td>
<td>Methylhippuric acids: 1 g/g Creatinine urine end of shift</td>
<td>Xylene: 1.5 mg/L whole blood (end of shift all isomers)</td>
<td>Methylhippuric acid: 300 mg/g urine (end of shift)</td>
</tr>
<tr>
<td>Toluene</td>
<td>Toluene: 1 mg/L blood end of shift</td>
<td>Hippuric acid: 2500 mg/g creatinine urine end of shift</td>
<td>o-Cresol: 0.5 mg/L urine end of shift</td>
<td>Hippuric acid: 1.6 g/g Creatinine urine end of shift</td>
<td>Toluene: 600 µg/L whole blood (end of shift all isomers)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o-Cresol: 1.5 mg/L urine (end of several shifts after hydrolysis; for long-term exposures)</td>
</tr>
<tr>
<td>Benzene</td>
<td>Muconic acid: 5 g/L urine end of shift</td>
<td>S-Phenylmercapturic acid: 0.045 mg/g urine end of exposure or end of shift</td>
<td>Trans, trans-Muconic acid: 2 mg/L urine end of exposure or end of shift</td>
<td>Possible significant absorption through the skin</td>
<td>Possible significant absorption through the skin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Italy</th>
<th>Finland</th>
<th>Denmark</th>
<th>Bulgaria</th>
<th>Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>Mandelic acid: 5.2 mmol/L urine at the end of workweek.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xylenes (o-, m-, p-isomers)</td>
<td>Methylhippuric acid: 5.0 mmol/L urine at the end of shift.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>Toluene concentrated: 500 nmol/L blood prior to shift.</td>
<td>Hippuric acid: 1.6 mmol/mmol Creatinine urine at the end of exposure or end of shift</td>
<td>Hippuric acid: 2 g/L urine end of shift</td>
<td>o-Cresol: 3 mg/L urine end of shift</td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Gibraltar</th>
<th>Latvia</th>
<th>Slovak Republic</th>
<th>Luxembourg</th>
<th>Turkey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>2 and 4-Ethylphenol: 12 mg/L urine end of exposure or work shift also after all work shifts for long-term exposure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Xylenes (o-, m-, p- isomers)</th>
<th>also after all work shifts for long-term exposure</th>
</tr>
</thead>
</table>

Toluene

<table>
<thead>
<tr>
<th>Hippuric acid: 1.6 g/g Creatinine urine end of shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene: 0.05 mg/l blood end of shift</td>
</tr>
<tr>
<td>Toluene: 600 µg/L blood end of exposure or work shift</td>
</tr>
<tr>
<td>o-Cresol: 1.5 mg/L urine after all work shifts for long-term exposure</td>
</tr>
<tr>
<td>o-Cresol: 1.5 mg/L urine end of exposure or work shift</td>
</tr>
<tr>
<td>Hippuric acid: 1600 mg/g creatinine end of exposure or work shift</td>
</tr>
</tbody>
</table>

Benzene

| Phenol: 25 µg/g Creatinine urine end of shift |

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.

Derived No Effect Level (DNEL) No information available

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Measures
Use only under a chemical fume hood. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Safety glasses with side-shields (European standard - EN 166)

Hand Protection Protective gloves

<table>
<thead>
<tr>
<th>Glove material</th>
<th>Breakthrough time</th>
<th>Glove thickness</th>
<th>EU standard</th>
<th>Glove comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable gloves</td>
<td>See manufacturers recommendations</td>
<td>-</td>
<td>EN 374</td>
<td>(minimum requirement)</td>
</tr>
</tbody>
</table>

Skin and body protection Long sleeved clothing Apron Impervious gloves

Inspect gloves before use.

Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves.

(Refer to manufacturer/supplier for information)

Ensure gloves are suitable for the task: Chemical compatibility, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.

Remove gloves with care avoiding skin contamination.

Respiratory Protection

When workers are facing concentrations above the exposure limit they must use
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Appropriate certified respirators.
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly.

Large scale/emergency use
In case of insufficient ventilation wear suitable respiratory equipment.

Small scale/Laboratory use
Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
When RPE is used a face piece Fit Test should be conducted.

Hygiene Measures
When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing.

Environmental exposure controls
No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

| Appearance                  | Clear, Colorless |
| Physical State              | Liquid           |
| Odor                        | aromatic         |
| Odor Threshold              | No data available|
| pH                          | No data available|
| Melting Point/Range         | -47.2 °C / -53 °F|
| Softening Point             | No data available|
| Boiling Point/Range         | 136.7 - 143.3 °C / 278 - 290 °F |
| Flash Point                 | 27.7 °C / 82 °F |
| Evaporation Rate            | No information available |
| Flammability (solid,gas)    | No information available |
| Explosion Limits            | Lower 1.1 vol %  Upper 7.0 vol % |
| Vapor Pressure              | 9 mmHg @ 25 °C   |
| Vapor Density               | 3.66 (Air = 1.0) (Air = 1.0) |
| Specific Gravity / Density  | No data available 0.87 |
| Bulk Density                | No data available |
| Water Solubility            | No information available |
| Solubility in other solvents| No information available |
| Partition Coefficient (n-octanol/water) | log Pow |
| Component                   | Ethylbenzene 3.118 |
|                             | Xylenes (o-, m-, p- isomers) 3.15 |
|                             | Toluene 2.65 |
|                             | Benzene 1.83 |
| Autoignition Temperature    | 527 °C / 980.6 °F |
| Decomposition Temperature   | No data available |
| Viscosity                   | No data available |
| Explosive Properties        | No information available |
| Oxidizing Properties        | No information available |

9.2. Other information

| Molecular Formula | C8H10 |
| Molecular Weight  | 106.17 |

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available.
10.2. Chemical stability
Stable under normal conditions

10.3. Possibility of hazardous reactions
Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
No information available.

10.4. Conditions to avoid
Incompatible products. Heat, flames and sparks.

10.5. Incompatible materials
Strong oxidizing agents. Strong acids.

10.6. Hazardous decomposition products

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects
Product Information
No acute toxicity information is available for this product

(a) acute toxicity;
   Oral
   No data available
   Dermal
   No data available
   Inhalation
   No data available

(b) skin corrosion/irritation;
   No data available

(c) serious eye damage/irritation;
   No data available

(d) respiratory or skin sensitization;
   Respiratory
   No data available
   Skin
   No data available

(e) germ cell mutagenicity;
   No data available

(f) carcinogenicity;
   No data available

The table below indicates whether each agency has listed any ingredient as a carcinogen

<table>
<thead>
<tr>
<th>Component</th>
<th>EU</th>
<th>UK</th>
<th>Germany</th>
<th>IARC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>Carc Cat. 1A</td>
<td></td>
<td></td>
<td>Group 2B</td>
</tr>
<tr>
<td>Benzene</td>
<td></td>
<td></td>
<td>Cat. 1</td>
<td>Group 1</td>
</tr>
</tbody>
</table>

(g) reproductive toxicity;
   Reproductive Effects
   Experiments have shown reproductive toxicity effects on laboratory animals.
   Developmental Effects
   Developmental effects have occurred in experimental animals.
   Teratogenicity
   Teratogenic effects have occurred in experimental animals.

(h) STOT-single exposure;
   No data available

(i) STOT-repeated exposure;
   No data available
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Target Organs
Eyes, Skin, Central nervous system (CNS), Liver, Kidney, Respiratory system.

(j) aspiration hazard;
No data available

Other Adverse Effects
Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information

Symptoms / effects,both acute and delayed
Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting delayed

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity
Ecotoxicity effects
Do not empty into drains.

<table>
<thead>
<tr>
<th>Component</th>
<th>Freshwater Fish</th>
<th>Water Flea</th>
<th>Freshwater Algae</th>
<th>Microtox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>9.6 mg/L LC50 96 h</td>
<td>1.8 - 2.4 mg/L EC50 48 h</td>
<td>2.6 - 11.3 mg/L EC50 72 h</td>
<td>EC50 = 9.68 mg/L 30 min</td>
</tr>
<tr>
<td></td>
<td>15.6 mg/L LC50 96 h</td>
<td>96 h 7.55</td>
<td>96 h 4.2 mg/L LC50 96 h 11.0 - 18.0 mg/L LC50 96 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 mg/L LC50 96 h</td>
<td>4.2 mg/L LC50 96 h 11.0 - 96 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xylenes (o-, m-, p- isomers)</td>
<td>30.26 - 40.75 mg/L LC50 96 h 780 mg/L</td>
<td>0.6 mg/L LC50 = 48 h</td>
<td>2.6 mg/L EC50 = 48 h</td>
<td>EC50 = 0.0084 mg/L 24 h</td>
</tr>
<tr>
<td></td>
<td>23.5 - 29.97 mg/L LC50 96 h 7.711 - 9.591 mg/L LC50 96 h 19 mg/L</td>
<td>3.82 mg/L EC50 = 48 h</td>
<td>438 mg/L EC50 &gt; 96 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.5 - 17.3 mg/L LC50 96 h 2.661 - 4.093 mg/L LC50 96 h 13.4 mg/L LC50 96 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>50-70 mg/L LC50 96 h 5.46 - 9.83 mg/L EC50 48 h</td>
<td>12.5 mg/L EC50 = 72 h</td>
<td>EC50 = 19.7 mg/L 30 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15-19 mg/L LC50 96 h 433 mg/L EC50 &gt; 96 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28 mg/L LC50 96 h</td>
<td>11.5 mg/L EC50 = 48 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 mg/mL LC50 96 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzene</td>
<td>70000 - 142000 µg/L LC50 96 h 22330 - 41160 µg/L LC50 96 h 28.6 mg/L LC50 96 h 8.76 - 15.6 mg/L EC50 48 h</td>
<td>10 mg/L EC50 = 48 h</td>
<td>29 mg/mL EC50 = 72 h</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.49 mg/L LC50 96 h 8.76 - 15.6 mg/L EC50 48 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.3 mg/L LC50 96 h 5.3 mg/L LC50 96 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.7 - 14.7 mg/L LC50 96 h</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
No information available

<table>
<thead>
<tr>
<th>Component</th>
<th>Degradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>86% (20d)</td>
</tr>
<tr>
<td>108-88-3 (0 - 0.5)</td>
<td></td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential
No information available

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
<th>Bioconcentration factor (BCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>3.118</td>
<td>15</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p- isomers)</td>
<td>3.15</td>
<td>0.6 - 15</td>
</tr>
<tr>
<td>Toluene</td>
<td>2.65</td>
<td>90</td>
</tr>
<tr>
<td>Benzene</td>
<td>1.83</td>
<td>3.5 - 4.4</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil
.

12.5. Results of PBT and vPvB assessment
No data available for assessment.

12.6. Other adverse effects
SAFETY DATA SHEET

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Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

Persistent Organic Pollutant
This product does not contain any known or suspected substance

Ozone Depletion Potential
This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products
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.

Contaminated Packaging
Empty remaining contents. Dispose of in accordance with local regulations. Do not re-use empty containers.

European Waste Catalogue (EWC)
According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

Other Information
Waste codes should be assigned by the user based on the application for which the product was used.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1. UN number
UN1307

14.2. UN proper shipping name
XYLENES

14.3. Transport hazard class(es)
3

14.4. Packing group
III

ADR

14.1. UN number
UN1307

14.2. UN proper shipping name
XYLENES

14.3. Transport hazard class(es)
3

14.4. Packing group
III

IATA

14.1. UN number
UN1307

14.2. UN proper shipping name
XYLENES

14.3. Transport hazard class(es)
3

14.4. Packing group
III

14.5. Environmental hazards
No hazards identified

14.6. Special precautions for user
No special precautions required

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories
Australia X = listed China Canada The product is classified and labeled according to EC directives or corresponding national laws. The product is classified and labeled in accordance with Directive 1999/45/EC Europe TSCA Korea Philippines Japan

<table>
<thead>
<tr>
<th>Component</th>
<th>EINECS</th>
<th>ELINCS</th>
<th>NLP</th>
<th>TSCA</th>
<th>DSL</th>
<th>NSDL</th>
<th>PICCS</th>
<th>ENCS</th>
<th>IECSC</th>
<th>AICS</th>
<th>KECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>202-849-4</td>
<td>-</td>
<td></td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p- isomers)</td>
<td>215-535-7</td>
<td>-</td>
<td></td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
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|----------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|

National Regulations

<table>
<thead>
<tr>
<th>Component</th>
<th>Germany - Water Classification (VwVwS)</th>
<th>Germany - TA-Luft Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>WGK 1</td>
<td></td>
</tr>
<tr>
<td>Xylenes (o-, m-, p- isomers)</td>
<td>WGK 2</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>WGK 2</td>
<td>Krebserzeugende Stoffe - Class III : 1 mg/m³ (Massenkonzentration)</td>
</tr>
<tr>
<td>Benzene</td>
<td>WGK 3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>France - INRS (Tables of occupational diseases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylbenzene</td>
<td>Tableaux des maladies professionnelles (TMP) - RG 84</td>
</tr>
<tr>
<td>Xylenes (o-, m-, p- isomers)</td>
<td>Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84</td>
</tr>
<tr>
<td>Toluene</td>
<td>Tableaux des maladies professionnelles (TMP) - RG 4bis,RG 84</td>
</tr>
<tr>
<td>Benzene</td>
<td>Tableaux des maladies professionnelles (TMP) - RG 4, RG 4bis,RG 84</td>
</tr>
</tbody>
</table>

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION

Full text of R-phrases referred to under sections 2 and 3
R10 - Flammable
R11 - Highly flammable
R20 - Harmful by inhalation
R38 - Irritating to skin
R45 - May cause cancer
R46 - May cause heritable genetic damage
R63 - Possible risk of harm to the unborn child
R65 - Harmful: may cause lung damage if swallowed
R67 - Vapors may cause drowsiness and dizziness
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R20/21 - Harmful by inhalation and in contact with skin
R36/38 - Irritating to eyes and skin
R42/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation
R48/23/24/25 - Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H225 - Highly flammable liquid and vapor
H312 - Harmful in contact with skin
H314 - Causes skin irritation
H315 - Harmful if inhaled
H341 - May be fatal if inhaled
H319 - May cause damage to organs through prolonged or repeated exposure

Legend
CAS - Chemical Abstracts Service
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
IECGC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
WEL - Workplace Exposure Limit
ACGIH - American Conference of Governmental Industrial Hygienists
DNEL - Derived No Effect Level
RPE - Respiratory Protective Equipment
LC50 - Lethal Concentration 50%
NOEC - No Observed Effect Concentration
PBT - Persistent, Bioaccumulative, Toxic
ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road
IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code
OECD - Organisation for Economic Co-operation and Development
BCF - Bioconcentration factor
Key literature references and sources for data
Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice
Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Creation Date 13-Feb-2015
Revision Date 21-Feb-2014
Revision Summary Not applicable.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer
The information provided on 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 guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of Safety Data Sheet
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
   - Product name: Zinc
   - Product Number: 96454
   - Brand: Sigma-Aldrich
   - CAS-No.: 7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against
   - Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
   - Company: Sigma-Aldrich
     3050 Spruce Street
     SAINT LOUIS MO  63103
     USA
   - Telephone: +1 800-325-5832
   - Fax: +1 800-325-5052

1.4 Emergency telephone number
   - Emergency Phone #: (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
   - GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
     Combustible dust,
     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 GHS Label elements, including precautionary statements
   - Pictogram
   - Signal word: Warning
   - Hazard statement(s)
     - H410: May form combustible dust concentrations in air
     - Very toxic to aquatic life with long lasting effects.
   - Precautionary statement(s)
     - P273: Avoid release to the environment.
     - P391: Collect spillage.
     - P501: Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS
   - Combustible dust
3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Formula: Zn
Molecular weight: 65.39 g/mol

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc powder (stabilized)</td>
<td>Aquatic Acute 1; Aquatic Chronic 1; H410</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7440-66-6</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>231-175-3</td>
<td></td>
</tr>
<tr>
<td>Index-No.</td>
<td>030-001-01-9</td>
<td></td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>Aquatic Acute 1; Aquatic Chronic 1; H410</td>
<td>&gt;= 5 - &lt; 10 %</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>1314-13-2</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>215-222-5</td>
<td></td>
</tr>
<tr>
<td>Index-No.</td>
<td>030-013-00-7</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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
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

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Special powder against metal fire Dry sandUse water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable extinguishing media
Water

5.2 Special hazards arising from the substance or mixture
Zinc/zinc oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available
6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
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.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
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
Keep container tightly closed in a dry and well-ventilated place.
Keep in a dry place.
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

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>TWA</td>
<td>2.000000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td>metal fume fever</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>10.000000 mg/m3</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>metal fume fever</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>----------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>5.000000 mg/m³</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>10.000000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>15.000000 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>5.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>15.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>5.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWA</td>
<td>5.000000 mg/m³</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></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**
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.

**Full contact**
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

**Splash contact**
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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 levels of dusts are desired, use type N95 (US) or type P1 (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**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

---

### 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><strong>a) Appearance</strong></td>
<td>Form: powder</td>
</tr>
<tr>
<td></td>
<td>Colour: grey</td>
</tr>
<tr>
<td><strong>b) Odour</strong></td>
<td>odourless</td>
</tr>
<tr>
<td><strong>c) Odour Threshold</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>d) pH</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>e) Melting point/freezing point</strong></td>
<td>Melting point/range: 420 °C (788 °F) - lit.</td>
</tr>
<tr>
<td><strong>f) Initial boiling point and boiling range</strong></td>
<td>907 °C (1,665 °F) - lit.</td>
</tr>
<tr>
<td><strong>g) Flash point</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>h) Evaporation rate</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>i) Flammability (solid, gas)</strong></td>
<td>May form combustible dust concentrations in air</td>
</tr>
<tr>
<td><strong>j) Upper/lower flammability or explosive limits</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>k) Vapour pressure</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>l) Vapour density</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>m) Relative density</strong></td>
<td>7.133 g/mL at 25 °C (77 °F)</td>
</tr>
<tr>
<td><strong>n) Water solubility</strong></td>
<td>insoluble</td>
</tr>
<tr>
<td><strong>o) Partition coefficient: n-octanol/water</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>p) Auto-ignition temperature</strong></td>
<td>does not ignite</td>
</tr>
<tr>
<td><strong>q) Decomposition temperature</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>r) Viscosity</strong></td>
<td>No data available</td>
</tr>
<tr>
<td><strong>s) Explosive properties</strong></td>
<td>During processing, dust may form explosive mixture in air.</td>
</tr>
<tr>
<td><strong>t) Oxidizing properties</strong></td>
<td>No data available</td>
</tr>
</tbody>
</table>

#### 9.2 Other safety information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bulk density</strong></td>
<td>1.8 - 3.2 kg/m³</td>
</tr>
</tbody>
</table>

---

### 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
Dust may form explosive mixture in air.
10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Acids and bases

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available (Zinc powder (stabilized))

Inhalation: No data available (Zinc powder (stabilized))
Dermal: No data available (Zinc powder (stabilized))
No data available (Zinc powder (stabilized))

Skin corrosion/irritation
No data available (Zinc powder (stabilized))

Serious eye damage/eye irritation
No data available (Zinc powder (stabilized))

Respiratory or skin sensitisation
Did not cause sensitisation on laboratory animals. (Zinc powder (stabilized))

Germ cell mutagenicity
No data available (Zinc powder (stabilized))

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.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available (Zinc powder (stabilized))
No data available (Zinc powder (stabilized))

Specific target organ toxicity - single exposure
No data available (Zinc powder (stabilized))

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available (Zinc powder (stabilized))

Additional Information
RTECS: ZG8600000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Effects due to ingestion may include:; chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness, Contact with eyes or skin may cause:; Irritation (Zinc powder (stabilized))
12. ECOLOGICAL INFORMATION

12.1 Toxicity
   - Toxicity to fish: LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h (Zinc powder (stabilized))
   - Toxicity to daphnia and other aquatic invertebrates: LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h (Zinc powder (stabilized))
   - Mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d (Zinc powder (stabilized))

12.2 Persistence and degradability
   The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential
   - Bioaccumulation: Algae - 7 d at 16 °C - 5 µg/l (Zinc powder (stabilized))
     - Bioconcentration factor (BCF): 466

12.4 Mobility in soil
   No data available (Zinc powder (stabilized))

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
   An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
   Very toxic to aquatic life with long lasting effects.
   No data available

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.

14. TRANSPORT INFORMATION

   DOT (US)
   - UN number: 3077
   - Class: 9
   - Packing group: III
   - Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Zinc powder (stabilized))
   - Reportable Quantity (RQ): 1020 lbs
   - Poison Inhalation Hazard: No

   IMDG
   - UN number: 3077
   - Class: 9
   - Packing group: III
   - EMS-No: F-A, S-F
   - Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
   - Marine pollutant: yes

   IATA
   - UN number: 3077
   - Class: 9
   - Packing group: III
   - Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

   Further information
   EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.
15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>2007-03-01</td>
</tr>
<tr>
<td>Zinc powder (stabilized)</td>
<td>7440-66-6</td>
<td>1993-04-24</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc powder (stabilized)</td>
<td>7440-66-6</td>
<td>1993-04-24</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>2007-03-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc powder (stabilized)</td>
<td>7440-66-6</td>
<td>1993-04-24</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>2007-03-01</td>
</tr>
</tbody>
</table>

New Jersey Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc powder (stabilized)</td>
<td>7440-66-6</td>
<td>1993-04-24</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>1314-13-2</td>
<td>2007-03-01</td>
</tr>
</tbody>
</table>

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

May form combustible dust concentrations in air

Aquatic Acute Acute aquatic toxicity
Aquatic Chronic Chronic aquatic toxicity
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

HMIS Rating
Health hazard: 0
Chronic Health Hazard: 0
Flammability: 0
Physical Hazard: 0

NFPA Rating
Health hazard: 0
Fire Hazard: 0
Reactivity Hazard: 0

Further information
Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name : 4,4'-DDD
Product Number : 35486
Brand : Sigma-Aldrich
CAS-No. : 72-54-8

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Dermal (Category 4), H312
Carcinogenicity (Category 2), H351
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 GHS Label elements, including precautionary statements
Pictogram

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Danger</th>
</tr>
</thead>
</table>

Hazard statement(s)
H301 Toxic if swallowed.
H312 Harmful in contact with skin.
H351 Suspected of causing cancer.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P264 Wash 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.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P322 Specific measures (see supplemental first aid instructions on this label).
P330 Rinse mouth.
P363 Wash contaminated clothing before reuse.
P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Synonyms</th>
<th>1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formula</td>
<td>C(<em>{14})H(</em>{10})Cl(_4)</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>320.04 g/mol</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>72-54-8</td>
</tr>
<tr>
<td>EC-No.</td>
<td>200-783-0</td>
</tr>
</tbody>
</table>

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane</td>
<td>Acute Tox. 3; Acute Tox. 4; Carc. 2; Aquatic Acute 1; Aquatic Chronic 1; H301, H312, H351, H410</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. Take victim immediately to hospital. Consult a physician.

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. 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
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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.

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. Normal measures for preventive fire protection. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSOMAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

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.
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**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.

### 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: solid</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>94.0 - 96.0 °C (201.2 - 204.8 °F)</td>
</tr>
<tr>
<td>f) Initial boiling point and boiling range</td>
<td>193.0 °C (379.4 °F) at 1.3 hPa (1.0 mmHg)</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>&lt; 0.00001 hPa (&lt; 0.00001 mmHg) at 25.0 °C (77.0 °F)</td>
</tr>
<tr>
<td>l) Vapour density</td>
<td>No data available</td>
</tr>
<tr>
<td>m) Relative density</td>
<td>1.38 g/cm3</td>
</tr>
<tr>
<td>n) Water solubility</td>
<td>No data available</td>
</tr>
<tr>
<td>o) Partition coefficient: n-octanol/water</td>
<td>log Pow: 6.02</td>
</tr>
</tbody>
</table>
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

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
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Hamster - > 5,000 mg/kg

TDLo Oral - Human - 428.5 mg/kg
Remarks: Endocrine:Adrenal cortex hypoplasia.

TDLo Oral - Rat - 6,000 mg/kg

TDLo Oral - Rat - 14 mg/kg

TDLo Oral - Rat - 2,100 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex).

Inhalation: No data available

LD50 Dermal - Rabbit - 1,200 mg/kg
Remarks: Behavioral:Excitement. Behavioral:Convulsions or effect on seizure threshold. Skin irritation

No data available

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**
This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: 2A - Group 2A: Probably carcinogenic to humans (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**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: KI0700000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. **ECOLOGICAL INFORMATION**

12.1 **Toxicity**

Toxicity to fish
- LC50 - other fish - 1.18 - 9 mg/l - 96.0 h
- LC50 - Lepomis macrochirus (Bluegill) - 0.04 - 0.05 mg/l - 96.0 h
- LC50 - Oncorhynchus mykiss (rainbow trout) - 0.06 - 0.09 mg/l - 96.0 h
- LC50 - Pimephales promelas (fathead minnow) - 3.47 - 5.58 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates
- EC50 - Daphnia pulex (Water flea) - 0.01 mg/l - 48 h

12.2 **Persistence and degradability**
No data available

12.3 **Bioaccumulative potential**
Indication of bioaccumulation.

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
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solids, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Reportable Quantity (RQ): 1 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 2811 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)
Marine pollutant: yes

IATA
UN number: 2811 Class: 6.1 Packing group: III
Proper shipping name: Toxic solid, organic, n.o.s. (2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane)

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane CAS-No. 72-54-8 Revision Date 1993-04-24

New Jersey Right To Know Components
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane CAS-No. 72-54-8 Revision Date 1993-04-24

California Prop. 65 Components
WARNING! This product contains a chemical known to the State of California to cause cancer.
2,2-bis(4-Chlorophenyl)-1,1-dichloro-ethane CAS-No. 72-54-8 Revision Date 2007-09-28
16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.  Acute toxicity
Aquatic Acute  Acute aquatic toxicity
Aquatic Chronic  Chronic aquatic toxicity
Carc.  Carcinogenicity
H301  Toxic if swallowed.
H312  Harmful in contact with skin.
H351  Suspected of causing cancer.
H400  Very toxic to aquatic life.
H410  Very toxic to aquatic life with long lasting effects.

HMIS Rating
Health hazard:  2
Chronic Health Hazard:  *
Flammability:  0
Physical Hazard  0

NFPA Rating
Health hazard:  2
Fire Hazard:  0
Reactivity Hazard:  0

Further information
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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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling
or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing
slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.2  Revision Date: 07/26/2016  Print Date: 02/01/2019
1. Identification

Product Name: Acenaphthene

Cat No.: AC201340000; AC201340050; AC201341000; AC201345000

CAS-No: 83-32-9

Synonyms: 1,2-Dihydroacenaphthylene; Naphthyleneethylene; 1,8-Ethlenenaphthalene

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

Company: Acros Organics
One Reagent Lane
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>
<th>Description</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>
<tr>
<td>Specific target organ toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Target Organs - Respiratory system.</td>
<td></td>
</tr>
</tbody>
</table>

Label Elements

Signal Word
Warning

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
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
Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>83-32-9</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 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 not breathing, give artificial respiration. Obtain medical attention.

Ingestion
Clean mouth with water. Get medical attention.

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  135 °C / 275 °F

Method -  No information available

Autoignition Temperature  450 °C / 842 °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
Do not allow run-off from fire fighting to enter drains or water courses.

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.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions
Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions
Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up
Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling
Avoid contact with skin and eyes. Do not breathe dust.

Storage
Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

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.
Acenaphthene

9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Brown</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>Not applicable</td>
</tr>
<tr>
<td>Melting Point/Range</td>
<td>90 - 95 °C / 194 - 203 °F</td>
</tr>
<tr>
<td>Boiling Point/Range</td>
<td>279 °C / 534.2 °F</td>
</tr>
<tr>
<td>Flash Point</td>
<td>135 °C / 275 °F</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>Not data available</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>10 mmHg @ 131 °C</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.060</td>
</tr>
<tr>
<td>Solubility</td>
<td>insoluble</td>
</tr>
<tr>
<td>Partition coefficient; n-octanol/water</td>
<td>No data available</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>450 °C / 842 °F</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>C12 H10</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>154.21</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

| Reactive Hazard | None known, based on information available |
| Stability       | Stable under normal conditions. |
| Conditions to Avoid | Excess heat. Incompatible products. |
| Incompatible Materials | Strong oxidizing agents, Metals, Strong acids |
| Hazardous Decomposition Products | Carbon monoxide (CO), Carbon dioxide (CO₂) |
| Hazardous Polymerization | No information available. |
| Hazardous Reactions | None under normal processing. |

11. Toxicological information

<table>
<thead>
<tr>
<th>Acute Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Information</td>
</tr>
<tr>
<td>Component Information</td>
</tr>
<tr>
<td>Component</td>
</tr>
<tr>
<td>Acenaphthene</td>
</tr>
<tr>
<td>Toxicologically Synergistic Products</td>
</tr>
</tbody>
</table>

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>Acenaphthene</td>
<td>83-32-9</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Mutagenic Effects</th>
<th>Reproductive Effects</th>
<th>Developmental Effects</th>
<th>Teratogenicity</th>
<th>STOT - single exposure</th>
<th>STOT - repeated exposure</th>
<th>Aspiration hazard</th>
<th>Symptoms / effects, both acute and delayed</th>
<th>Endocrine Disruptor Information</th>
<th>Other Adverse Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>Respiratory system</td>
<td>None known</td>
<td>No information available</td>
<td>No information available</td>
<td>No information available</td>
<td>The toxicological properties have not been fully investigated</td>
</tr>
</tbody>
</table>

12. Ecological information

**Ecotoxicity**
The product contains following substances which are hazardous for the environment. Very toxic to aquatic organisms.

<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>Acenaphthene</td>
<td>EC50: 0.23 - 1.15 mg/L, 96h (Pseudokirchneriella subcapitata)</td>
<td>LC50: 1.3 - 2.1 mg/L, 96h static (Lepomis macrochirus)</td>
<td>EC50 = 0.58 mg/L 15 min</td>
<td>EC50: 1.102 - 1.475 mg/L, 48h Static (Daphnia magna)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>Persistence and Degradability</th>
<th>Bioaccumulation/ Accumulation</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>May persist</td>
<td>No information available.</td>
<td>Is not likely mobile in the environment due its low water solubility.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>3.91 - 4.43</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.

<table>
<thead>
<tr>
<th>DOT</th>
<th>UN-No</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN3077</td>
<td></td>
</tr>
</tbody>
</table>
Acenaphthene

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
Proper technical name: Acenaphthene
Hazard Class: 9
Packing Group: III

TDG
UN-No: UN3077
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
Hazard Class: 9
Packing Group: III

IATA
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

IMDG/IMO
UN-No: UN3077
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class: 9
Packing Group: III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

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>Acenaphthene</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>201-469-6</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.
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)

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration Not applicable
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acenaphthene</td>
<td>100 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

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>Acenaphthene</td>
<td>X</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 04-Jun-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

1.1. Identification

<table>
<thead>
<tr>
<th>Product form</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance name</td>
<td>Acetone</td>
</tr>
<tr>
<td>Chemical name</td>
<td>2-Propanone</td>
</tr>
<tr>
<td>CAS No</td>
<td>67-64-1</td>
</tr>
<tr>
<td>Product code</td>
<td>LC10420, LC10425</td>
</tr>
<tr>
<td>Formula</td>
<td>C3H6O</td>
</tr>
<tr>
<td>Synonyms</td>
<td>2-propanone / beta-ketopropene / dimethyl formaldehyde / dimethyl ketone / dimethylketal / DMK (=dimethyl ketone) / keto propane / methyl ketone / pyroacetic acid / pyroacetic ether / pyroacetic spirit</td>
</tr>
</tbody>
</table>

1.2. Relevant identified uses of the substance or mixture and uses advised against

<table>
<thead>
<tr>
<th>Use of the substance/mixture</th>
<th>Solvent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cleaning product</td>
</tr>
<tr>
<td></td>
<td>Chemical raw material</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Flammable liquids Category</th>
<th>H225</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/eye irritation Category 2A</td>
<td>H319</td>
</tr>
<tr>
<td>Specific target organ toxicity (single exposure) Category 3</td>
<td>H336</td>
</tr>
</tbody>
</table>

Full text of H statements : see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

![GHS02](image1.png) ![GHS07](image2.png)

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 - 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
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>Flamm. 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, H338</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: Heat sources, Direct sunlight, incompatible materials. Keep container closed when not in use.

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.
Acetone
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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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

<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>Aromatic odour Sweet odour Fruity odour</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>306 - 653 ppm</td>
</tr>
<tr>
<td></td>
<td>737 - 1574 mg/m³</td>
</tr>
<tr>
<td>pH</td>
<td>7</td>
</tr>
<tr>
<td>Melting point</td>
<td>-95 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>56 °C</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>235 °C</td>
</tr>
<tr>
<td>Critical pressure</td>
<td>47010 hPa</td>
</tr>
<tr>
<td>Flash point</td>
<td>-18 °C</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>6</td>
</tr>
<tr>
<td>Relative evaporation rate (ether=1)</td>
<td>2</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Non flammable</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>247 hPa (20 °C)</td>
</tr>
<tr>
<td>Vapor pressure at 50 °C</td>
<td>828 hPa (50 °C)</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>2.0</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.79</td>
</tr>
<tr>
<td>Relative density of saturated gas/air mixture</td>
<td>1.2</td>
</tr>
<tr>
<td>Specific gravity / density</td>
<td>786 kg/m³</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>58.08 g/mol</td>
</tr>
<tr>
<td>Log Pow</td>
<td>-0.24 (Test data)</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>465 °C</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>0.417 mm²/s</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>32 mPa.s (20 °C; 0.27 mPa.s; 40 °C)</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>2 - 12.8 vol %</td>
</tr>
<tr>
<td></td>
<td>60 - 310 g/m³</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available.</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>None.</td>
</tr>
<tr>
<td>9.2. Other information</td>
<td></td>
</tr>
<tr>
<td>Minimum ignition energy</td>
<td>1.15 mJ</td>
</tr>
<tr>
<td>Specific conductivity</td>
<td>500000 pS/m</td>
</tr>
<tr>
<td>Saturation concentration</td>
<td>589 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. Highly volatile. Substance has neutral reaction.</td>
</tr>
</tbody>
</table>

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.
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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

<table>
<thead>
<tr>
<th>Acetone (67-64-1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>5800 mg/kg (Rat; Equivalent or similar to OECD 401; Experimental value)</td>
</tr>
<tr>
<td>LD50 dermal rabbit</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>580.000 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 skin contact : ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.
Symptoms/injuries after eye contact : Irritation of the eye tissue.
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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)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persistence and degradability</td>
<td>Readily biodegradable in water. Biodegradable in the soil. Biodegradable in the soil under anaerobic conditions. No test data on mobility of the substance available.</td>
</tr>
<tr>
<td>Biogeochemical oxygen demand (BOD)</td>
<td>1.43 g O₂/g substance</td>
</tr>
<tr>
<td>Chemical oxygen demand (COD)</td>
<td>1.92 g O₂/g substance</td>
</tr>
<tr>
<td>ThOD</td>
<td>2.20 g O₂/g substance</td>
</tr>
<tr>
<td>BOD (% of ThOD)</td>
<td>0.872 (20 days; Literature study)</td>
</tr>
</tbody>
</table>

12.3. Bioaccumulative potential

Acetone (67-64-1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCF fish 1</td>
<td>0.69 (BCF)</td>
</tr>
<tr>
<td>BCF other aquatic organisms 1</td>
<td>3 (BCF; BCFWIN)</td>
</tr>
<tr>
<td>Log Pow</td>
<td>-0.24 (Test data)</td>
</tr>
<tr>
<td>Bioaccumulative potential</td>
<td>Not bioaccumulative.</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

Acetone (67-64-1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface tension</td>
<td>0.0237 N/m</td>
</tr>
</tbody>
</table>

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.
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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
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
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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:

| H225 | Highly flammable liquid and vapor |
| H319 | Causes serious eye irritation |
| H336 | May cause drowsiness or dizziness |

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.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name: Aldrin
Product Number: 36666
Brand: Sigma-Aldrich
Index-No.: 602-048-00-3
CAS-No.: 309-00-2

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet
Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone #: +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture
GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 2), H300
Acute toxicity, Dermal (Category 1), H310
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure (Category 1), H372
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 GHS Label elements, including precautionary statements
Pictogram

Signal word: Danger
Hazard statement(s)
H300 + H310  Fatal if swallowed or in contact with skin.
H351  Suspected of causing cancer.
H372  Causes damage to organs through prolonged or repeated exposure.
H410  Very toxic to aquatic life with long lasting effects.
Precautionary statement(s)
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.
P262 Do not get in eyes, on skin, or on clothing.
P264 Wash 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.
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P302 + P350 IF ON SKIN: Gently wash with plenty of soap and water.
P310 Immediately call a POISON CENTER/doctor.
P322 Specific measures (see supplemental first aid instructions on this label).
P330 Rinse mouth.
P361 Remove/Take off immediately all contaminated clothing.
P363 Wash contaminated clothing before reuse.
P391 Collect spillage.
P405 Store locked up.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>Acute Tox. 2; Acute Tox. 1; Carc. 2; STOT RE 1; Aquatic Acute 1; Aquatic Chronic 1; H300 + H310, H351, H372, H410</td>
<td>90 - 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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. Take victim immediately to hospital. Consult a physician.

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. 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

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
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

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.

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
Keep container tightly closed in a dry and well-ventilated place.
Storage class (TRGS 510): 6.1B: Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>309-00-2</td>
<td>TWA</td>
<td>0.05 mg/m³</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td>Central Nervous System impairment</td>
<td>TWA</td>
<td>0.25 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
</tr>
<tr>
<td></td>
<td>Liver damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kidney damage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Confirmed animal carcinogen with unknown relevance to humans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Danger of cutaneous absorption</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential Occupational Carcinogen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Potential for dermal absorption

<table>
<thead>
<tr>
<th></th>
<th>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.25 mg/m³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>California permissible exposure limits for chemical contaminants (Title 8, Article 107)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL</td>
<td>0.25 mg/m³</td>
</tr>
</tbody>
</table>

### 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.

- **Full contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

- **Splash contact**
  - Material: Nitrile rubber
  - Minimum layer thickness: 0.11 mm
  - Break through time: 480 min
  - Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

**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.

### 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: solid</td>
</tr>
<tr>
<td>b) Odour</td>
<td>Colour: colourless</td>
</tr>
<tr>
<td></td>
<td>No data available</td>
</tr>
</tbody>
</table>
c) Odour Threshold  No data available

d) pH  No data available

e) Melting point/freezing point  96.0 - 98.0 °C (204.8 - 208.4 °F)

f) Initial boiling point and boiling range  No data available

g) Flash point  No data available

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  No data available

l) Vapour density  No data available

m) Relative density  1.60 g/cm³ at 20.00 °C (68.00 °F)

n) Water solubility  insoluble

o) Partition coefficient: n-octanol/water  log Pow: 6.50

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

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
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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects
Acute toxicity
LD50 Oral - Rat - 39.0 mg/kg
Inhalation: No data available
LD50 Dermal - Rabbit - 15.0 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste): Olfaction: Other changes.
Behavioral: Convulsions or effect on seizure threshold. Behavioral: Excitement.

No data available

**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**
This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

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.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA’s list of regulated carcinogens.

**Reproductive toxicity**
No data available

No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
Causes damage to organs through prolonged or repeated exposure.

**Aspiration hazard**
No data available

**Additional Information**
RTECS: IO2100000

Nausea, Vomiting, Headache, Tremors, Incoordination., Dizziness, Cyanosis, Seizures., Unconsciousness

Kidney -

**12. ECOLOGICAL INFORMATION**

12.1 **Toxicity**

Toxicity to fish
LC50 - Oncorhynchus mykiss (rainbow trout) - 0.01 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 0.03 mg/l - 48 h

12.2 **Persistence and degradability**
No data available
12.3 Bioaccumulative potential
Bioaccumulation: Leuciscus idus (Golden orfe) - 3 d
- 0.002 mg/l

Bioconcentration factor (BCF): 3,700

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
Very toxic to aquatic life with long lasting effects.
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. 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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2811  Class: 6.1  Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Aldrin)
Reportable Quantity (RQ): 1 lbs Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG
UN number: 2811  Class: 6.1  Packing group: I
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Aldrin)
Marine pollutant: yes

EMS-No: F-A, S-A

IATA
UN number: 2811  Class: 6.1  Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s. (Aldrin)

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>309-00-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>309-00-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>309-00-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin</td>
<td>309-00-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>
16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

<table>
<thead>
<tr>
<th>Acute Tox.</th>
<th>Acute toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Acute</td>
<td>Acute aquatic toxicity</td>
</tr>
<tr>
<td>Aquatic Chronic</td>
<td>Chronic aquatic toxicity</td>
</tr>
<tr>
<td>Carc.</td>
<td>Carcinogenicity</td>
</tr>
<tr>
<td>H300</td>
<td>Fatal if swallowed.</td>
</tr>
<tr>
<td>H300 + H310</td>
<td>Fatal if swallowed or in contact with skin.</td>
</tr>
<tr>
<td>H310</td>
<td>Fatal in contact with skin.</td>
</tr>
<tr>
<td>H351</td>
<td>Suspected of causing cancer.</td>
</tr>
<tr>
<td>H372</td>
<td>Causes damage to organs through prolonged or repeated exposure.</td>
</tr>
</tbody>
</table>

**HMIS Rating**
- Health hazard: 4
- Chronic Health Hazard: *
- Flammability: 0
- Physical Hazard: 0

**NFPA Rating**
- Health hazard: 4
- Fire Hazard: 0
- Reactivity Hazard: 0

**Further information**
Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. 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. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.
1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name: Dibenzofuran

Product Number: 236373
Brand: Aldrich

CAS-No.: 132-64-9

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA

Telephone: +1 800-325-5832
Fax: +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone #: +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H302 Harmful if swallowed.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P391 Collect spillage.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none
3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances
Synonyms: Diphenylene oxide
Formula: C_{12}H_{8}O
Molecular weight: 168.19 g/mol
CAS-No.: 132-64-9
EC-No.: 205-071-3

Hazardous components

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dibenzofuran</td>
<td>Acute Tox. 4; Aquatic Acute 2; Aquatic Chronic 2; H302, H411</td>
<td>&lt;= 100 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

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. Move out of dangerous area.

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
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

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

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**
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.

---

7. **HANDLING AND STORAGE**

7.1 **Precautions for safe handling**
Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs. 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**
Keep container tightly closed in a dry and well-ventilated place. 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

---

8. **EXPOSURE CONTROLS/PERSONAL PROTECTION**

8.1 **Control parameters**

- **Components with workplace control parameters**
Contains no substances with occupational exposure limit values.

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.

  - **Full contact**
  Material: Nitrile rubber
  Minimum layer thickness: 0.11 mm
  Break through time: 480 min
  Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

  - **Splash contact**
  Material: Nitrile rubber
  Minimum layer thickness: 0.11 mm
  Break through time: 480 min
  Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

  Data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an
industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance
   Form: crystalline
   Colour: white, beige

b) Odour
   No data available

c) Odour Threshold
   No data available

d) pH
   No data available

e) Melting point/freezing point
   Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.

f) Initial boiling point and boiling range
   154 - 155 °C (309 - 311 °F) at 27 hPa (20 mmHg) - lit.

g) Flash point
   130.0 °C (266.0 °F) - closed cup

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
   No data available

l) Vapour density
   No data available

m) Relative density
   No data available

n) Water solubility
   No data available

o) Partition coefficient: n-octanol/water
   log Pow: 3.77

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
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

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
The preceding data, or interpretation of data, was determined using Quantitative Structure Activity Relationship (QSAR) modeling.

Inhalation: No data available
Dermal: No data available

No data available

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.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

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: HP4430000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Toxicity to fish
NOEC - Cyprinodon variegatus (sheepshead minnow) - 1 mg/l - 96.0 h
LC50 - Pimephales promelas (fathead minnow) - 1.05 mg/l - 96.0 h

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
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Toxic to aquatic life with long lasting effects.

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.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077   Class: 9   Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: yes
Poison Inhalation Hazard: No

IMDG
UN number: 3077   Class: 9   Packing group: III   EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran)
Marine pollutant: yes

IATA
UN number: 3077   Class: 9   Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Dibenzofuran 132-64-9 2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
CAS-No. 132-64-9 Revision Date 2007-07-01

Pennsylvania Right To Know Components
CAS-No. 132-64-9 Revision Date 2007-07-01

New Jersey Right To Know Components
CAS-No. 132-64-9 Revision Date 2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox. Acute toxicity
Aquatic Acute Acute aquatic toxicity
Aquatic Chronic Chronic aquatic toxicity
H302 Harmful if swallowed.
H401 Toxic to aquatic life.
H411 Toxic to aquatic life with long lasting effects.

HMIS Rating
Health hazard: 1
Flammability: 1
Physical Hazard 0

NFPA Rating
Health hazard: 2
Fire Hazard: 1
Reactivity Hazard: 0

Further information
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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.7  Revision Date: 11/25/2014  Print Date: 11/10/2018
# SAFETY DATA SHEET

Creation Date 27-Jan-2010  
Revision Date 17-Jan-2018  
Revision Number 6

1. Identification

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Methylene chloride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat No. :</td>
<td>D37-1; D37-4; D37-20; D37-200; D37-200LC; D37-500; D37FB-19; D37FB-50; D37FB-115; D37FB-200; D37POPB-200; D37RB-19; D37RB-50; D37RB-115; D37RB-200; D37RS-19; D37RS-28; D37RS-50; D37RS-115; D37RS-200; D37SK-4; D37SK-4LC; D37SS-28; D37SS-50; D37SS-115; D37SS-200; D37SS-1350; D37RS1000ASME; NC1485726; D37RE200ASME; NC1568702</td>
</tr>
<tr>
<td>CAS-No</td>
<td>75-09-2</td>
</tr>
<tr>
<td>Synonyms</td>
<td>Dichloromethane; DCM</td>
</tr>
</tbody>
</table>

Recommended Use: Laboratory chemicals.  
Uses advised against: Food, drug, pesticide or biocidal product use

2. Hazard(s) identification

| Classification | This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200) |

| Skin Corrosion/Irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Liver, Kidney, Blood. | |

Label Elements

Emergency Telephone Number  
CHEMTREC®, Inside the USA: 800-424-9300  
CHEMTREC®, Outside the USA: 001-703-527-3887
Methylene chloride

Revision Date 17-Jan-2018

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
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
Storage
Store locked up
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)

3. Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>&gt;99.5</td>
</tr>
</tbody>
</table>

4. First-aid measures

General Advice
If symptoms persist, call a physician.

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. If skin irritation persists, call a physician.

Inhalation: Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion: Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects: None reasonably foreseeable. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

Notes to Physician: Treat symptomatically.

5. Fire-fighting measures

Suitable Extinguishing Media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media: No information available.

Flash Point Method: No information available.

Autoignition Temperature: 556 °C / 1032.8 °F.

Explosion Limits:
- Upper: 23 vol %
- Lower: 13 vol %

Sensitivity to Mechanical Impact and Static Discharge: No information available.

Specific Hazards Arising from the Chemical: Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.


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>2</td>
<td>1</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

6. Accidental release measures

Personal Precautions: Use personal protective equipment. Ensure adequate ventilation. Should not be released into the environment.

Environmental Precautions: Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Up.

7. Handling and storage

Handling: Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation.

Storage: Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines:
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
<th>Mexico OEL (TWA)</th>
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</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>TWA: 50 ppm</td>
<td>(Vacated) TWA: 500 ppm</td>
<td>IDLH: 2300 ppm</td>
<td>TWA: 100 ppm</td>
</tr>
<tr>
<td></td>
<td>(Vacated) STEL: 2000 ppm</td>
<td>(Vacated) Ceiling: 1000 ppm</td>
<td></td>
<td>TWA: 330 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA: 25 ppm</td>
<td></td>
<td>STEL: 500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL: 125 ppm</td>
<td></td>
<td>STEL: 1740 mg/m³</td>
</tr>
</tbody>
</table>

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. 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

Long sleeved clothing.

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.

10. Stability and reactivity

Reactive Hazard

None known, based on information available
Stability
Stable under normal conditions.

Conditions to Avoid
Incompatible products. Excess heat.

Incompatible Materials
Strong oxidizing agents, Strong acids, Amines

Hazardous Decomposition Products
Carbon monoxide (CO), Carbon dioxide (CO₂), Hydrogen chloride gas, Phosgene

Hazardous Polymerization
Hazardous polymerization does not occur.

Hazardous Reactions
None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
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>Methylene chloride</td>
<td>&gt; 2000 mg/kg ( Rat )</td>
<td>&gt; 2000 mg/kg ( Rat )</td>
<td>53 mg/L ( Rat ) 6 h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>76000 mg/m³ ( Rat ) 4 h</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.

<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>Methylene chloride</td>
<td>75-09-2</td>
<td>Group 2A</td>
<td>Reasonably Anticipated</td>
<td>A3</td>
<td>X</td>
<td>A3</td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen

Mexican - Occupational Exposure Limits - Carcinogens
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects
Mutagenic effects have occurred in microorganisms.

Reproductive Effects
No information available.

Developmental Effects
No information available.

Teratogenicity
No information available.

STOT - single exposure
Central nervous system (CNS)

STOT - repeated exposure
Liver Kidney Blood
Methylene chloride

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
Tumorigenic effects have been reported in experimental animals.

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>Methylene chloride</td>
<td>EC50: &gt;660 mg/L/96h</td>
<td>Pimephales promelas: LC50: 193 mg/L/96h</td>
<td>EC50: 1 mg/L/24 h</td>
<td>EC50: 140 mg/L/48h</td>
</tr>
</tbody>
</table>

Persistence and Degradability
Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation
No information available.

Mobility
Will likely be mobile in the environment due to its volatility.

<table>
<thead>
<tr>
<th>Component</th>
<th>log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>1.25</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.

<table>
<thead>
<tr>
<th>Component</th>
<th>RCRA - U Series Wastes</th>
<th>RCRA - P Series Wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride - 75-09-2</td>
<td>U080</td>
<td>-</td>
</tr>
</tbody>
</table>

14. Transport information

DOT
UN-No: UN1593
Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
Packing Group: III

TDG
UN-No: UN1593
Proper Shipping Name: DICHLOROMETHANE
Hazard Class: 6.1
Packing Group: III

IATA
UN-No: UN1593
Proper Shipping Name: Dichloromethane
Hazard Class: 6.1
Packing Group: III

IMDG/IMO
UN-No: UN1593
Proper Shipping Name: Dichloromethane
Hazard Class: 6.1
Packing Group: III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed
### 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>Methylene chloride</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>200-838-9</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.
- 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)**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>&gt;99.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**SARA 313**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight %</th>
<th>SARA 313 - Threshold Values %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>&gt;99.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**SARA 311/312 Hazard Categories** See section 2 for more information

<table>
<thead>
<tr>
<th>Component</th>
<th>CWA - Hazardous Substances</th>
<th>CWA - Reportable Quantities</th>
<th>CWA - Toxic Pollutants</th>
<th>CWA - Priority Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Clean Air Act**

<table>
<thead>
<tr>
<th>Component</th>
<th>HAPS Data</th>
<th>Class 1 Ozone Depleters</th>
<th>Class 2 Ozone Depleters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OSHA Occupational Safety and Health Administration**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specifically Regulated Chemicals</th>
<th>Highly Hazardous Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>125 ppm STEL 12.5 ppm Action Level 25 ppm TWA</td>
<td>-</td>
</tr>
</tbody>
</table>

**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

<table>
<thead>
<tr>
<th>Component</th>
<th>Hazardous Substances RQs</th>
<th>CERCLA EHS RQs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>1000 lb 1 lb</td>
<td>-</td>
</tr>
</tbody>
</table>

**California Proposition 65**

This product contains the following proposition 65 chemicals

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>California Prop. 65</th>
<th>Prop 65 NSRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylene chloride</td>
<td>75-09-2</td>
<td>Carcinogen</td>
<td>200 µg/day   50 µg/day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Carcinogen</td>
</tr>
</tbody>
</table>

**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>Methylene chloride</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
U.S. Department of Transportation

Reportable Quantity (RQ): Y
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 27-Jan-2010
Revision Date 17-Jan-2018
Print Date 17-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
ATTACHMENT H

Jobsite Safety Inspection Checklist
## JOBSITE SAFETY INSPECTION CHECKLIST

Client: _____________________________                             Inspection Date: _______________________

Site: _______________________________                            Inspector: _____________________________

Employees: _______________________________________________________________________________________________________

Notes:______________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________

__________________________________________________________________________________________________________________________________

Check one of the following:  **A:** Acceptable  **NA:** Not Applicable  **D:** Deficiency

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>NA</th>
<th>D</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate PPE being worn by Langan employees and subcontractors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air monitoring instruments calibrated daily and results recorded on the Daily Instrument Calibration check sheet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air monitoring readings recorded on the air monitoring data sheet/field log book?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incident reporting procedures known?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site security an issue?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle /pedestrian traffic issue?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate size/type fire extinguisher supplied?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evidence that drilling operator is responsible for the safety of his rig.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Aid kit available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PERSONAL PROTECTIVE EQUIPMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Protection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head protection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Shoes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety vests?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand protection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deficiencies??</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HOUSEKEEPING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work area kept clean/tidy to minimize potential hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste being disposed of quickly and properly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate lighting for job?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable water available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>HAND TOOLS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are tools in good condition and properly used? (INSPECT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are proper tools being used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are tools safety stored when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have tools been inspected prior to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are employees familiar with using tools?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is additional PPE required for tools? Available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>POWER TOOLS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are tools in good condition and properly used? (INSPECT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are tools properly grounded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety guards in place and used correctly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competent instruction / supervision?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cords include in inspection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### HAZWOPER

- Employees have current 40-hr./8-hr./Supervisor HAZWOPER training?
- Project staff medically cleared to work in hazardous waste sites and fit-tested to wear respirators, if needed?
- Respiratory protection readily available?
- Subcontract workers have current 40-hr./8-hr./Spvsr. HAZWOPER training, as appropriate?
- Subcontract workers medically cleared to work on site, and fit-tested for respirator wear?
- Subcontract workers have respirators readily available?

### HEALTH & SAFETY PLAN

- HASP available on site for inspection?
- Health & Safety Compliance agreement (in HASP) appropriately signed by Langan employees and subcontractors?
- Hospital route map with directions posted on site?
- Emergency Notification List posted on site?
- Personnel trained in CPR/First Aid on site?
- MSDSs readily available, and all workers knowledgeable about the specific chemicals and compounds to which they may be exposed?
- Project site safe practices ("Standing Orders") posted?
- Health & Safety Incident Report forms available?
- Decontamination procedures being followed as outlined in HASP?

### UNDERGROUND UTILITY

- Mark outs of underground utilities done prior to initiating any subsurface activities?
- Underground utilities located and authorities contacted before digging?
- Visually observed mark-outs?
- Is subsurface work within three feet of underground utilities?
  - Is so, is or was soft dig techniques used?
- Drilling performed in areas free from underground utilities?

### EXCAVATION / TRENCH

- Are excavations/trenches over 5 feet deep sloped, shored or a trench box used?
- Operations supervised by a Competent Person?
- Is Competent Person preforming daily inspections of excavation/trench?
- Adequate barricades in place?
- Have underground utilities been identified?
- Ladders / means of egress in trench with 25-foot of every worker?
- Has PE designed or approved protective system?
- Excavated material and other objects placed more than 2 feet away from excavation edge?
- Public protected from exposure to open excavation?

### CONFINED / PERMIT-ENTRY CONFINED SPACE

- People entering the excavation regarding it as a permit-required confined space and following appropriate procedures?
- Confined space entry permit is completed and posted?
- All persons knowledgeable about the conditions and characteristics of the confined space?
- All persons engaged in confined space operations have been trained in safe entry and rescue (non-entry)?
- Full body harnesses, lifelines, and hoisting apparatus available for rescue needs?
- Attendant and/or supervisor certified in basic first aid and CPR?
- Confined space atmosphere checked before entry and continuously while the work is going on?
- Results of confined space atmosphere testing recorded?
- Evidence of coordination with off-site rescue services to perform entry rescue, if needed?

### ELECTRICAL SAFETY

- Equipment at least 10 feet from overhead power lines?
- Is equipment grounded?
- GFCI used and tested where required?
- Are extension cords rated for this work being used and are they properly maintained?
- Electrical dangers posted at site?
### FLAMMABLE LIQUIDS
- Are flammable liquids used at site?
- Are flammable liquids stored in appropriate containers?
- Are flammable liquids kept away from combustion sources?
- Do flammable liquid containers have warning labels?

### LADDERS
- Are ladders used at site?
- Were ladders inspected prior to use?
- Are ladders in good working condition?
- Are ladders secured to prevent slipping, sliding or falling?
- Do side rails extend three feet above top of landing area?
- Are top two steps of stepladders being used?
- Is extension on ladder facing out?
- Are ladders sufficient for task?
- Are ladders sufficient for task?

---

**Unsafe acts observed?**

---

**Additional remarks**

---

**Notes:**

---

**Distribution:**
- Project Manager - Name: ___________________________
- Health & Safety Officer - Name: __________________________
- Health & Safety Manager- Name: **Anthony Moffa, CHMM**
GENERAL

- No smoking, eating, or drinking in this work zone.
- Upon leaving the work zone, personnel will thoroughly wash their hands and face.
- Minimize contact with contaminated materials through proper planning of work areas and decontamination areas, and by following proper procedures. Do not place equipment on the ground. Do not sit on contaminated materials.
- No open flames in the work zone.
- Only properly trained and equipped personnel are permitted to work in potentially contaminated areas.
- Always use the appropriate level of personal protective equipment (PPE).
- Maintain close contact with your buddy in the work zone.
- Contaminated material will be contained in the Exclusion Zone (EZ).
- Report any unusual conditions.
- Work areas will be kept clear and uncluttered. Debris and other slip, trip, and fall hazards will be removed as frequently as possible.
- The number of personnel and equipment in the work zone will be kept to an essential minimum.
- Be alert to the symptoms of fatigue and heat/cold stress, and their effects on the normal caution and judgment of personnel.
- Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved quickly by the site HSO.

TOOLS AND HEAVY EQUIPMENT

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other device not specifically designed to carrying passengers.
- Loose-fitting clothing or loose long hair is prohibited around moving machinery.
- Ensure that heavy equipment operators and all other personnel in the work zone are using the same hand signals to communicate.
- Drilling/excavating within 10 feet in any direction of overhead power lines is prohibited.
- The locations of all underground utilities must be identified and marked out prior to initiating any subsurface activities.
- Check to insure that the equipment operator has lowered all blades and buckets to the ground before shutting off the vehicle.
- If the equipment has an emergency stop device, have the operator show all personnel its location and how to activate it.
- Help the operator ensure adequate clearances when the equipment must negotiate in tight quarters; serve as a signalman to direct backing as necessary.
- Ensure that all heavy equipment that is used in the Exclusion Zone is kept in that zone until the job is done, and that such equipment is completely decontaminated before moving it into the clean area of the work zone.
- Samplers must not reach into or get near rotating equipment such as the drill rig. If personnel must work near any tools that could rotate, the equipment operator must completely shut down the rig prior to initiating such work. It may be necessary to use a remote sampling device.
APPENDIX B

Support of Excavation and Foundation Pile Drawings
WEST 155TH STREET
T.O. CURB
NAVD88 EL. ± 12.00'

ELEC.
±5'-0"
WATER
15" COMBINED SEWER
NAVD88 EL. ± 0.00'

EX. BRIDGE FND PILES.
AVOID PILES WHEN
DRILLING NEW TIE-BACKS.

8' CONST'N FENCE
WATER LEVEL
NAVD88 EL. ± 6'-0"

6'-0"
B.O. GEN. EXCAVATION
NAVD88 EL. ± 6'-6"
1'-4"
SLAB
T.O. 1ST FL SLAB
PROJ. EL. 0'-0"
NAVD88 EL. ± 18.85'

1'-2"
1'-2"
FND WALL
NOTE:
CONTRACTOR IS FULLY RESPONSIBLE
FOR INVESTIGATING EXISTING
UTILITIES PRIOR TO COMMENCEMENT
OF EXCAVATION/DRILLING.

NEW BUILDING SHOWN
FOR REFERENCE ONLY
T.O. 10" CELLAR FL SLAB
PROJ. EL. -10'-0"
NAVD88 EL. ± 8.85'

PILE CAP
FND PILES BY OTHERS.
LOCAL DEWATERING
REQUIRED (BY
OTHERS).

B.O. FOOTING
NAVD88 EL. ± 4.52'

17'-0" MIN. TOE
8'-6"
9-5/8" Ø DRILLED PIPE
PILE IN CANTILEVER
W/ CENTER BAR
3" TIMBER LAGGING, TYP.
3'-0"
±3'-10" ±3'-10"
1'-0" 1'-0"
3'-6" 3'-6" 3'-0" 4'-6" 3'-0" 3'-6" 22'-0"
T.O. BRIDGE
NAVD88 EL. ± 50.00'

NOTE:
CONTRACTOR IS FULLY RESPONSIBLE
FOR INVESTIGATING EXISTING
UTILITIES PRIOR TO COMMENCEMENT
OF EXCAVATION/DRILLING.
LOCAL DEWATERING
REQUIRED (BY OTHERS).

DRIVEN STEEL
SHEETING PILES IN
CANTILEVER, TYP.
1'-0" 1'-0" 15'-0" MIN. TOE
1'-10" 6'-10" WATER LEVEL
NAVD88 EL. ± 6'-0"
±6'-2" ±6'-2" 1'-0" 1'-0" 15'-0" MIN. TOE
1'-10" 6'-10" B.O. GEN. EXCAVATION
NAVD88 EL. ± 6'-6"
**TRENCH SHORING - MINIMUM REQUIREMENTS**

**SHORING DETAIL I**

1. **SHORING DETAILS**
   - PLOT DATE:
   - SCALE: N.T.S.

2. **INSTALLATION PROCEDURES:**
   - PRIOR TO COMMENCEMENT OF WORK
     - SET UP THE RIG ON PROPER LOCATION AND PLUMB THE MAST.
     - INSTALL DRILLED GR. 80 PIPE PILES, SHAFTED OR非 APPROVED EQUAL) ONE BAG CEMENT-SAND MIX INTO PIPE AND NAILED TO WALL.
   - IF EXISTING CONCRETE IS DISCOVERED DURING INSTALLATION, FOLLOW THE PROCEDURES TO EXTRACT THE CONCRETE TO THE EXCAVATION LINE.
   - IF THE EXCAVATION LINE IS BEHIND THE CONCRETE, ADJUST EXCAVATION LINE.
   - WHEN EXCAVATION TO ESSENTIAL FACILITIES, REMOVE INNER DRILLING ROD AND FOLLOW UP WITH ADDITIONAL CASING TO ELEVATION SHOWN FLUSH METHOD.
   - IF THE INTERNAL FLUSHING BAGS GET STUCK, ADVANCE DRILL BIT THROUGH OBSTRUCTION UNTIL THE INTERNAL FLUSHING BAGS ARE OUT.
   - IF THE CASING IS STUCK, ADVANCE DRILL BIT THROUGH EXCAVATION LINE AND INSTALL ADDITIONAL CASING WITH A MINIMUM OF 2 FEET.
   - IF THE EXCAVATION LINE IS BEHIND THE CONCRETE, BEHIND THE CONCRETE, BAG CEMENT-SAND MIX INTO THE EXCAVATION LINE.
   - IF EXISTING CONCRETE IS DISCOVERED DURING INSTALLATION, FOLLOW THE PROCEDURES TO EXTRACT THE CONCRETE TO THE EXCAVATION LINE.
   - WHEN EXCAVATION TO ESSENTIAL FACILITIES, REMOVE INNER DRILLING ROD AND FOLLOW UP WITH ADDITIONAL CASING TO ELEVATION FLUSH METHOD.

3. **WALER TO WALER CONNECTION - SECTION E**
   - DRAWN BY: 11/06/2020
   - CHECKED BY: 11/06/2020

4. **SHORING DETAIL II**
   - LAGGING (TYP.)
   - STEEL PLATE, U.O.N. (TYP.)
   - 1'-0" THK. CUSTOM CUT GUSSET PLATE, U.O.N. (TYP.)

5. **WALERRK/PIPE SOLDIER CONNECTION**
   - U Совет: 11/06/2020
   - CHECKED BY: 11/06/2020

6. **SHORING DETAIL III**
   - LAGGING (TYP.)
   - STEEL PLATE, U.O.N. (TYP.)
   - 1'-0" THK. CUSTOM CUT GUSSET PLATE, U.O.N. (TYP.)
DOUBLE CHANNEL WALER / TIE-BACK DETAIL

ELEVATION

SECTION A-A

PLANT SCALE: N.T.S.
QUALITY ASSURANCE PROJECT PLAN

for

280 WEST 155TH STREET DEVELOPMENT
NEW YORK, NEW YORK
NYSDEC BCP No. C231138

Prepared For:

280 W 155TH STREET OWNER, L.L.C.
c/o 299 Park Avenue, 35th Floor
New York, New York 10171

Prepared By:

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.
300 Kimball Drive
Parsippany, New Jersey 07054

December 2020
100765102
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1.0 PROJECT DESCRIPTION

1.1 Introduction

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan) has prepared this Quality Assurance Project Plan (QAPP) on behalf of 280 W 155TH STREET OWNER, L.L.C. (the Volunteer) for the property at 280 West 155th Street (Tax Block 2040, Lot 48) in the Harlem neighborhood of New York, New York (the Site). A Site Location Map is included as Figure 1.

This QAPP specifies analytical methods to be used to ensure that data collected during the Interim Remedial Measures (IRM) are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

1.2 Project Objectives

The IRM Work Plan includes collection of documentation samples as part of petroleum-impacted soil excavation (if it is encountered). This QAPP addresses sampling and analytical methods that will be necessary in support of IRM activities. These objectives have been established in order to meet standards that will protect public health and the environment for the site.

1.3 Scope of Work

The specific scope of work covered in this QAPP includes any documentation sampling that will occur during implementation of the IRM Work Plan. The IRM Work Plan requires collection of documentation soil samples to assess potential residual contamination following excavation of petroleum-impacted soil, if encountered.

2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall objectives are:

- To evaluate the quality of soil following excavation of petroleum impacts through the collection of documentation samples; and
To adequately characterize excavated petroleum-impacted soil based on the sampling requirements of proposed soil disposal facilities.

DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and quality assurance/quality control (QA/QC) documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- Precision – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- Accuracy – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil samples, accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.
- Representativeness – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified
sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory’s possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory’s Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

- **Completeness** – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.

- **Comparability** – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.

- **Sensitivity** – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

### 3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Implementation of the IRMWP will be overseen by Langan for 280 W 155TH STREET OWNER, L.L.C. The environmental consultant will also arrange data analysis and reporting tasks. The analytical services will be performed by an Environmental Laboratory Approval Program (ELAP)-certified laboratory. Data validation services will be performed by approved data validation contractor(s).

For the required sampling as stated in the IRMWP, sampling will be conducted by Langan, the analytical services will be performed by York Analytical Laboratories, Inc. of Stratford, Conn. (New York State Department of Health [NYSDOH] ELAP certification number 10854). Data validation services will be performed by Joe Conboy; résumé attached (Attachment A).
Key contacts for this project are as follows:

280 W 155TH STREET OWNER, L.L.C. Pavit Sabharwal
Telephone: (516) 624-9502

Langan Project Manager: Amanda Forsburg
Telephone: (973) 560-4900

Langan Quality Assurance Officer (QAO): Steve Ciambruschini
Telephone: (973) 560-4900

Langan Remedial Engineer: Seth Vaidya
Telephone: (973) 560-4900

Program Quality Assurance Monitor: Allyson Kritzer
Telephone: (973) 560-4900

Data Validator: Joseph Conboy
Telephone: (215) 845-6900

Laboratory Representative: Alpha Analytical, Inc.
Ben Rao
Telephone: (201) 847-9100

4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality to evaluate soil impacts at the site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

Precision
Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the
reporting limit (RL) meet the precision criteria if the absolute difference is less than ±2X the RL. For results greater than 2X the RL, the acceptance criteria is a relative percent difference (RPD) of ≤50% (soil), and <30% (groundwater). RLs and method detection limits (MDL) are provided in Attachment B.

**Accuracy**

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix interferences, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of field blanks and through compliance to all sample handling, preservation, and holding time requirements. All field blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated field blank was evaluated against laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias.

Laboratory accuracy is assessed by evaluating the percent recoveries of MS/MSD samples, LCS/LCSDs, surrogate compound recoveries, internal standard responses and the results of method preparation blanks. MS/MSD, LCS/LCSD, internal standard responses and surrogate percent recoveries were compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

**Completeness**

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
• Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
• Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Soil and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

**Representativeness**

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the sampling program and was satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and will be required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory’s possession. This is performed by following all applicable EPA and standard methods, laboratory-issued SOPs, the laboratory’s Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

**Comparability**

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and was satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data were comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability was controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance
objectives. Previously collected data were evaluated to determine whether they may be combined with contemporary data sets.

**Sensitivity**
Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest (e.g., at the NYSDEC Subpart 375-6 Soil Cleanup Objectives). The Project Manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the Project Manager will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated field blanks and duplicate samples will be based on the recommendations listed in DER-10 and as described in Section 5.3.2.

**5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES**

Soil sampling will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). The following sections describe procedures to be followed for specific tasks.

**5.1 Field Documentation Procedures**

Field documentation procedures will include summarizing field data in field books and proper sample labeling. These procedures are described in the following sections.
5.1.1 Field Data and Notes

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability and secure page binding. The pages of the notebook will not be removed.

Entries were made in waterproof, permanent blue or black ink. No erasures will be allowed. Incorrect entries will be crossed out with a single strike mark and the change initialed and dated by the team member making the change.

Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team’s activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number;
- Reasons for being on-site or taking the sample;
- Date and time of activity;
- Sample identification numbers;
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches were made in the field logbook when appropriate;
- Physical location of sampling locations such as depth below ground surface;
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures;
- Description of the sample including physical characteristics, odor, etc.;
- Readings obtained from health and safety equipment;
• Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample;
• Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera;
• Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.; and
• Names of sampling personnel and signature of persons making entries.

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained in the central project file.

5.1.2 Sample Labeling

Each sample collected will be assigned a unique identification number and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition, the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink. Sample nomenclature procedures are included in Attachment D.

5.2 Equipment Calibration and Preventative Maintenance

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels and screen soil samples. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the
logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer’s specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the manufacturer’s recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

5.3 Sample Collection

5.3.1 Soil Samples

Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Soil samples collected for analysis of VOCs will be collected using Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized and placed into glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of
collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

5.3.2 Sample Field Blanks and Duplicates

Use of dedicated sampling equipment is planned; therefore, collection of field blanks is not anticipated. If the use of reusable sampling equipment is required, proper decontamination procedures will be employed (as further described in Section 5.7) and field blanks will be collected for quality assurance purposes at a rate of one per 20 investigative soil samples. If required, field blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Field blank samples will be analyzed for the complete list of analytes on the day of sampling. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative soil samples and will be submitted to the laboratory as “blind” samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

5.4 Sample Containers and Handling

Certified, commercially clean sample containers will be obtained from the analytical laboratory. The laboratory will also prepare and supply the required field blank sample containers and reagent preservatives. Sample containers, including the field blank containers, will be placed in plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of 4°C ±2°C.

Samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated field blanks will be
maintained at a temperature of 4°C ±2°C while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.

5.5 Sample Preservation

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

5.6 Sample Shipment

5.6.1 Packaging

Sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (third-party courier, e.g., FedEx) then laboratory address labels will be placed on top of the cooler.

5.6.2 Shipping

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory from the site or Langan office by a laboratory provided courier
under the chain-of-custody protocols described in Section 5.9. A third-party courier may be used if necessary.

- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

5.7 Decontamination Procedures

Though not anticipated, decontamination procedures will be used if non-dedicated sampling equipment is utilized during the IRM. Decontamination of field personnel is discussed in the site-specific Health and Safety Plan (HASP) included in Appendix A of the IRMWP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

5.8 Residuals Management

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

5.9 Chain of Custody Procedures

A chain-of-custody protocol has been established for collected samples was and will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to
actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the samples, except for third-party shipping couriers, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.

- Following sample collection, the chain-of-custody form will be completed for the samples collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. Entries will be made in waterproof, permanent blue or black ink.

- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling/Field Team Leader will be responsible for enforcing chain-of-custody procedures during field work.

- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling/Field Team Leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Samples will be packaged for shipment or pickup via courier to the laboratory with the appropriate chain-of-custody form. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form. A copy of the form will be retained by the Langan sampling team for the project file, and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory.
Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory’s Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

5.10 Laboratory Sample Storage Procedures

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, Langan must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Following analysis, the laboratory’s specific procedures for retention and disposal will be followed as specified in the laboratory’s SOPs and/or QA manual.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Introduction

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.
The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

### 6.2 Data Reduction

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQuIS. To avoid transcription errors, data will be loaded directly into the American Standard Code for Information Interchange (ASCII) format from the LIMS. If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

### 6.3 Data Validation

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10 percent of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).
A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- Inductively couple plasma (ICP) serial dilutions; and
- Results verification and reported detection limits.
Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- “U” - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- “UJ” - Not detected. Quantitation limit may be inaccurate or imprecise;
- “J” - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method;
- “N” – Tentative identification. Analyte is considered present in the sample;
- “R” – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

7.1 Introduction

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

7.2 System Audits

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.
7.3 **Performance Audits**

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

7.4 **Formal Audits**

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.
8.0 CORRECTIVE ACTION

8.1 Introduction

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

8.2 Procedure Description

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be
documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 8.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.
## CORRECTIVE ACTION REQUEST

**Number:** __________________________  
**Date:** ____________

**TO:** _________________________________________  
You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring.  
Your written response is to be returned to the project quality assurance manager by ____________

### CONDITION:

### REFERENCE DOCUMENTS:

### RECOMMENDED CORRECTIVE ACTIONS:

<table>
<thead>
<tr>
<th>Originator</th>
<th>Date</th>
<th>Approval</th>
<th>Date</th>
<th>Approval</th>
<th>Date</th>
</tr>
</thead>
</table>

### RESPONSE

### CAUSE OF CONDITION

### CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

### C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: ____________________________  
**DATE:** ____________
9.0 REFERENCES


USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.


ATTACHMENT A

Resumes
Mr. Conboy has seven years of environmental chemistry, quality assurance, and environmental database management experience, with a current emphasis on validation of laboratory data for submittal to NJDEP via the New Jersey Data of Known Quality Protocols and to NYSDEC. Previous work experience includes performing validation of data for projects in USEPA Regions 2 and 3 while employing appropriate validation guidelines for each region, managing large data sets, updating appropriate regulatory limits, performing statistical evaluations, and preparing electronic data deliverables and report deliverables using the Earthsoft EQuIS database program, and acted as an intermediary between project managers, field staff, and laboratories. Mr. Conboy also has experience in field sampling techniques and maintains current OSHA HAZWOPER certification.

SELECTED PROJECTS

- **1400 Ferris, Bronx, NY** – Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs and SVOCs including 1,4-dioxane, and tangentially used based on professional judgment to perform validation of PFAS data.
- **Broome Street Parking Lot, NY** - Completed validation of waste characterization data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOCs, SVOCs, herbicides, PCBs, pesticides, metals including mercury, ignitability temperature, pH, reactive cyanide, reactive sulfide, cyanide, and hexavalent chromium. Toxicity characteristic leachate procedure extraction data for VOCs, SVOCs, herbicides, pesticides, metals, and mercury were also validated.
- **215 North 10th Street, Brooklyn, NY** - Completed validation of soil and groundwater data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data.
- **35 Commercial Street, Brooklyn, NY** - Completed validation of soil data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.
- **Suffolk Street, Lower East Side, NY** - Completed validation of soil, groundwater, and soil vapor data and prepared the Data Usability Summary Report for submittal to NYSDEC. USEPA Region II
guidelines, with aide from National Functional Guidelines, were employed to perform validation of VOC, VOCs by USEPA TO-15, SVOC, SVOC SIM, herbicide, PCB, pesticide, metals, mercury, cyanide, hexavalent chromium, trivalent chromium data, and tangentially used based on professional judgment to perform validation of PFAS data.

- Managed a database for a confidential client containing 10+ years of environmental chemical data from multiple laboratories, requiring select data validation in accordance with New Jersey Data of Known Quality Protocols and identifying areas of delineation from historic field information. Once identified, NJDEP designated groundwater, surface water, soil, sediment, soil vapor, and custom screening criteria were researched and applied to each area, requiring individualized flagging for reporting.*

- Prepared the New Jersey Data of Known Quality Protocol Data Usability Evaluation and managed the database for a confidential client for a data set greater than 20 years old. A DUE or any validation effort was not prepared in the 20 years prior to current. This included data from variations of methods for volatile organic compounds, semivolatile organic compounds, total and dissolved metals, pesticides, herbicides, natural attenuation parameters, and per- and polyfluoroalkyl substances in multiple media.*

- Performed 200+ Stage 2a validations for a combined 87-acre USEPA designated Corrective Action site under the Resource Conservation and Recovery Act, including a quick-turn USEPA required PCB by soxhlet extraction investigation across multiple plants. Once a former train car painting facility, USEPA required a quick-turn PCB by soxhlet extraction soil investigation.

- Preparation of a quality assurance program for a confidential client in West Virginia. A quick turn QAPP was prepared in a service location new to the consultant, resulting in research into state requirements for data usability and auditing newly employed laboratories. The QAPP was understood to be prepared for groundwater only, but the client did not reveal the need for sediment and soil. Two QAPPs were submitted for review to governing agencies.*

- Used statistical software to determine a localized background upper confidence limit of chromium for a confidential client’s sand and gravel site. Validation was used to confirm laboratory procedures, and data was used in ProUCL calculations to compare to researched background chromium levels for Pennsylvania soils.*

- Prepared daily perimeter dust and air monitoring summaries and validation of low level mirex data for a confidential client’s superfund site. Low level mirex data was generated by university laboratories and subject to validation following national functional guidelines to aide in river clean-up, including sediment, surface water, and treatment system water matrices.*

*Project completed prior to employment at LANGAN.
Allyson Kritzer
Staff Engineer
Environmental Engineering, Remedial Investigation/Remedial Action

3 years in the industry ~ 3 years with Langan

Ms. Kritzer has 3 years of working experience on environmental projects, particularly investigation and remediation of environmental contamination. She has participated in multiple phases of site remediation including site investigation, remedial investigation, and remedial action. Her experience includes sample collection and characterization of various environmental media, and preparing reports and other environmental regulatory documents.

Selected Projects

Bond Street Redevelopment, Brooklyn, NY – Staff Engineer to oversee the DEC and EPA determined remediation at 365 Bond Street. Responsibilities included excavation oversight and documentation, community and work zone air monitoring, weekly SECS inspections and crack gauge monitoring.

101-111 Murray Street, Manhattan, NY - Staff Engineer for the remedial action activities conducted at the 101-111 Murray Street redevelopment site. Responsibilities included air monitoring, excavation oversight, soil management oversight, post-excavation soil sampling, ground water sampling, and spill closure report preparation.

525 West 52nd Street, Manhattan, NY - Staff Engineer for the remedial action activities conducted at the 525 West 52nd Street redevelopment site. Responsibilities included air monitoring, excavation oversight, soil management oversight, and post-excavation soil sampling.

Former BICC Cables Site, Yonkers, NY - Third party staff engineer for the remedial action activities conducted at the Former BICC Cables site. Responsibilities included sediment cover cap installation oversight and NYSDEC correspondence.

Consolidated Edison 11th Avenue & 50th Street, Manhattan, NY - Staff Engineer for the remedial action activities conducted at the intersection of 11th Avenue and 50th Street in Manhattan, NY. Responsibilities include well gauging and oil absorbent sock replacement.

Former Penick Facility, Montville, NJ - Staff Engineer at a former pharmaceutical manufacturer in Montville, NJ. Responsibilities included groundwater sampling.

165 Mercer Street, Manhattan, NY - Staff Engineer for the remedial investigation activities conducted at the 165 Mercer Street site. Responsibilities included soil boring installation, soil sampling, temporary monitoring well installation, and groundwater sampling.

Education
B.S., Bioengineering
SUNY Binghamton

Professional Registrations
10-Hour Construction Safety
40-Hour HAZWOPER
NYSDEC Erosion and Sediment Control Certification
Respirator Fit Tested
Ms. Forsburg has over nine years of experience that includes working on environmental projects, particularly investigation and remediation of environmental contamination. She has assisted in remedial investigations and has been involved in the collection of field data and assisted in the preparation of reports and other environmental regulatory documents for projects in New Jersey and New York.

Ms. Forsburg's field experience includes investigation and remediation of contaminated sites including the collection of soil, groundwater, and air samples for environmental analysis, supervision of injections and remedial excavations, and the completion of air monitoring to ensure OSHA compliance on HAZWOPER sites. Office experience includes management of field investigation and remediation as well as completion of proposals, Phase I Environmental Site Assessments, remedial investigation reports, and remedial closure reports in support of these activities. Ms. Forsburg has worked on projects under regulatory oversight of the New Jersey Department of Environmental Protection (NJDEP), New York State Department of Environmental Conservation (NYSDEC), and New York City Office of Environmental Remediation (NYCOER).

Selected Projects

NYSDEC Brownfield Redevelopment, Remedial Investigation and Remediation Action – 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Remedial Investigation – Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, Remedial Action – 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, Remedial Investigation and Remedial Action – 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Remedial Action, Lowe’s Home Centers, Kings Plaza Site Redevelopment – Brooklyn, NY
NYSDEC Spills Remediation, Con Edison Soil Remediation - Bronx, NY
NYSDEC Spills Remediation, Con Edison NAPL Monitoring and Removal, Various Sites – Manhattan, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 400 Park Avenue South, New York, NY
NYCOER E-Designation Remediation and Volunteer Cleanup Program Redevelopment, Remedial Investigation and Remedial Action – 540 West 53rd Street, New York, NY
Remedial Action – 508 West 24th Street, New York, NY

Education

B.A., Environmental Studies
Bucknell University

B.A., Environmental Geology
Bucknell University

Professional Registration

Certified Hazardous Materials Manager (CHMM)
OSHA 29 CFR 1910.120 Certification (HAZWOPER)

Professional Affiliations

New Jersey Society of Women Environmental Professionals (NJSWEP)
Association of Environmental and Engineering Geologists – New York-Philadelphia Chapter Secretary
Professional Women in Construction - New York Chapter Program Committee
Alliance of Hazardous Materials Professionals New Jersey Chapter (AHMPNJ)

Amanda Forsburg, CHMM
Project Scientist
Environmental Oversight, Remedial Investigation, Remedial Action

9 years in the industry ~ 9 years with Langan
Amanda Forsburg, CHMM

NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 53 West 53rd Street (MoMA Expansion), New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 508 West 24th Street, New York, NY
NYCOER E-Designation Remediation, Remedial Investigation and Remedial Action – 68 Charlton Street, New York, NY
NYCDEP Remediation, Remedial Investigation and Remedial Action – 225 East 39th Street, New York, NY
Sky View Parc Mixed-Use Construction, Sub-Slab Vapor Ventilation System Construction – Flushing, NY
Liberty Plaza Redevelopment Site, Remedial Investigation and Remedial Action – Randallstown, MD
Former Penick Corporation Facility RCRA Site, Remedial Investigation and Remedial Action – Montville, NJ
Former Pan Graphics Facility, Soil and Groundwater Remediation – Garfield, NJ
Former Pan Graphics Facility, Sediment Investigation and Cap Construction – Lodi, NJ
Former Flintkote Facility, Soil and Groundwater Investigation – East Rutherford, NJ
Interport Site, Impacted Soils Delineation and Remediation – Newark, NJ
Lowe’s Home Center Store, Sub-Slab Vapor Ventilation System O&M – Eatontown, NJ
Lowe’s Home Center Store, Sub-Slab Methane Gas Ventilation System O&M – Woodbridge, NJ
Lowe’s Home Center Store, Sub-Slab Vapor Barrier Construction – Rosedale, NY
Stop & Shop, Groundwater and Indoor Air Monitoring – Emerson, NJ
Stop & Shop, Methane Gas Ventilation System O&M – Raritan, NJ
Stop & Shop, Sub-Slab Vapor Ventilation System O&M – New Paltz, NY
Former First Aviation Services Facility, Groundwater Monitoring and Remediation, Teterboro, NJ
Phase I Environmental Site Assessments and Due Diligence Investigations, Various Sites – NJ and NY
Mr. McMahon is a consulting geologist whose primary focus within his tenure at Langan has been in providing environmental support to redevelopment sites within the metropolitan New York area. He has experience with projects in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup, Voluntary Cleanup and Spill Programs, and New York City Office of Environmental Remediation E-Designated and New York City Voluntary Cleanup Program sites. These projects have included the completion of Phase I environmental site assessments, Phase II and remedial investigations, UST closures, NYSDEC closures and remedial excavation oversight for off-site disposal and/or treatment. Mr. McMahon also has significant field experience including implementation and management of all phases of environmental projects involving soil, sediment, groundwater, surface water, and soil vapor contamination including Phase I inspections, Phase II site investigations, Remedial Investigations, and Remedial Actions.

Many of these projects have included his oversight of remedial actions to clean up or mitigate hazardous waste sites in rural, urban, and industrial settings. These remedial action designs have included in-situ soil remedial injections, contaminated soil removal/disposal management plans, and soil vapor intrusion mitigation systems including advanced vapor barriers and sub-slab depressurization systems.

Selected Projects

NYSDEC Brownfield Redevelopment 363 and 365 Bond Street, Brooklyn, NY
NYSDEC Brownfield Redevelopment, Fashion Outlets of Niagara Falls, NY
NYSDEC Spills Redevelopment, 540 West 26th Street, New York, NY
NYSDEC Spills Redevelopment, 101 Murray Street, New York, NY
NYSDEC Spills Redevelopment, 110 University Place, New York, NY
NYSDEC Spills Redevelopment, Grant Park, Yonkers, NY
NYSDEC Spills Redevelopment, The Shops At Nanuet, Nanuet, NY
NYCOER E-Designation Remediation, 505 W 19th Street, New York, NY
NYCOER E-Designation Remediation, 53 West 53rd Street, New York, NY
NYCOER E-Designation Remediation, 525 West 52nd Street, New York, NY
NYCOER E-Designation Remediation, 412 Greenwich Street, New York, NY
NYCOER E-Designation Remediation, 508 West 24th Street, New York, NY
NYSDEC (Region 7) Site Remedial Investigation, Hillcrest, NY
Former Manufactured Gas Plant Site Remedial Investigation, Geneva, NY
NYSDEC (Region 2) Superfund Site Remedial Investigation, Jamaica, NY
NYSDEC (Region 5) Superfund Site Remedial Investigation, Whitehall, NY
Former Manufactured Gas Plant Site Investigation/Confidential Client, Mechanicville, NY
Remedial Investigation of Industrial Facility/Confidential Client, Batavia, NY
OGS Geotechnical Survey for Construction, Rome, NY
Mr. Vaidya has close to 20 years of geotechnical engineering experience with particular emphasis on design and construction of foundations for high-rise structures in urban areas. Mr. Vaidya’s specific areas of expertise include planning and implementing sub-surface investigations; engineering shallow and deep foundation systems; inspection of soil compaction and foundation sub-grade preparation; static and dynamic load testing of driven pile foundations; design and installation of driven piles, mini-piles, auger pressure-grouted displacement (APGD) piles, and rock-socketed caissons; tie-back and tie-down anchor design and construction; design and monitoring of soil surcharges; design and construction of temporary and permanent excavation support systems; Plaxis finite element modeling; geotechnical instrumentation monitoring; and . He has obtained extensive fieldwork, office supervision, and project management experience on several projects in New York and New Jersey.

SELECTED PROJECTS

- 1 Seventh Avenue South, New York, NY
- 1 Nassau Place Development, Staten Island, NY
- 17th Street Development, New York, NY
- 100 West 18th Street Development, New York, NY
- 135 West 45th Street Development, New York, NY
- 18-30 MW Offshore Wind Farm, Offshore NJ
- 225 West 58th Street Development, New York, NY
- 236 Livingston Street Development, Brooklyn, NY
- 250 East 57th Street Development, New York, NY
- 250 South Street Development, New York, NY
- 255 Hudson Street Development, New York, NY
- 303 East 51st Street, New York, New York
- 330 Spring Street Development, New York, NY
- 363 and 365 Bond Street Development, Brooklyn, NY
- 499 Greenwich Street Development, New York, NY
- 508 West 24th Street development, New York, NY
- 535 West End Avenue Development, New York, NY
- 610 Lexington Avenue Development, New York, NY
- American Dream Meadowlands, East Rutherford, NJ
- Bank Street Commons, White Plains, NY
- Carnegie West 57th Street Development, New York, NY
- Central Park Tower Development, New York, NY
- City Gate, Queens, NY
- Costco, Ocean Township, NJ
- Gem Tower Development (55 West 46th Street), New York, NY
- Harlem-West 125th St. Development, New York, NY
- Hudson Street Residential Building, New York, NY
- Lowe’s, Various Locations
- Marble Collegiate Church Connection Building, New York, NY
- Nathani Heights Development, Mumbai, India

EDUCATION

M.S., Civil Engineering (Geotechnical)  
University of Massachusetts, Amherst  

B.E., Civil Engineering  
University of Mumbai, India

PROFESSIONAL REGISTRATION

Professional Engineer (PE) in NJ and NY

AFFILIATIONS

Deep Foundations Institute (DFI)  
DFI India Regional Committee  
American Society of Civil Engineers (ASCE)  
Geo Institute of ASCE
NEW YORK WHEEL, STATEN ISLAND, NEW YORK, NY
ONE57 DEVELOPMENT, NEW YORK, NY
ONE NEW YORK PLAZA, NEW YORK, NY
PARRISH ART MUSEUM DEVELOPMENT, WATER MILL, LONG ISLAND, NY
REVANTA DEVELOPMENT, GURGAON, INDIA
STOP & SHOP, RIDGEFIELD, CT
TARGET, BETHEL, CT
TARGET, WILKES-BARRE, PA
THE DIAMOND TOWER DEVELOPMENT, NEW YORK, NY
THE ORION, 350 WEST 42ND STREET, NEW YORK, NY
THE STANDARD (856 WASHINGTON STREET) DEVELOPMENT, NEW YORK, NY
THE TOWER RESIDENCES (BATTERY PARK SITE 2A), NEW YORK, NY
WATCHUNG SQUARE MALL, WATCHUNG, NJ
WOODCREST PARK VILLAGE DEVELOPMENT, OCEANSIDE, NY
Mr. Ciambruschini has over 30 years of experience in hydrogeologic and environmental investigations including management of environmental and geotechnical investigations relating to petroleum and chlorinated solvent spill sites, underground storage tank sites, manufactured gas plant sites, landfills, wastewater treatment facilities and industrial/commercial sites. His experience includes managing environmental compliance audits, remedial investigation, pre-acquisition due diligence and permitting assessment, feasibility studies and design, construction and operation of complex innovative remediation systems to treat, contain and recover contaminated soil and groundwater. These projects are managed under various NJDEP, PADEP, NYDEC, NYCDP and CTDEP programs. Mr. Ciambruschini provides consultation to a diverse group of clients including private developers, utilities, retail and industrial facilities and is expert in assessing remediation options and funding options under various state and federal grant, loan and tax reimbursement programs including Brownfield programs.

Selected Projects

- Brodson Property, Montville NJ, (RCRA, NJDEP ACO Cleanup)
- Carroll Gardens, Brooklyn, NY (NY Brownfield, EPA Superfund, OER E-designated Site)
- Con Edisson Appendix B Spill Sites - Various Locations, NY
- Former MGP Site, Brooklyn, NY (VCP Site)
- Extell Development, Hudson Yards, New York, NY (NYC E-designated, NYS Brownfield Site)
- Pan Graphics, Bergen County, NJ (ISRA, LSRP)
- New Jersey Turnpike General Environmental Services Contract, Various Sites, NJ
- Liberty Science Center, Jersey City, NJ (EO 215)
- Blue Back Square, West Hartford, CT (UST, Transfer Act, Brownfield)
- Hershey, Act II Investigation (PA VCP)
- Hershey, Naugatuck, CT (CT Transfer Act)
- Halby Chemical Sites, Various Sites, DE (CERCLA)
- Unisys, Middletown CT, (CT Transfer Act, Brownfield)
- Ryder Rental, Various Sites in CT (CT Transfer Act)
- St. Marks Avenue, Brooklyn, NY (Vapor Mitigation)
- Pan Graphics, Lodi, NJ (Eco Risk Assessment, LSRP)
ATTACHMENT B

Laboratory Reporting Limits and Method Detection Limits
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<thead>
<tr>
<th>Method</th>
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<th>Analyte</th>
<th>MDL</th>
<th>RL</th>
<th>Units</th>
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<td>MDL</td>
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<td>EPA 8270D</td>
<td>Soil</td>
<td>Caprolactam</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Carbazole</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4-Chloro-3-methylphenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4-Chloroaniline</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Bis(2-chloroethoxy)methane</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Bis(2-chloroethyl)ether</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Bis(2-chloroisopropyl)ether</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Chloronaphthalene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Chlorophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4-Chlorophenyl phenyl ether</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Chrysene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
</tbody>
</table>
## ATTACHMENT B
Laboratory Reporting Limits and Method Detection Limits

<table>
<thead>
<tr>
<th>Method</th>
<th>Matrix</th>
<th>Analyte</th>
<th>MDL</th>
<th>RL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Dibenzo(a,h)anthracene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Dibenzofuran</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Di-n-butyl phthalate</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,2-Dichlorobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,3-Dichlorobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,4-Dichlorobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>3,3'-Dichlorobenzidine</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4-Dichlorophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Diethyl phthalate</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4-Dimethylphenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Dimethyl phthalate</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4,6-Dinitro-2-methylphenol</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4-Dinitrophenol</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4-Dinitrotoluene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,6-Dinitrotoluene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Di-n-octyl phthalate</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,2-Diphenylhydrazine (as Azobenzene)</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Bis(2-ethylhexyl)phthalate</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Fluoranthene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Fluorene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Hexachlorobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Hexachlorobutadiene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Hexachlorocyclopentadiene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Hexachloroethane</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Indeno(1,2,3-cd)pyrene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Isophorone</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Methylnaphthalene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Methylphenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>3- &amp; 4-Methylphenols</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>Method</td>
<td>Matrix</td>
<td>Analyte</td>
<td>MDL</td>
<td>RL</td>
<td>Units</td>
</tr>
<tr>
<td>--------------</td>
<td>--------</td>
<td>-------------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Naphthalene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4-Nitroaniline</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Nitroaniline</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>3-Nitroaniline</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Nitrobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2-Nitrophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>4-Nitrophenol</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>N-nitroso-di-n-propylamine</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>N-Nitrosodimethylamine</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>N-Nitrosodiphenylamine</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Pentachlorophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Phenanthrene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Pyrene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>Pyridine</td>
<td>83.5</td>
<td>167</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,2,4,5-Tetrachlorobenzene</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,3,4,6-Tetrachlorophenol</td>
<td>41.7</td>
<td>83.3</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>1,2,4-Trichlorobenzene</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4,6-Trichlorophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
<tr>
<td>EPA 8270D</td>
<td>Soil</td>
<td>2,4,5-Trichlorophenol</td>
<td>20.9</td>
<td>41.7</td>
<td>ug/kg</td>
</tr>
</tbody>
</table>

**ATTACHMENT B**

Laboratory Reporting Limits and Method Detection Limits
ATTACHMENT C

Analytical Methods / Quality Assurance
Summary Table
<table>
<thead>
<tr>
<th>Matrix Type</th>
<th>Field Parameters</th>
<th>Laboratory Parameters</th>
<th>Analytical Methods</th>
<th>Sample Preservation</th>
<th>Sample Container Volume and Type</th>
<th>Sample Hold Time</th>
<th>Number of Samples to be Collected</th>
<th>Field Duplicate Samples</th>
<th>Equipment Blank Samples</th>
<th>Trip Blank Samples</th>
<th>Ambient Air Samples</th>
<th>MS/MSD Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Total VOCs via PID</td>
<td>CP-51 VOCs</td>
<td>EPA 8260C</td>
<td>Cool to 4°C</td>
<td>Two 40-ml VOC vials with 5ml H₂O, one with MeOH or 3 Encore Samplers (separate container for % solids)</td>
<td>14 days, freeze at lab within 48 hours</td>
<td>TBD</td>
<td>1 per 20 samples (minimum 1)</td>
<td>1 per 20 samples, if needed (minimum 1, if needed)</td>
<td>1 per shipment of VOC samples</td>
<td>NA</td>
<td>1 per 20 samples (minimum 1)</td>
</tr>
<tr>
<td></td>
<td>CP-51 SVOCs</td>
<td>EPA 8270D</td>
<td>Cool to 4°C</td>
<td>4 oz. jar*</td>
<td>14 days extract, 40 days after extraction to analysis</td>
<td>14 days extract, 40 days after extraction to analysis</td>
<td>TBD</td>
<td>1 per 20 samples (minimum 1)</td>
<td>1 per 20 samples, if needed (minimum 1, if needed)</td>
<td>1 per shipment of VOC samples</td>
<td>NA</td>
<td>1 per 20 samples (minimum 1)</td>
</tr>
</tbody>
</table>

Notes:
*can be combined in one or more 8 oz. jars
mL = milliliter
VOC = Volatile organic compound
SVOC = Semi-volatile organic compound
TBD = to be determined
PID = Photoionization detector
CP-51: New York State Department of Environmental Conservation Commissioner’s Policy #51
EPA = U.S. Environmental Protection Agency
NA = Not applicable
⁰C = degree Celsius
ATTACHMENT D

Sample Nomenclature
SOP #01 – Sample Nomenclature

INTRODUCTION

The Langan Environmental Group conducts an assortment of site investigations where samples (Vapor, Solids, and Aqueous) are collected and submitted to analytical laboratories for analysis. The results of which are then evaluated and entered into a data base allowing quick submittal to the state regulatory authority (New York State Division of Environmental Conservation [NYSDEC]). In addition, Langan is linking their data management system to graphic and analytical software to enable efficient evaluation of the data as well as creating client-ready presentational material.

SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) is applicable to the general framework for labeling vapor, solid (soil) and aqueous (groundwater) samples that will be submitted for laboratory analysis. The nomenclature being introduced is designed to meet the NYSDEC EQuIS standard and has been incorporated into Langan software scripts to assist project personnel in processing the data. While this SOP is applicable to all site investigation; unanticipated conditions may arise which may require considerable flexibility in complying with this SOP. Therefore, guidance provided in this SOP is presented in terms of general steps and strategies that should be applied; but deviation from this SOP must be reported to the Project Manager (PM) immediately.

GENERAL SAMPLE IDENTIFICATION CONSIDERATIONS

Sample Labels
All sample ware must have a label. Recall that when you are using the Encore™ samples (see below); they are delivered in plastic lined foil bags. You are to label the bags1:

![Sample Label Image]

All other samples containers including Terra Cores™ must be labeled with laboratory provided self-adhesive labels.

Quick Breakdown of Sample Format
The general format for sample nomenclature is:

1Both Alpha and York laboratories permit the combining of the three Encore™ into a single bag. This may not be appropriate for all laboratories so please confirm with the labs themselves.
LLNN_ID

Where

**LL** is a grouping of two (2) to four (4) letters signifying the sample media source. In older nomenclature SOPs this portion of the sample identification is commonly referred to as the Sample Investigation Code

**NN** represents a two digit number identifying the specific sample location or sample sequence number

_ (underscore) is required between the sample lettering and numeric identification and additional modifying data that determines the date of sampling or the depth of the sample interval

**ID** is a modifier specific to the sample type media (depth of soil sample or date of groundwater sample)

**LL – Sample Investigation Code**

Langan has devised a list of two to four letters to insure a quick ability to identify the sample investigation.

<table>
<thead>
<tr>
<th>Code</th>
<th>Investigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Ambient Air</td>
</tr>
<tr>
<td>DS</td>
<td>Drum</td>
</tr>
<tr>
<td>EPB</td>
<td>Endpoint Location - Bottom (Excavation)</td>
</tr>
<tr>
<td>EPSW</td>
<td>Endpoint Location - Sidewall (Excavation)</td>
</tr>
<tr>
<td>FP</td>
<td>Free Product</td>
</tr>
<tr>
<td>IA</td>
<td>Indoor Air</td>
</tr>
<tr>
<td>IDW</td>
<td>Investigation Derived Waste (Soil Pile)</td>
</tr>
<tr>
<td>MW</td>
<td>Monitoring Well (Permanent)</td>
</tr>
<tr>
<td>SB</td>
<td>Soil Boring</td>
</tr>
<tr>
<td>SG</td>
<td>Staff Gauge (Stream Gauging)</td>
</tr>
<tr>
<td>SL</td>
<td>Sludge</td>
</tr>
<tr>
<td>SV</td>
<td>Soil Vapor Point</td>
</tr>
<tr>
<td>SVE</td>
<td>Soil Vapor Extraction Well</td>
</tr>
<tr>
<td>SW</td>
<td>Surface Water</td>
</tr>
<tr>
<td>TMW</td>
<td>Temporary Monitoring Well</td>
</tr>
<tr>
<td>TP</td>
<td>Test Pit (Excavated Material from Test Pit Not Associated With Sidewall or Bottom Samples)</td>
</tr>
<tr>
<td>WC</td>
<td>Waste Characterization Boring</td>
</tr>
<tr>
<td>COMP</td>
<td>Composite Sample</td>
</tr>
<tr>
<td>TB</td>
<td>Trip Blank (QA/QC Sampling – All Investigations)</td>
</tr>
<tr>
<td>FB</td>
<td>Field Blank (QA/QC Sampling – All Investigations)</td>
</tr>
<tr>
<td>DUP</td>
<td>Duplicate (QA/QC Sampling – All Investigations)</td>
</tr>
</tbody>
</table>

**NN – Numeric Identifier**

The two digit number that follows the sample investigation code (LL) identifies the specific sample based on the soil boring, monitoring well, endpoint or other location identification. For a subset of samples
where there is no specific location identifier, the two digit number is the sequence number for the sample submitted. For example, an aqueous sample from a monitoring well identified as MW-1 would have the sample investigation code of MW and the numeric identifier as 01. Note there is no hyphen. The same can be done for soil borings, a soil sample collected from soil boring 9 (SB-9) would be have the LLNN identification of SB09 (again, no hyphen).

Note however that there is a subset of samples related to laboratory analytical quality assurance, among these includes TB, FB, and DUP. On many investigations, the Scope will require multiple collections of these types of samples, therefore the numerical number represents the sequence sample count where the first sample is 01, the second sample is 02, and the third sample is 03 and so on.

*Underscore*

The underscore is required. It separates the investigation code and numeric identifier from the modifier specific to the sample itself. Note that every effort should be made to insure that the underscore is clear on the sample label and chain of custody (COC).

**ID – Modifier Specific to Type Media**

Each sample investigation code and numeric identifier is further modified by an ID specific to the sample type media. In general, soil samples (soil borings or endpoint samples) use an ID that indicates the depth at which the sample was taken. Aqueous samples (groundwater or surface water samples) are identified by the date the sample was collected. Other types of samples including quality control (TB, FB, and DUP), Vapor samples (AA, IA, SV or SVE), other soil type samples (IDW, sludge, free product, drum, and others) are also identified by a date. The following rules apply to the ID when using sample depth or sample date.

**Sample Depth**

The sample depth must be whole numbers (no fractions) separated by a hyphen. Thus for a soil sample collected from the soil boring SB-1 from a depth of 6 feet to 8 feet, the sample would be identified as:

SB01_6-8

Unfortunately, the NYSDEC EQuIS system does not accept fractions. Therefore, if your sample interval is a fraction of a foot (6.5-7.5), round up to the larger interval (6-8).

**Sample Date**

The sample date is always in the format of MMDDYY. Note that the year is two digits. Thus for a groundwater sample collected on July 1, 2015 from the monitoring well MW-1, the sample would be identified as:

MW01_070115

**Special Cases**

There are a couple of specific sample types that require further explanation.

**Endpoint Sampling**

End point sidewall samples are sometimes modified by magnetic direction (N, S, E, and W). For example, the first sidewall endpoint sample from the north wall of an excavation at a depth of 5 feet would be written as:

EPSW01_N_5
Again, note that the N in the identification refers to north and is separated from the prefix investigation code/numeric identifier and ID modifier suffix by underscores.

**Vapor Extraction Well Sample**

As with the sidewall endpoint samples, the sample name is altered by inserting a middle modifier between the prefix and suffix of the sample name. The middle modifier is used to identify the source of the sample (inlet sample port, midpoint sample port or outlet sample port). For example the midpoint port of the vapor extraction well number 1 sampled on July 1, 2015 would be written as:

SVE01_MID_070115

**Matrix Spike and Matrix Spike Duplicate**

On occasion, a Langan investigation will collect a sample to be used to provide the lab with a site specific medium to spike to determine the quality of the analytical method. This special case of sampling requires additional information to be used in the sample name, specifically, a suffix specifying whether the sample is the matrix spike (MS) or the matrix spike duplicate (MSD). In the following example, the sample is collected from soil boring number 1 at a depth of 2-4 feet. For the matrix spike sample:

SB01_2-4_MS

and for the matrix spike duplicate sample:

SB01_2-4_MSD

**Multiple Interval Groundwater Sampling**

Although not currently a common practice, low flow sampling facilitates stratigraphic sampling of a monitoring well. If the scope requires stratigraphic sampling then groundwater samples will be labeled with a lower case letter following the well number. For example, placing the pump or sampling tube at 10 feet below surface in MW01 on July 1, 2015 would require the sample to be labeled as:

MW01a_070115

While a second sample where the pump or tubing intake is placed at 20 feet would be labeled as:

MW01b_070115

Note that it is important that you record what depth the intake for each sample represents in your field notes; as this information is going to be critical to interpreting the results.